

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ERICSSON INC.
Petitioner,

v.

KONINKLIJKE KPN N.V.
Patent Owner.

Case No. IPR2023-00902

Patent No. 9,438,572

DECLARATION OF CRAIG BISHOP

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I. INTRODUCTION

I, Craig Bishop, declare as follows:

1. I have been retained as an independent expert witness on behalf of Ericsson Inc. and Telefonaktiebolaget LM Ericsson (“Petitioners”) (“Ericsson”) in connection with Inter Partes Review (“IPR”) of U.S. Patent No. 9,438,572 (“the ’572 patent”).

2. I am being compensated for my work in this matter at my accustomed hourly rate. I am also being reimbursed for reasonable and customary expenses associated with my work and testimony in this investigation. My compensation is not contingent on the results of my study, the substance of my opinions, or the outcome of this matter.

3. I have been asked to opine on the date of public accessibility for one 3GPP deliverable: S3-070234, “Key Refresh in SAE/LTE,” 3GPP TSG SA WG3 Security – SA3#46b, 28-29 March, 2007.

4. In the preparation of this declaration I have reviewed the documents cited herein, each of which is a type of material that experts in my field would reasonably rely upon when forming their opinions.

5. In forming the opinions expressed within this declaration, I have considered:

1) The attached appendices to this declaration; and

- 2) My own academic background, knowledge, and professional experiences in the field of wireless communications and 3GPP standards-development, as described below.
6. Although I have attempted to organize the information presented in this declaration into helpful sections and/or divisions, my opinions are supported by the information in the declaration in its entirety.

II. QUALIFICATIONS

7. My complete qualifications and professional experience are described in my *curriculum vitae*, a copy of which has been submitted as **Appendix A**. The following is a summary of my relevant qualifications and professional experience.

8. I earned my Bachelor of Electronic Engineering degree with Honors from Polytechnic of Central London in 1989. In 2005, I earned my MSC in Computer Science with Distinction from the University of Kent.

9. After graduating with my first degree, I worked as an operations engineer at the British Broadcasting Corporation (BBC) for 4 years, then as a civil servant at the UK Radiocommunications Agency until 1996, during which time I became involved in telecommunications standardization in the European Telecommunication Standards Institute (ETSI), working in particular in Technical Committee Radio Equipment and Systems (TC RES2) concerned with the standardization of Private Mobile Radio (PMR). From 1994 through 1996, I acted

as Rapporteur for voice and data related PMR standards ETS 300 113, ETS 300 219 and ETS 300 390. I participated as the only TC RES2 delegate on behalf of the UK Radiocommunications Agency, generating proposals in support of UK administration and business requirements, downloading and reviewing other meeting input documents when available, and proposing changes as necessary to ensure input documents and the resulting specifications were in line with said requirements.

10. In 1996, I joined Samsung Electronic Research Institute as a Senior Standards Engineer where I worked for 16 years, eventually becoming Director of Standards and Industry Affairs in 2011. My work at Samsung mainly focused on the standardization of GSM/GPRS, UMTS, and LTE/EPS systems. Initially, I participated in ETSI Special Mobile Group (SMG) committees SMG1, SMG2, SMG4, SMG5, SMG9 and relevant UMTS related sub-committees until 1999, working on the air interface radio access network protocols, service, and terminal aspects of UMTS and GSM/GPRS. I was specifically involved in the ETSI SMG2 meetings leading up to selection of WCDMA as the radio access technology for the Frequency Division Duplex mode of UMTS.

11. Beginning in 1998, I worked as a Principal Standards Engineer on the 3rd Generation Partnership Project (3GPP) on UMTS. I have been involved with 3GPP since its creation. I attended the inaugural 3GPP TSG meetings held in

December 1998, and I began attending Working Group (WG) meetings in 1999. Specifically, I attended Radio Access Network (RAN) WG1, RAN WG2, Services & System Aspects (SA) WG1, Terminals (T) WG2, and other Working Groups and Technical Specification Group (TSG) plenary meetings covering similar technical aspects as in my previous work in ETSI. As examples, RAN WG1 was, and is, a Working Group responsible for the specification of the physical layer of the latest wireless cellular standards, and RAN WG2 was, and is, a Working Group responsible for signaling protocol layers 2 and 3 residing just above the physical layer. As part of this work, I would prepare meeting contributions in support of Samsung's research and development activities. Also, by way of preparation for each meeting, I would download contributions, typically all of the meeting's contributions, and review those of interest to Samsung, and where necessary, prepare additional input to the meeting based on said review.

12. Beginning in 2000, I acted as project manager and then as system engineer at Samsung, providing technical requirements for the team working on Samsung's UMTS modem development. This involved scrutiny of ongoing standardization work, particularly in RAN WG1, RAN WG2, and TSG Core Network (CN) WG1, from which I would download, and assess the impact of, contributions on Samsung's development project, ensuring that Samsung's development team was kept informed about the latest developments as layers 2 and

3 of the UMTS standard were stabilized.

13. During this period, in addition to authoring and presenting technical contributions for the 3GPP standard, and producing technical requirements for the radio modem, I acted as Rapporteur for 3GPP Technical Reports covering User Equipment (UE) capability requirements (3GPP TR 21.904) from 1999–2000, and the Evolution of the 3GPP System (3GPP TR 21.902) in 2003 (the first Study Item to consider the 3GPP system beyond UMTS towards LTE/EPS).

14. In 2005, I became Head of Advanced Technologies, Standards and Regulation (ATSR) at Samsung. In addition to my managerial duties which included responsibility for standards, research, and regulatory engineers including three standards engineers who were regularly attending RAN WG2 and Core Network and Terminals (CT) WG1 Working Groups, I personally continued to work on 3GPP standardization issues. From 2005 until 2008, I regularly attended and participated in SA WG2 meetings, and from 2008 until 2011 I regularly attended and participated in SA WG1 meetings. I also attended SA plenary meetings from 2008 until I left Samsung in 2013. As well as generating contributions in support of Samsung's research and development as preparation for each meeting, I would download and review documents from other 3GPP members, identifying those of interest to Samsung and, where necessary, preparing additional contributions on behalf of Samsung. The work required a sound working

knowledge of the broader 3GPP system to ensure effective management of the ATSR team, effective participation in meeting discussions, expert assessment of third-party standards contributions, and provision of implementation guidance to Samsung developers.

15. From 2006 until I stopped attending SA WG1 meetings in 2011, I authored and presented over 100 contributions to SA WG2 and SA WG1 meetings at 3GPP and appeared as an author/co-author on 18 patent applications related to User Equipment operation in the IMS and the 3GPP Core Network.

16. In 2011, I became Director of Standards and Industry Affairs at Samsung, and in November of that year I was elected to the Board of ETSI on which I served for a term of 3 years until November 2014.

17. Upon leaving Samsung in January 2013, I set up my independent consulting company which is a member of ETSI, and as part of various projects undertaken, I have continued to regularly access the 3GPP and ETSI document servers, and to keep abreast of 3GPP and ETSI document handling practices.

18. Through my extensive work on 3GPP standardization issues, I have become very familiar with 3GPP's practices relating to making final specifications, draft standards, and standards-related contributions publicly available, including in the 1999–2012 timeframe when I was attending or monitoring various 3GPP Technical Specification and Working Groups.

III. PUBLIC AVAILABILITY OF 3GPP STANDARDS PROPOSALS AND OTHER DOCUMENTS

19. Based on my years of experience working in various capacities on 3GPP standards issues, I am familiar with the regular business practices of the 3rd Generation Partnership Project (3GPP) relating to technical documents including how 3GPP makes these documents public.

a. Prominence and Purpose of 3GPP

20. 3GPP was inaugurated in December 1998 to produce Technical Specifications and Technical Reports for the Universal Mobile Telecommunications System (UMTS), a 3G Mobile System based on evolved GSM core networks and a new radio access network known as UTRA (UMTS Terrestrial Radio Access). **Appendix B**, p. 15. At that time, various standards organizations agreed to cooperate to produce a complete set of globally applicable Technical Specifications for the next 3G standard that would then be transposed into standards by regional standardizations bodies such as ETSI.

21. 3GPP is a partnership between organizational partners, market representation partners, and individual members such as companies. **Appendix C**, pp. 7-8 (3GPP Working Procedures, 2000). By January 2000, there were 284 companies participating as individual members. **Appendix B**, p. 18. In 1998, at least dozens of companies were already members of 3GPP. In fact, 350 delegates,

including me, attended the first 3GPP Technical Meetings in December 1998.

Appendix B, p. 6. As of April 28, 2023 there were 816 members of 3GPP.

Appendix D.

22. 3GPP produced technical standards covering cellular telecommunications networks, including User Equipment or Mobile Device (UE) technologies, Radio Access Network (RAN) technologies, Core Network (CN) technologies, and service and system capabilities. Beginning in 1998 and continuing through today, interested companies and members of the public have tracked the developments of the latest 3GPP specifications and reports, e.g., to ensure that products and services developed were consistent with the standards being developed. It is my opinion that a person working in cellular communications modem development would have to be familiar with 3GPP and the specification-related documents in order to properly perform their job. Indeed, textbooks and articles about cellular communications commonly directed readers to the 3GPP website for information regarding standards development. **Appendix B**, p. 1; **Appendix E**, p. 6. As a POSITA in cellular communications myself, I would regularly visit and refer others to the 3GPP website for the latest developments in 3G, E-UTRA / EPS (i.e., Evolved UMTS aka LTE), and GSM standardisation.

23. My personal experience at Samsung confirms 3GPP's prominence.

Engineers and managers at Samsung responsible for developing 3G modem software (but not attending 3GPP meetings) referred to 3GPP specifications regularly in their work and I would often be asked to confirm the interpretation of specified requirements, or to which release or version of a given 3GPP specification they should be developing their products.

b. 3GPP's Policy of Making Documents Public

24. 3GPP's policy was to make 3GPP documents available to the public. Because the purpose of 3GPP was worldwide adoption of a common standard, no restrictions on distribution or discussion were placed on 3GPP documents, but rather the dissemination and sharing of 3GPP documents was specifically encouraged and necessary for creating an industry-wide standard. **Appendix F**, p. 8 ("No password is needed to access any information on the 3GPP Web site, all information is openly published.").

c. 3GPP Structure and Standards Development Process

25. Within 3GPP, responsibility for producing specifications was delegated to Technical Specification Groups (TSGs), sometimes also known as "Technical Bodies". **Appendix C**, p. 11. At its inception, 3GPP was divided into four Technical Specification Groups (TSGs), each covering a particular category of technology. They were: TSG CN responsible for the Core Network; TSG RAN responsible for the Radio Access Network; TSG SA responsible for Services and

Systems Aspects; and TSG T responsible for Terminals. A fifth, TSG GERAN, was added in July 2001 when responsibility for GSM radio access standardization was transferred to 3GPP to ETSI¹. **Appendix G** (figure showing 3GPPP structure). Interested members of the public would have been aware of the division of work by subject matter among the TSGs and among the working group (WG) within each TSG. **Appendix G**; **Appendix H**, p. 5 (Figure 4.3 showing division of work by subject matter among RAN WGs in 2001). Within each TSG, each WG also focused on particular subject matter, and the majority of the standards-development work was conducted at the WG level in bi-monthly or quarterly meetings². **Appendix B**, p. 20. A brief description of each Working Group's technology area could be found on the Working Group home pages on the 3GPP website. *See, e.g., Appendix I* (SA WG3 Homepage). For example, SA WG3 (also called "SA3" or "S3") was (and still is) "for the security of the 3GPP system, performing analyses of potential security threats to the system, considering the new threats introduced by the IP based services and systems and setting the security [and privacy] requirements for the overall 3GPP system." **Appendix I**.

26. The Working Groups met regularly. The attendees (also called "delegates") at these meetings were mainly engineers representing

¹ TSG T and TSG CN were later merged in 2005 to create TSG CT, and TSG GERAN was closed 2016.

² Depending on the amount of work required on the technology aspect covered by the Working Group.

telecommunications companies from around the world, including NOKIA, Samsung, Huawei, Ericsson, and Motorola, among others. *E.g.*, **Appendix J** (delegates that attended SA WG3 meeting #46b).

27. Although attendance at 3GPP meetings was generally limited to 3GPP members, interested members of the public would have been made aware of Working Group meeting dates and times as well as the technical documents it produced via 3GPP's website. **Appendix I** (archived SA WG3 page having links to meeting information, email exploder lists, and technical documents). Interested members of the public would have been aware of the meeting information pages for each TSG Working Group.

d. 3GPP Documents

i. TDocs

28. The technical specifications and reports developed by 3GPP were and are driven by the technical contributions of 3GPP member companies. As part of that development process, various types of documents were produced. As relevant to this case, the 3GPP process particularly involved the consideration of temporary documents or "TDocs," which are also referred to as proposals, contributions, and in some cases change requests. The approval of proposals contained in TDocs result in the creation of technical specifications.

29. Prior to each Working Group meeting, members of the Working

Group could prepare TDocs to identify, discuss, and/or propose a new feature or change(s) to an existing feature or to identify a technical issue for discussion.

Interested members of the public would know that TDocs can be a helpful source of technical information regarding the 3GPP specifications.

30. Each TDoc was assigned a TDoc number, according to a standard format set by 3GPP.³ As described in the 3GPP Working Procedures from 1999, the numbering system followed the format Gxmnzzz.ext. **Appendix C**, pp. 15-16. Within that format, “Gx” referred to the relevant TSG. For example, “S” was used for TSG SA. Likewise, “m” referred to the relevant Working Group. **Appendix C**, p. 15. A document for SA WG3 would therefore begin with “S3.” **Appendix C**, p. 15. The two digits “nn” represented the year (*e.g.*, 99), and the digits “zzz” represented the unique document number. **Appendix C**, p. 16. This document number was used as the TDoc’s filename.

31. Each TDoc would include in its header the meeting at which the contributor intended the TDoc to be discussed. Most TDocs were uploaded to the 3GPP website for public viewing prior to the relevant Working Group meeting listed on the TDoc, although some TDocs, *e.g.* those created at the meeting based on revisions of given TDocs, were uploaded during or after the meeting. **Appendix**

³ Some documents other than technical contributions (such as meeting reports) were also assigned TDoc numbers, for ease of reference.

F, p. 8. Specifically, “TDoc numbers start to be allocated some weeks before a 3GPP meeting, and the authors then create [the TDocs] and they or the group’s secretary *uploads them to the public file server as soon as possible.*” **Appendix F**, p. 8 (emphasis added). The documents were uploaded to the public file repository in an area allocated to the particular Working Group. **Appendix I** (SA WG3 Homepage with link to WG3’s “Documents Area”). Immediately upon upload, any member of the public could download and access the TDocs and other documents offered for discussion. This process has been in place since I began attending Working Group meetings in 1999.

e. Distribution over the 3GPP Listserv

32. An important means of distributing working documents such as TDocs and draft Technical Specifications as well as administrative information to 3GPP members and interested members of the public was through the 3GPP email listservs (also referred to as the “email exploder” or “email reflector”). All TSGs and Working Groups had listservs corresponding to their groups. Each listserv acted as an email alias that distributed emails and email attachments sent to that alias to every person subscribed to that listserv.

33. Subscribing to a listserv has always been simple and open to any member of the public—not just 3GPP members. **Appendix K**. The email listservs were featured prominently on 3GPP’s home page and could be accessed link.

Appendix L . That link would take a user to a list of email listservs, organized by TSG. It is my opinion that the 3GPP email listservs were well known among persons interested in following or participating in the development of wireless cellular standards. **Appendix B**, p. 17 (textbook noting that “[g]iven that 3GPP has participants from all over the world, the use of the Internet, email exploders [*i.e.*, listservs] and other such facilities have proved invaluable for distributing and sharing information, working drafts and so on”); **Appendix M** at Section 5 (“The vast majority of the technical discussions and decision making in both IETF and 3GPP is done over mailing lists. ... It is recommended that interested individuals subscribe to and participate in these lists.”).

34. There were hundreds of subscribers to some of the listservs, see e.g., **Appendix N** showing 301 subscribers to TSG SA3. The people that subscribed were typically engineers, such as me, but also technology strategists and technical managers. The subscriber list typically included at least all those persons who planned to attend an upcoming meeting where a TDoc may be discussed. The typical practice among people who were to attend an upcoming meeting was to use the WG’s listserv to review and form opinions about the ideas in TDocs. The email listservs provided an efficient way for contributors to quickly and efficiently disseminate information. In my recollection, the number of subscribers for a particular WG listserv usually far exceeded the number of people attending those

WG meetings. For example, 31 delegates attended SA WG3 Meeting #46b, which occurred in March and April 2007, when there were around 300 subscribers to the SA WG3 listserv. **Appendix J, Appendix N.**

35. No confidentiality limitations or restrictions on further dissemination were placed on documents distributed via the listservs. **Appendix F**, p. 9 (3GPP FAQs webpage: “This distribution on the group’s email exploder is important, because once that happens, *the document is effectively in the public domain*, since membership of the exploder is open to all and is (almost) unpoliced.”) (emphasis added). This has been the practice and understanding since I became involved with 3GPP in 1998. The listservs were also used to distribute information about upcoming TSG or WG meetings, such as invitations and draft agendas for each meeting. **Appendix O; Appendix P.**

36. The listserv emails were (and remain) archived in a public online archive (available at <http://list.etsi.org/scripts/wa.exe?INDEX>). In my experience, this archive has existed and been accessible to members of the public since the email lists were created in 1998. **Appendix Q.** Each archived email contains a computer-generated date stamp indicating when the email was sent and thereby when any attached document became publicly disclosed through distribution to listserv subscribers.

f. Public availability via the 3GPP Website's Public File Repository

37. All TDocs, technical reports, and technical specifications were also freely available to interested to interested members of the public through the public file repository accessible via the 3GPP website. Interested members of the public would have been well aware of 3GPP and of the 3GPP website. 3GPP documents were accessible to any member of the public through the 3GPP website without providing any login credentials or other exclusive access criteria.

38. It is my recollection and opinion that, starting in 1999, interested 3GPP members could and did locate relevant documents of interest on the 3GPP website using reasonable diligence based on the website's indexing scheme or the TDoc's naming convention. The documents on the 3GPP website were (and remain) organized according to the relevant Working Groups within 3GPP (each of which focused on particular subject matter) and then further organized based on the meetings of those groups. Interested members of the public would have known which Working Groups focused on particular subject matter.

39. An interested member of the public could locate documents of interest by first navigating a web browser to the 3GPP website (www.3gpp.org/home.htm). By way of example, in the 2007 timeframe, to locate documents from the 3GPP home page, a user could have clicked "Technical Bodies", selected the Working Group of their choice, and then followed the link to "Documents area" to access

files on the 3GPP server. **Appendix L; Appendix R, Appendix I.** Alternatively, instead of accessing the 3GPP file repository from the 3GPP website home page, a user could have also accessed the file repository through the web address www.3gpp.org/ftp, or at [ftp.3gpp.org](ftp://ftp.3gpp.org) using dedicated FTP client software.

40. The top two levels of indexing within the file repository were thus based wholly on subject matter, as reflected by the division of subject matter among the various TSGs and Working Groups. Specifically, an individual would select the relevant TSG covering the subject matter of interest:



www.3gpp.org - /ftp/

[\[To Parent Directory\]](#)

03 April 2007	07:54	<dir> Inbox
08 December 2006	09:27	<dir> Information
14 September 2006	16:15	<dir> Invitation
29 January 2007	10:13	<dir> Joint Meetings
12 March 2007	14:32	<dir> Op
24 November 2006	19:51	<dir> PCG
07 March 2007	15:25	<dir> Specs
14 March 2001	10:53	<dir> tsg_cn
28 February 2005	14:50	<dir> tsg_ct
30 June 2003	10:45	<dir> tsg_geran
01 March 2005	14:04	<dir> tsg_ran
28 March 2003	10:05	<dir> tsg_sa
08 January 2007	17:57	<dir> tsg_t
08 February 2007	11:04	<dir> workshop

Appendix S. If the individual were interested in the services and system aspects of 3GPP, they would click “tsg_sa/.” From there, the individual would click on the particular SA Working Group covering the subject matter of interest:



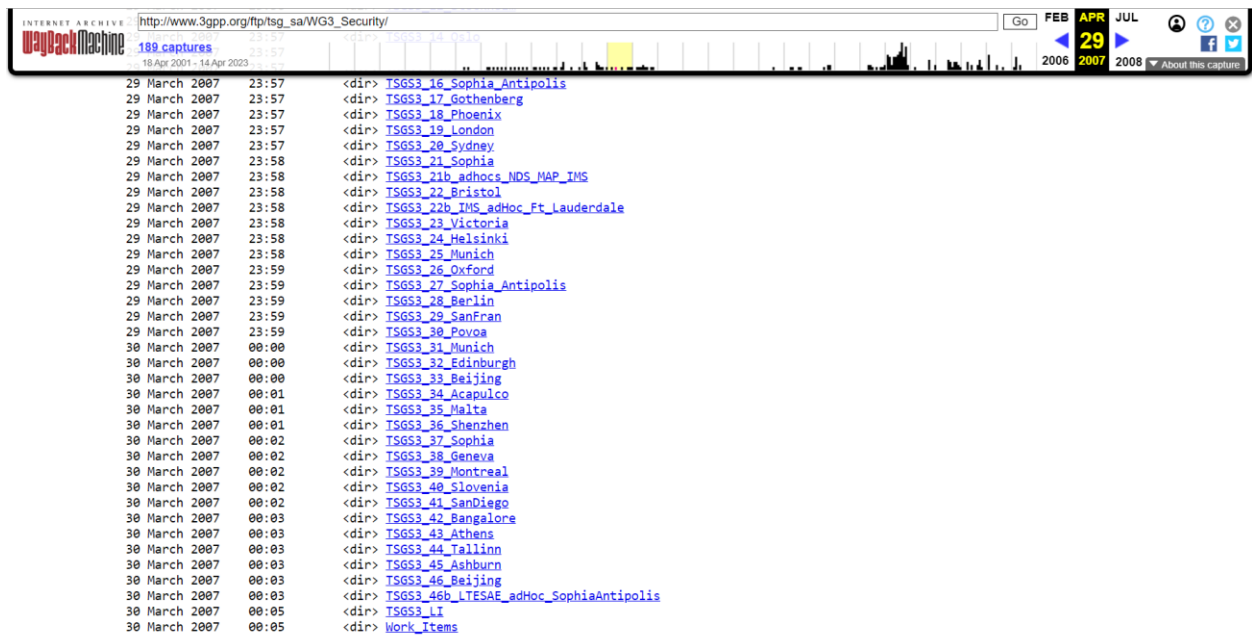
www.3gpp.org - /ftp/tsg_sa/

[\[To Parent Directory\]](#)

04 April 2007	15:33	<dir> TSG_SA
04 April 2007	15:34	<dir> WG1_Serv
20 April 2007	14:49	<dir> WG2_Arch
30 March 2007	00:05	<dir> WG3_Security
30 March 2007	00:33	<dir> WG4_CODEC
30 March 2007	00:33	<dir> WG5_TM

Appendix T. For example, if the individual were interested in the specification of security aspects, the individual would know to choose the folder for WG3.

41. Once a user is in the relevant Working Group folder (SA WG3 in this example), an individual would see a list of all meetings held by SA WG3:



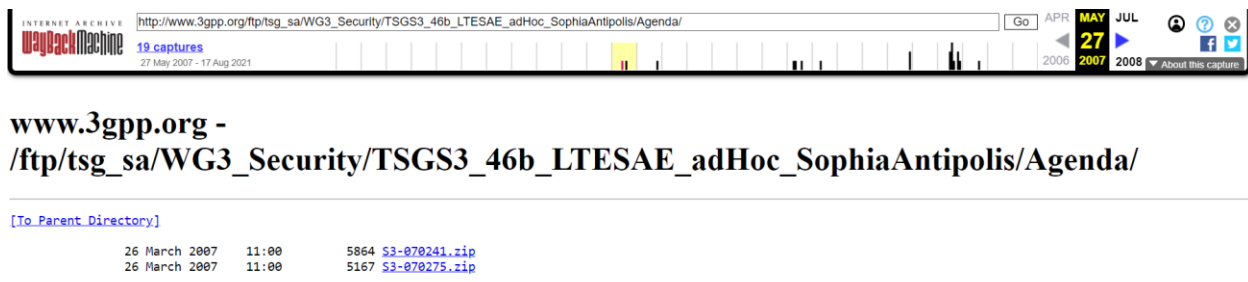
Appendix U. As shown, a folder existed for each meeting. For example,

“TSGS3_46b_LTESAE_adhoc_SophiaAntipolis” corresponded to TSG SA WG3

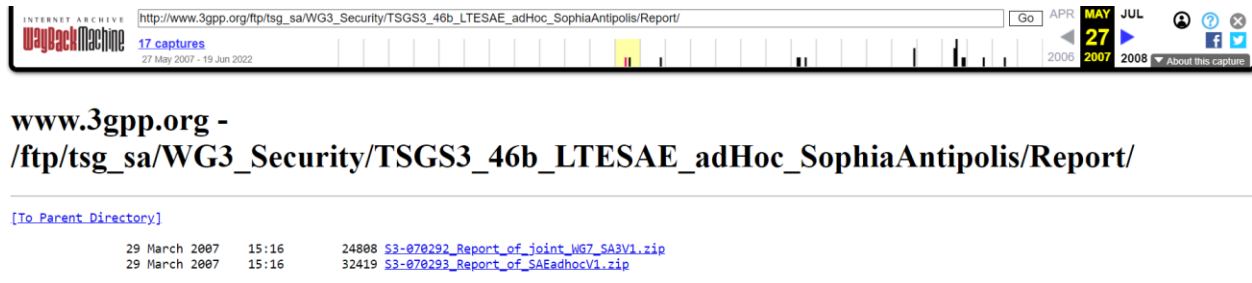
Meeting #46b, and the timestamp associated with the meeting #46b directory indicates it was last updated on March 30, 2007. **Appendix U.**

An interested member of the public would know which meeting(s) would have covered particular subject matter based on the publicly available meeting agendas.

E.g. **Appendix V** (draft agenda for SA WG3 Meeting #46b).



Many POSITAs would have received the meeting agendas directly via the WG listservs. **Appendix P** (email to SA WG3 listserv linking to draft SA2 #46b meeting agenda). Also, the meeting agendas were stored on the 3GPP website server within each meeting folder as shown above. **Appendix W** (SA WG3 Meeting #46b folder). Further, an individual could ascertain what subject matter was addressed at each meeting by reviewing the report issued after each meeting. *E.g.*, **Appendix X** (draft meeting report SA WG3 Meeting #46b). Such reports were included within the report folder for each meeting.



Appendix Y.

42. Once an individual navigated to the desired meeting folder, for example “TSGS3_46b,” the individual could then select the “docs” folder to view the documents associated with that meeting. The documents within this folder were listed by TDoc number, and interested members of the public would have known to review the meeting report for each meeting to determine what topics were discussed at that meeting. *E.g.*, **Appendix X**. It was common knowledge that each meeting report contained a list of TDocs and that it could be used to quickly identify relevant TDocs. Within this list of documents, each TDoc was listed at least by TDoc number, title (reflecting subject matter), and source (*i.e.*, the party who contributed the TDoc) *E.g.*, **Appendix X**, pp. 8-10. Thus, an interested member of the public could significantly narrow the set of relevant TDocs.

43. Many TDocs were uploaded to the public file server for public viewing prior to the relevant meeting (although some TDocs were submitted during or soon after the meetings). TDocs distributed via the email listservs were typically uploaded on the same day or within days of being distributed over the

listserv. Throughout my participation in 3GPP, it was always recommended that delegates attending a meeting download the relevant set of documents from the 3GPP file repository onto their personal computers prior to each meeting.

Appendix F, p. 7 (3GPP FAQs, advising this).

44. 3GPP's public file repository provides a reliable mechanism for identifying the date and time a document was uploaded to the website and then available to download for public viewing. When a document is uploaded, the file server automatically assigns the document a time stamp—*i.e.*, an accurate and automatically computer-generated electronic record of when the document was uploaded—as part of the regular business practices of 3GPP. Indeed, “the time stamp of the Zip file can be relied upon to indicate when the upload occurred.”

Appendix F, p. 9 (3GPP FAQs). This has always been the practice regarding uploading documents to the 3GPP file repository, and my personal experience confirms that the time stamps have always been a reliable way to determine when a file was uploaded to the 3GPP website and immediately available for public download.

**IV. EXHIBIT 1013. S3-070234, “KEY REFRESH IN SAE/LTE”,
CONTRIBUTION TO TSG SA WG3 #46B 28-29 MARCH 2007**

45. S3-070234 is a TDoc that was submitted to and discussed at the March 28 - 29, 2007 Meeting #46b, SAE / LTE ad hoc meeting of the 3GPP TSG

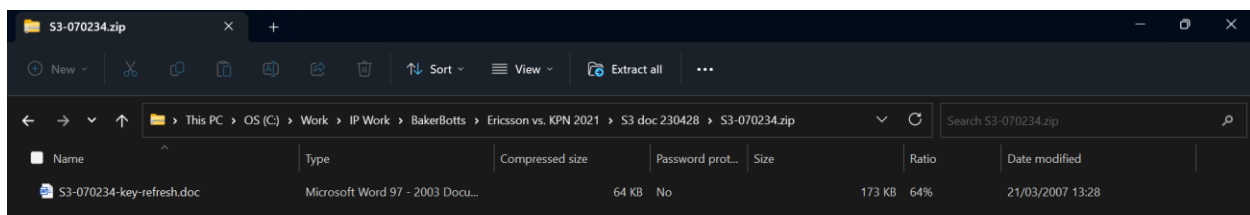
SA Working Group 3 in Sophia Antipolis, France. This TDoc is titled “Key refresh in SAE/LTE” Ex. 1013. This TDoc further indicates that it was submitted by “Nokia, Siemens Networks” (as “Source to WG”). Ex. 1013.

46. To obtain this document, I directed a web browser to the URL:

https://www.3gpp.org/ftp/tsg_sa/WG3_Security/TSGS3_46b_LTESAE_adHoc_SophiaAntipolis/Docs. A true and correct excerpt from that directory is shown below.

 S3-070233.zip	2007/03/21 14:04	111,6 KB
 S3-070234.zip	2007/03/21 14:29	63,3 KB
 S3-070235.zip	2007/03/21 14:10	32,9 KB

I selected the link “S3-070234.zip” and downloaded a zip file of the same name (“S3-070234.zip”). **Appendix Z**, p. 1. The zip file contained a Word document titled “S3-070234-key-refresh.doc” with a last modified date of March 21, 2007. A screen shot of the zip file contents is shown below. A true and correct copy of this document within the zip file (S3-070234.zip) is provided as Ex. 1013.



47. S3-070234.zip has been available for download from 3GPP’s public file repository on the 3GPP website since March 21, 2007, as evidenced by the upload date corresponding to that file. **Appendix Z**, p.1 (excerpt above).

48. As I described in paragraphs 37-44 above, an interested member of the public would have been capable of navigating to relevant 3GPP documents on the 3GPP website using reasonable diligence. On March 21, 2007, a user could access 3GPP's public file repository through the "Meeting documents" link on the relevant Working Group home page. **Appendix I.** The Working Group home pages could be accessed from the 3GPP home page by selecting the "Technical Bodies" link. **Appendix L.** A user could then select "TSG SA WG3," which would take the user to the TSG SA3 home page. **Appendix R, Appendix I.** The TSG SA3 home page contained a list of useful links and information including a link to the "Documents area" for the working group. **Appendix I.**

49. As described in paragraph 40, an interested member of the public would have known which TSG and WG to focus on based on the subject matter they were interested in. The Working Group's "Documents area" link would have taken the user directly to the documents for that working group, which was organized by Working Group meetings, as described in paragraphs 41-44. An interested member of the public exercising reasonable diligence would have used the meeting agendas, meeting reports, and the list of TDocs to identify a narrow set of documents pertaining to the particular subject matter of interest.

50. As I described in paragraph 46, the upload time stamp indicates that S3-070234.zip was uploaded to 3GPP's publicly available website on March 21,

2007, and that any member of the public could have downloaded the zip file, extracted the Word document enclosed, and viewed its contents without restriction on March 21, 2007, and anytime thereafter. Based on my personal knowledge and experience, this time stamp accurately reflects the date the document was uploaded to the 3GPP public file repository, and I have no reason to believe this particular time stamp is inaccurate. I have therefore determined that Ex. 1013 was available for any member of the public to download from the 3GPP website no later than March 21, 2007. Further, as described in paragraphs 24 and 37, 3GPP documents were freely available and were not burdened by any confidentiality requirements or restrictions on further dissemination.

51. The meeting report from SA WG3 Meeting #46b further indicates that an interested member of the public would have looked at S3-070234 in particular because it was discussed at the meeting where further contributions on the issue were requested. **Appendix X**, pp. 5, 8. (“Noted, no decision on this, but rather contributions were requested before the 2th May 16:00 CET.”)

52. It is my opinion, therefore, that from March 21, 2007, an interested member of the public using reasonable diligence could have located S3-070234.zip on the 3GPP website, downloaded the reference without providing any credentials, and disseminated the reference to others without restriction.

V. DECLARATION

53. I declare that all statements made herein on my own knowledge are 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.

Date: May 4, 2023

Executed: _____

Craig Bishop

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Appendix A

Curriculum Vitae

Name: Craig Bishop
Contact Tel No.: +44 (0)7984 564949 (mobile)
Email: craig@bishopcom.co.uk
Current job title: Independent Consulting Engineer, CEO
Address: 43 Ospringe Street, Faversham, Kent, ME13 8TW

Key Skills and Experience

- 33 years Telecoms, Radio and Broadcast experience
- 26 years experience of 2G/3G/4G telecoms standardisation
- Extensive knowledge of 3GPP and ETSI specifications and procedures including document handling and publication practices
- Sound understanding of 3GPP systems, including Radio Access Interfaces and Networks, Access Stratum protocols, Core Networks, Non-Access Stratum protocols, and IMS
- Experience of ETSI role from regulatory perspective (harmonised standards, mandates, spectrum, etc)
- Depositions, reports, and declarations as expert witness in cases on 3GPP technologies and on 3GPP & ETSI practices and procedures.
- Intellectual property analysis including prior art search and evaluation of patent essentiality
- Application of data analytics and machine learning techniques to standards and IP data
- Programming in Java, Python, C, Octave (Matlab)

Career History

Bishop Communications Ltd.

01/13 –

Independent Telecommunications Standards and Intellectual Property Consultant

Company is a full ETSI member

Activities have included:

- Provision of expertise for EC funded ETSI Specialist Task Force (STF489) to produce implementation guidelines for Total Conversation for emergency services. Project delivered on time / budget and well received. Output published March 2016 as ETSI TR 103 201.
- Provision of expertise for ETSI Specialist Task Force (STF555) assessing the impact on existing standards of communications involving IoT devices in all types of emergency situations. Project delivered on time / budget and well received. Output published July 2019 as ETSI TR 103 582.
- Provision of expert support for IPR litigation from standards landscape analysis / background technical reports to expert testimony reports / declarations and depositions on matters including the public availability of 3GPP and ETSI prior art.
- Intellectual property analysis assessing strengths and weaknesses of patents and patent portfolios, conducting searches for prior art, evaluating patent essentiality, and acquiring relevant documentation.
- Provision of standards consultancy services for Samsung Electronics in ETSI including membership of the ETSI Board until November 2014

Technologies covered in patent related work include: 3GPP GSM, UMTS, LTE radio interface technologies (Phy, MAC, RLC, RRC), 3GPP access and core networks (GPRS/UMTS & EPC NAS), IMS. Organisations covered include 3GPP & ETSI.

Clients served during last 10 years include: Addy Hart LLP, Alston & Bird LLP, AT&T, Baker Botts LLP, Banner Witcoff LLP, DLA Piper LLP, European Telecommunications Standards Institute (ETSI),

Fish & Richardson P.C., Gibson Dunn LLP, Haynes and Boone LLP, Hillebrand-CE GmbH (working for third party clients as Consulting Engineer for Hillebrand-CE), Kilpatrick Townsend & Stockton, Kirkland & Ellis LLP, K&L Gates LLP, Morgan, Lewis & Bokius LLP, MckoolSmith LLP, PV Law LLP, Paul Hastings LLP, Perkins Coie LLP, Powell Gilbert LLP, Sidley Austin LLP, Samsung Electronics Research & Development Institute UK (SRUK), Taylor Wessing LLP, Williams & Connolly LLP, WilmerHale LLP.

Expert testimony through deposition:

- *Huawei Technologies Co. Ltd. vs. T-Mobile US, Inc., et al.*, Case Nos. 2:16-cv-0052-JRG-RSP, 2:16-cv-0055-JRG-RSP, 2:16-cv-0056-JRG-RSP, and 2:16-cv-0057-JRG-RSP (E.D. Tex.). On behalf of T-Mobile US Inc.
- *T-Mobile US, Inc., et al. v. Huawei Technologies Co. Ltd.*, Case Nos. IPR2017-00696 and IPR2017-00697 (PTAB). On behalf of T-Mobile US Inc.
- *LG Electronics, Inc., v. Koninklijke KPN N.V.*, Case No. IPR2018-00558 (PTAB). On behalf of LG Electronics, Inc.
- *Nokia of America Corp. and Ericsson Inc. v. IPCOM, GMBH & Co.*, Case No. IPR2021-00533 (PTAB). On behalf of Ericsson Inc.
- *IPCom, GmbH & Co., Plaintiff, v. AT&T Inc., et al, Defendant, Nokia of America Corp., Intervenor, Ericsson Inc., Intervenor.*, Civil Action No. 2:20-CV-322-JRG, and *IPCom, GmbH & Co., Plaintiff, v. Verizon Communications, et al., Defendant, Nokia of America Corp., Intervenor, Ericsson Inc., Intervenor.*, Civil Action No. 2:20-CV-323-JRG. On behalf of Ericsson Inc.
- *Ericsson Inc. v. Koninklijke KPN N.V.*, Case No. IPR2022-00069 (PTAB). On behalf of Ericsson Inc.

Expert testimony in court:

- *Between IPCom GmbH and Vodafone, et al.*, Claim No. HP-2018-000030 Claim No. HP-2018-000031, High Court of Justice, Business & Property Courts of England and Wales, Intellectual Property List (ChD), Patents Court. Retained by Vodafone.
- *Between (1) Mitsubishi Electric Corporation (2) Sisvel International SA and Oneplus Mobiletech UK Limited, Oppo Mobile UK Ltd, Xiaomi Technology UK Limited, et al.*, Claim No. HP-2019-000014, High Court of Justice, Business & Property Courts of England and Wales, Intellectual Property List (ChD), Patents Court. Retained by Oneplus, Oppo, and Xiaomi (trial held remotely due to COVID-19 restrictions)

Samsung Electronics Research Institute (SERI)

12/96 – 01/13

Director Standards and Industry Affairs

03/11 – 01/13

Mission and Tasks as for previous role plus:

- Proactive member of ETSI Board following election as Board member in November 2011
- Worked with Samsung internal and external legal counsel in response to EC investigation into Samsung suspected abuse of Standards Essential Patents.
- Deposed by Apple as fact witness in ITC investigation 337-TA-794.

Head of Advanced Technologies Standards & Regulation

09/05 - 03/11

Mission: To help position Samsung and SERI at the forefront of mobile telecommunication developments through participation in and leadership of mobile communications standards and European regulatory affairs

Key tasks:

- Developed standards and research strategy and coordinated activities with head office, acting as official Samsung contact for the European Telecommunications Standards Institute.
- Programme managed standardisation and regulation projects covering 3GPP (RAN2, CT1, SA2, SA1, SA, RAN, CT), OMA, and mobile Broadcast strategies and technologies (DVB Forum),

European Framework projects (FP7), Spectrum Management (CEPT, ETSI EM, TFES, BRAN, ...) and European Regulatory affairs (Digital Europe, relations with European Commission, ...). - Grew department from 3 to 12 persons to cater for these activities.

- Participated and actively contributed to 3GPP SA1 (11/08 – 11/11), SA2 (10/05 – 08/11), SA and ETSI TC SCP groups on issues including IMS / CS Interworking (VCC / SRVCC, VoLTE, T-ADS, ICS), Local IP Access & Selected IP Traffic Offload (LIPA-SIPTO), MOSAP, M2M/MTC, Embedded / 4FF UICC.
- Drafted and filed communication technology related patents related to 3GPP SA2 and CT1 technologies – 18 filed, mainly IMS and 3GPP NAS related
- Supported Samsung IP team with analysis of Samsung and 3rd party communication technology related patents and claim charts including GSM/GPRS, UTRAN, NAS, and IMS patents
- Chaired SERI Patent Committee from 2007-2009 - SERI achieved patent targets for first time in 2007 and did so in every year following

Standards consultant – part time

09/04 – 09/05

(Whilst studying fulltime for MSC)

During this time, I conducted a review of the wireless communication technologies and the associated standards space, with a particular emphasis on 802.16a, as well as 3G and 802.11 evolutions. I was also involved in analysis of 3rd party patents and claim charts on request from Samsung IP team.

Technology Manager System Engineering group

06/03 – 09/04

Mission: To establish a System Engineering group within SERI to support development of SERI's dual mode GSM/UMTS radio modem platform.

Key Tasks:

- Defined and implemented System Engineering group strategy including recruitment and line management of the group which grew from 3 to 10 engineers during this period.
- Developed detailed system requirements for SERI's dual mode 2G/3G radio modem platform(s) including production of background documentation describing system wide behaviour
- Defined system test programme for platform, including example test cases using off the shelf test equipment. This project outsourced (under my supervision) to a third party company for completion.
- Provided continued support to development engineers in terms of understanding specification and system requirements, particularly with respect to Access Stratum and Non Access Stratum specifications and protocols.
- Instigated and managed studies investigating optimised system architecture for future Samsung mobile platforms.
- Analysed Samsung and 3rd party 3GPP technology related patents and claim charts on request by Samsung IP team and reported on their value and standards essentiality.

Technology Manager Standards & System Group

04/02 – 06/03

Mission: To provide Standards support to SERI development teams and Samsung's global standardisation activities.

Key Tasks:

- Devised and implemented revised strategy to improve the focus of activities and provide improved support for software developers from a system perspective.
- Attended 3GPP TSG SA plenary and occasional SA WG1 meetings - acted as rapporteur for 3GPP Evolution technical report 3GPP TR 21.902.

- Analysed 3rd party GSM/GPRS technology related patents and claim charts on request by Samsung IP team and reported on their value and standards essentiality.
- Line managed 3 engineers, ensuring that the group provided expert support for SERI SW and HW developers in terms of standards interpretation and system requirements, particularly with respect to the Radio Access Network.

Project Manager

04/00 – 04/02

Mission: To establish and manage development of a dual mode GSM/UMTS modem platform.

Key tasks:

- Defined and managed work relating to core technology development for Samsung's 3G handsets.
- Determined major technical architecture and parameters for the platform producing high level system requirements specification and project development plan.
- As a technical authority on UMTS, supported the project in terms of requirements specification and interpretation (L1, MAC/RLC, RRC, and NAS specifications), and contributed towards the training of UMTS project team members.
- Acting in a consultative capacity, interfaced with other departments in Samsung and with external customers/suppliers on issues relating to 2G and 3G technologies
- Responsible for the overall planning, work allocation and co-ordination of engineers for the project, as well as being involved in recruitment – during this period the number of engineers working on the project increased from 10 to over 40.
- Instigated, defined and managed a feasibility study involving HW and SW engineers, as essential preparation for the development of a dual mode GSM/UMTS radio modem platform.

Senior/Principal Standards Engineer

12/96 – 04/00

Mission: To support Samsung standards and development activities in ETSI and 3GPP.

Key Tasks:

- Gathered and disseminated information throughout Samsung concerning latest specifications and trends in telecommunications, providing advice to Senior Management on future strategies for telecommunications development.
- Acted as sole Samsung representative in ETSI TC SMG2 from December 1996 and during the selection phase for the UMTS Radio Access Technology providing training for Samsung engineers on elaborated technologies
- Participated in 3GPP TSG RAN WG1 (UTRA Physical Layer), and RAN WG2 (L2/3) contributing specifically in areas related to FEC, Common Packet Channel, and Transmit Diversity
- In 3GPP TSG T WG2 I initiated and acted as rapporteur for the UE capabilities work item. I also acted as liaison officer between TSG T WG2, TSG RAN WG1 and TSG SA WG1 (Service Aspects) on issues of common interest
- Acted as main spokesperson for and advisor on Samsung strategic activities in, 3GPP TSG RAN from 3GPP's creation until April 2000
- Acted in a consultative capacity advising the company on technical, commercial and regulatory issues relating to 3rd generation telecommunications development and implementation.
- Developed and promoted programme to co-ordinate standards activities throughout Samsung. – Samsung Global Standards Strategy Group established in September 1998.
- Attended ETSI TCs, SMG1, SMG4, SMG5, SMG7, SMG9 and SMG11 as required by Samsung to keep abreast of developments prior to establishment of 3GPP

HPTO Spectrum Engineer

- Responsible for the management of spectrum for use by PMR and Wireless LAN technologies.
- Defined and instigated development of an improved assignment methodology for Private Mobile Radio (PMR) channels, promoting increased quality and spectrum efficiency.
- Managed research projects involving the assessment and selection of bids from external companies, submitted under competitive tender.
- Represented the Agency in the National and International fora associated with the use of Land Mobile Radio, acting as rapporteur for PMR voice and data standards in ETSI Sub-Technical-Committee RES02, and as chairman of a sub-working group under ITU WP8A drafting the recommendation for use of the radio spectrum by Radio LANs.
- Involved in CEPT Spectrum Engineering Project Teams, dealing with spectrum for Narrow band PMR technology and co-ordination between that technology and T-DAB transmissions in Band III.
- Dispensed technical advice both within the Agency and to external customers, on national and international PMR standards, assessing requests for additional frequencies, and providing technical justification for assignments and wider spectrum policy

BBC Radio**11/89 – 05/93****Radio Operations Engineer**

- Worked on projects requiring the design, development, maintenance and testing of equipment for use within the broadcasting chain.
- Responsible for acceptance testing of new studios for Radio 5, and in particular redesign of outside source circuits for the main sports continuity studio.
- Involved in acceptance testing for NICAM transmission routers. Designed and implemented modifications to synchronise transmission feeds, resulting in seamless switching between routers.

Education

1. MSC in Computer Science from the University of Kent

Awarded (with distinction): 07/2006

Dissertation title: Roles Variables and Program Analysis – Received prize for outstanding achievement

2. B.Eng. (Hons) in Electronic Engineering from the Polytechnic of Central London

Awarded: 07/1989

3. In house and external technical and management training including: Learning Tree courses on System Analysis and Design, User Requirements, UML, and Project Management.
4. On-line courses from: Coursera, Udemy, and Zenva courses covering Machine Learning, Python, Data Science, and Natural Language Processing

Appendix B



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Includes CD-ROM

GSM and UMTS

The Creation of Global Mobile Communication

Edited by

Friedhelm Hillebrand

Consulting Engineer, Germany

With contributions from 37 key players involved in the work for GSM and UMTS



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This common concept would be based on UMTS service innovation, UTRA and the GSM core network evolution. This result had been prepared and enabled by a network of interested companies active at the global level.

8.2.6.2 *The Efficient Global Open Organisation of the UMTS and GSM Specification Work in the Third Generation Partnership Project (3GPP)*

8.2.6.2.1 Problem Situation

The implementation of the agreement on the UMTS cornerstones within the existing organisations would have been unmanageable. Three committees in different continents would have worked on the UMTS radio specifications (SMG2, T1P1.5 radio sub-working group, ARIB), several other committees would have worked on network aspects (SMG12 and SMG3, T1P1.5 network sub-working group, TTC). The situation in other key areas like services, SIM, O&M would have been comparably difficult. There would have been no overall decision-making body for conflict resolution. Therefore, the global strategic agreement on the UMTS cornerstones called for a new more efficient global organisational solution, in order to lead the agreement on the cornerstones to a complete and consistent UMTS system specification available in time for the market.

8.2.6.2.2 Proposal to Initiate a Partnership Project for GSM and UMTS

In order to secure the integrity of GSM and UMTS, the cohesion between GSM and UMTS, the ongoing cross-fertilisation between UMTS and GSM and an efficient specification work, I proposed in the fourth quarter of 1997 to create an ETSI Partnership Project for UMTS and GSM to several network operators and manufacturers. This would provide a single lean working structure and would be open to all committed parties world-wide. This Partnership Project model had been developed in the ETSI reform in 1996, but had never been used.

This Partnership Project for GSM and UMTS was proposed by several GSM network operators at SMG#24 in December 1997.¹¹⁹ The document "Future Organisation for GSM and UMTS Standardisation", source T-Mobil, Mannesmann Mobilfunk, E-Plus Mobilfunk, aimed at a smooth and efficient standardisation process for the evolution of GSM and towards UMTS. The GSM community is now a global community of operators and manufacturers but has experienced difficulties in opening up for a wider participation in ETSI/SMG. Organisations from outside Europe still cannot become full ETSI members. Even voting rights for associate members in Technical Bodies were not endorsed by ETSI's General Assembly in November 1997. Present working methods with ANSI T1P1 on common GSM specifications are proven as a best possible solution for co-operation with other standard bodies, but they are very complex. This situation calls for a closer and more efficient overall co-operation. The GSM MoU Association and especially the Asian Pacific Interest Group (APIG) of GSM MoU have expressed their desire to participate fully in GSM work and in third generation standardisation and to ensure roaming with Japan.

For these reasons, these three companies proposed the establishment of SMG as the joint working structure among the interested bodies to produce GSM and UMTS standards for ETSI (as an ETSI partnership project) and for the other interested bodies, avoiding parallel work and overhead co-ordination; current budget allocations for ETSI/SMG to be considered

¹¹⁹ MG P.97-1062 submitted by T-Mobil, Mannesmann and Eplus.

as an asset for this possible joint working structure; the SMG chairman to carry out an exploratory mission in this sense."¹²⁰

8.2.6.2.3 Endorsement of the Partnership Project by Technical Committee SMG and Mandate for Exploratory Missions

After an intensive discussion and some revisions of the document it was approved by SMG#24 in December 1997.¹²¹ This included a mandate for exploratory missions to Japan and the US. This mission mandate was endorsed by the chairman of the ETSI General Assembly and Board as well as the ETSI director general in a meeting on 13 January 1997 in Sophia Antipolis.

I gave a first progress report to SMG#24bis in January 1999.¹²² Then I led – as mandated by SMG – an exploratory mission to Japan on 3–11 February 1998. We found a strong interest in such an intensified co-operation.¹²³ The following summary was agreed in the meeting on 5–6 February 1998 between ETSI SMG, UMTS Forum, GSM, ARIB, TTC and ANSI T1P1:

- “1. There is interest to create common specifications for IMT-2000 in the areas of terminals, radio access networks and core networks
2. It was recognised that the development of these standards in parallel organisations would be slow and could lead to unnecessary differences
3. It was agreed that the best way to proceed would be to further explore the creation of a common working structure (a “Project”) to produce common specifications.
4. Such a Project, built on agreed common interests, would need appropriate recognition by as well as relationship / membership to the standardisation bodies.
5. A procedure for a transition phase into the full implementation of the Project would need to be worked out.”¹²⁴

This was the basic agreement for the creation of the Third Generation Partnership Project.

8.2.6.2.4 Lead Taken by the ETSI Board

Creation of the UMTS Globalisation Group

Due to the fundamental importance the creation of such a Partnership Project had for ETSI, the ETSI Board created the UMTS Globalisation Group with a strong SMG participation who undertook the negotiations for the implementation (see Chapter 9, Section 1). This group was chaired by Karl Heinz Rosenbrock, the ETSI director general.

The interest of the GSM and UMTS community was especially actively supported by those members of the ETSI Board in the UMTS Globalisation Group and in ETSI Board meetings: Wolf Haas of Mannesmann Mobilfunk, Kari Lang of Nokia and Tom Lindström of Ericsson. Their contribution was decisive for the ultimate success, the creation of 3GPP.

Great help for the ultimate resolution came also from the UMTS Forum and the chairman

¹²⁰ Extract from the SMG#24 Meeting Report (CD ROM folder B1), Section 3.3

¹²¹ SMG P-97-1154.

¹²² SMG P-98-0009.

¹²³ Report on the Japan mission in SMG P-98-0112.

¹²⁴ This summary is contained in SMG P-98-0112 as appendix B13. It was also presented to SMG and the ETSI Board in February 1998.

Thomas Beijer. His diplomacy, bridge building ability and the ability not to give up strategic targets was an indispensable key to the ultimate success.

SMG was represented in the UMTS Globalisation Group by Gunnar Sandegren (SMG vice chairman), Francois Grassot (ECTEL TMS chairman) and me as SMG chairman.

Factions in the UMTS Globalisation Group

There was a very strong polarisation between three factions in the UMTS Globalisation Group. They were not officially organised. Therefore, I will name and describe them briefly:

"Greater ETSI faction": they wanted an even stronger and greater role for ETSI in the future in UMTS. They feared a big loss, if SMG the greatest producer of deliverables in ETSI were to "emigrate" to the Partnership Project. They tried to bring non-European partners into ETSI. But after the decision of the ETSI General Assembly to grant these parties only associate membership without voting rights, this was not attractive to the non-Europeans. In the UMTS Globalisation Group they tried in the beginning to block the Partnership Project and later to minimise the scope of work to be transferred to the Partnership Project.

"Fixed-mobile convergence faction": this community came from a fixed network background. They hoped to reach fixed-mobile convergence by bringing the relatively independent GSM/UMTS work into an organisation which would be created by melting the existing fixed network committees with SMG under the leadership of the fixed side. Their UMTS vision was dominated by fixed-mobile convergence as a high priority. They lacked in their groups dealing with the fixed network evolution towards third generation a sufficient support and momentum. They wanted to keep GSM and UMTS in ETSI in order to reach their targets and to exploit the SMG momentum and know-how. They tried in the beginning to block the creation of the Partnership Project. Later they tried to limit the scope of the transferred work as much as possible.

"GSM-UMTS faction": due to the global acceptance of GSM and the UMTS cornerstones they needed an efficient globally open work structure which dealt with all system aspects. Their prime concern was the progress of their GSM-based UMTS vision. This was complemented with work on the "mobile-fixed convergence". They saw that the number of mobile users would very soon be much bigger than the number of fixed users. They wanted to transfer all GSM and UMTS work into the Partnership Project.

The Decision of the ETSI General Assembly Which Freed the Way for 3GPP

Due to the strong polarisation in ETSI a decision of the General Assembly on principles was needed in September 1998. During this General Assembly I was charged with negotiating a compromise, which was acceptable to the whole ETSI membership. The compromise proposal foresaw:

- to create 3GPP for an initial phase of UMTS;
- to keep GSM in ETSI; and
- to create the ETSI Project UMTS for long-term UMTS aspects.

This proposal was endorsed with a very high majority. It cleared the way to the 3GPP agreement signed in December 1998.

The Success of 3GPP

The first 3GPP Technical Meeting in December 1998 attracted 350 delegates and the level

of participation and contributions remained high. 3GPP produced a common set of Technical Specifications for UMTS based on service innovation, UTRA and the GSM core network evolution. The work was started in December 1998. The Technical Specifications of UMTS Release 99 were completed in December 1999. Some smaller issues were resolved by March 2000. For this purpose all pure UMTS work was transferred from SMG to 3GPP during the first quarter of 1999. The responsibility for the common GSM and UMTS specifications was transferred in the third quarter of 1999. 3GPP was supported by a large number of SMG contributors and SMG leaders. The full-time program managers of the SMG technical support were made available to 3GPP. All proven SMG working methods were made available to 3GPP.

In autumn 1999 ANSI T1P1 and TIA with UWCC proposed the transfer of the remaining GSM work (mainly EDGE, SIM and mobile station testing) to 3GPP in order to ensure the cohesion between the classic GSM and UMTS. The ETSI Board endorsed this proposal based on a review and recommendation of SMG. A Board ad-hoc group was installed with SMG representation. The negotiations between the partners led to an acceptance in principle in May 2000. Therefore, the remaining GSM activities were transferred to 3GPP in mid-2000. ETSI Project UMTS attracted 30–50 delegates and did not have the momentum to produce UMTS specifications. It was closed in 2000.

So finally the SMG vision of 3GPP was realised. The creation of 3GPP ensures the integrity of GSM and UMTS, the cohesion between GSM and UMTS and the cross-fertilisation of GSM and UMTS. 3GPP allows all interested and committed organisations, e.g. regulators, network operators and manufacturers world-wide to participate in the work with equal rights.

8.2.7 Complementary Work to 3GPP in ETSI

8.2.7.1 The Transposition of 3GPP Documents in ETSI Documents

After the creation of 3GPP the question arose, how to “transpose” the 3GPP documents into ETSI documents and whether there is a need for additional documents. 3GPP elaborates and approves common Technical Specifications and Technical Reports, which should be transposed into ETSI documents. I developed the following concept, which was endorsed by SMG and the ETSI Board.¹²⁵

3GPP is acknowledged by the ETSI internal rules as an ETSI Technical Body. Therefore Technical Specifications and Reports approved by 3GPP are to be recognised directly as ETSI Technical Specifications and Reports without another “ETSI internal approval”. They can be published directly by the ETSI Secretariat.

Besides Technical Specifications and Reports there are in ETSI European Standards (ENs). They are approved by an ETSI Technical Body and then in a second step by the whole ETSI membership with the assistance of the National Standardisation Organisations.

A broad demand survey¹²⁶ regarding the demand for ENs in autumn 1999 showed that a demand for ENs exists for the purposes of the R&TTE-Directive only (access of terminals to the market). All other demand can be covered by Technical Specifications.

These ENs should be elaborated and approved by a “pure” European Committee of

¹²⁵ p.99-751.

¹²⁶ p.99-736.

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8.2.7.2 *The Elaboration of European UMTS/IMT-2000 Harmonised Standards for Terminals Pursuant to the R&TTE Directive*

In order to avoid barriers to international trade the European Commission requested ETSI in a letter in December 1999 to produce European harmonised standards pursuant to the R&TTE Directive, which "would typically describe emission masks ensuring proper coexistence of the different members of the IMT-2000 family and that it would be aligned with similar standards outside the Community".

I was charged by SMG with forming a small delegation and to talk to the different parties involved to explore a way forward. A strategic framework and several technical documents were elaborated and endorsed by SMG. The principles were endorsed by the ETSI Board. A joint ERM/SMG Task Force was formed in May 2000 to do the technical work.

The strategic framework document developed by me and endorsed by Technical Committee SMG¹²⁷ identifies the regulatory requirements and contains the following key targets for the standardisation work:

- ETSI needs to produce harmonised standards for all IMT-2000 systems.
- The work can reference ITU, 3GPP2 and TTA specifications directly. There is no need to transpose these into ETSI documents.
- The harmonised standards will be produced by a joint ERM/SMG Task Force and EP DECT.
- The first release of the harmonised standard needs to be completed ideally in October 2000.

8.2.7.3 *Technical Committee MSG, the New Body for ENs*

The work, which remains in ETSI, is the elaboration and approval of ENs needed for regulatory purposes. For this task I proposed to create a new body Technical Committee MSG (Mobile Standards Group) and its terms of reference. This was endorsed by SMG¹²⁸ and approved by the ETSI Board. It started in June 2000.

8.2.7.3.1 *EP SCP (ETSI Project Smart Card Platform)*

The generic smart-card work and the work on common lower layer functions for smart-cards of all 3G systems was transferred to EP SCP which was created in March 2000.

8.2.8 *Conclusions*

During the period from April 1996 to February 1999 ETSI Technical Committee SMG issued a UMTS strategy consensus on a vision which was based on services' innovation, GSM evolution and Internet orientation. All basic concepts for the UMTS standard were

¹²⁷ SMG P-00-194,
¹²⁸ SMG P-00-183.

elaborated and agreed. Very difficult decisions like the UTRA decision were taken. On this basis a set of reports and raw specifications were produced. The creation of a globally open efficient new working structure, the 3GPP, was initiated and brought to life. All UMTS and GSM work was transferred to 3GPP. The necessary changes in ETSI were initiated. Then the Technical Committee SMG was closed at the end of July 2000 since its mission was fulfilled.

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Chapter 9: The Third Generation Partnership Project (3GPP)

Section 1: The Creation of 3GPP

Karl Heinz Rosenbrock¹

Having read the title, it should not surprise you that this section deals with the creation of the Partnership Project for the standardisation of a Third Generation Mobile Communications System (3GPP).

Why, you may ask, in a history book about the GSM and UMTS development, do I want to talk about the establishment of a partnership project? Isn't it the most natural thing to do? This is, of course, a stance an insider can take today – after nearly 30 months of 3GPP's creation and the smooth and successful running of this project.

As this section will eventually show, it took quite some time, filled with tough and even passionate discussions, before the goal was achieved. Approaching this idea from a rather philosophical point of view, one should not be too surprised about the big efforts needed, because already the old Greek ancestors knew that "prior to being successful the Gods will demand some sweat" ...²

This section starts with some general considerations leading the European Telecommunications Standards Institute (ETSI) membership towards a global approach in standardisation and then deals with the establishment of an ad hoc group of the ETSI Board (UGG = UMTS Globalisation Group) to address the matter of global standardisation in this context and the related meetings and discussions. Afterwards, the 3GPP will be described in a rather general manner, highlighting how it works, who the stakeholders are and dealing with the results achieved so far. The section is rounded up with the relationship towards the International Telecommunication Union (ITU) and other initiatives as well as a few concluding remarks.

9.1.1 First Approaches to Globalisation

The re-engineering process ETSI, the "Excellent" Telecommunications Standards Institute in Europe, undertook in the years 1995/1996 – only 7 years after its creation – resulted in among others a kind of mission statement for the Institute: "Making international standards happen first in Europe".

¹ The views expressed in this section are those of the author and do not necessarily reflect the views of his affiliation.

² One of my cruel translations of a German idiom "Vor den Erfolg haben die Götter den Schweiß gesetzt" ...

Classical examples of ETSI success stories that witness this slogan are among others: the Global System for Mobile Communication (GSM); Digital Enhanced Cordless Telecommunications (DECT); Digital Audio Broadcasting (DAB); Digital Video Broadcasting (DVB); Terrestrial Trunked Radio (TETRA), just to name a few of them.

In positioning ETSI in the standardisation landscape, it became clear that the trends and changes towards globalisation, convergence and new value chains would lead to the creation of a huge volume of standards making space. Furthermore, it was not tenable for ETSI to try to fill the entire space. Choices had to be made. In addition, the investigations revealed that collaboration by means of appropriate partnerships could be a promising formula.

ETSI consciously withstood the temptation to become a global standards body. But it has always undertaken great efforts to ensure that all of its products, i.e. deliverables, such as European Norms (ENs), ETSI Standards (ESs), ETSI Technical Specifications (TSs), etc. satisfy real market needs and have the potential to become global standards. The ITU remains ETSI's global partner of choice. But the fast moving markets were expected to require ETSI to supplement this with various international partnerships on a case-by-case basis.

The high level task force that undertook the ETSI review in 1995/1996 advised the Institute that it had to sustain its core competence of making high quality standards for large and complex telecommunications systems. But, if neat demarcation lines are going to cease to exist, then ETSI must inevitably move more into the IT, audio-visual and other fields. It should do this in good partnerships, where other Standards Developing Organisations (SDOs) or appropriate fora and consortia are willing to co-operate with ETSI. Retrenchment by ETSI was not considered to be in Europe's interest.

Other results of interest here, of ETSI's re-engineering process after 7 years of existence were:

- to reduce the hierarchical structure in the Technical Organisation to a minimum;
- to delegate power (of approval, etc.) to the Technical Bodies where the main work is being done;
- to focus on semi-autonomous projects;
- to aim at proper project management;
- to allow the creation of ETSI Partnerships Projects (EPPs);
- to streamline and rationalise the ETSI Working Procedures;
- to improve the use of electronic tools for further rationalisation and innovation;
- to use audio and video conferencing;
- to broadcast inter-active meetings;
- to increase standards promotion activities;
- to facilitate and to promote direct electronic access to ETSI documents and deliverables free of charge.

Regarding ETSI's external relations the advice given was: that ETSI should add to its strength through partnerships in complementing areas, ceding some sovereignty on a case-by-case basis to achieve common purposes.

ETSI should continue its dialogue (in GSC/RAST) with its major regional/national counterparts, with the objective of strengthening arrangements for effective co-operation and be prepared to enter into bilateral co-operation on a case-by-case basis.

With this short excerpt of some basic results stemming from the ETSI re-engineering

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process undertaken in the middle of the 1990s, we have the fertile soil, i.e. the driving forces, motivations, basic elements needed in order to establish a partnership project.

The tremendous success story of GSM may have even led some ETSI members to believe that it would have been the most natural choice to repeat this with the third generation mobile communication system within ETSI, too. But for insiders it became clear that such a success could not be guaranteed another time.

After having dealt with the ETSI internal change in orientation from Europe-centric to international and global, let's have a short look at the first attempts at getting into closer contact with our partners. Let's start with our American friends.

In Sections 5.3 and 5.4 the standardisation work on PCS 1900 in ANSI T1P1 as well as the new co-operation between ANSI T1P1 and ETSI Technical Committee SMG are described.

The relationship between ANSI T1P1 and ETSI TC SMG started in 1996/1997. Both Technical Committees were working on independent sets of Technical Specifications, i.e. GSM 1900 in the US and GSM 900/1800 in Europe, etc. Parallel working with different speeds includes the risk of differences that may result in incompatibilities. In order to avoid these difficulties both SDOs agreed to merge the two independent sets of specifications into a common one and to further develop it commonly using a co-ordinated approach, i.e. each work item and the results were approved in both committees and incorporated into the common specifications.

Despite the fact that the co-operation between T1P1 and SMG was excellent, it suffered a little from the fact that the double approval process and the difficult co-ordination process at several levels, e.g. first in T1P1 and then within SMG, were not very efficient and too time consuming. One of the lessons learnt from this exercise was: Why don't we really co-operate, i.e. work together, from the very beginning – then avoiding any type of "approval ping-pong"? This was another good reason to consider what and how to improve the standardisation work for the third generation...

Now let's have a look at the relationships with our friends from Asia.

In the People's Republic of China, network operators had implemented large GSM networks based on existing ETSI standards. In order to avoid divergence, Chinese authorities (RITT) joined ETSI as an associate member and participated fully in the work of ETSI TC SMG since 1997. Thus, it was possible to fully integrate the Chinese requirements into the standardisation process within TC SMG in order to secure the integrity of GSM between China and the "rest of the world".

In the meantime – with the Universal Terrestrial Radio Access (UTRA) decision in January 1998 – contacts with Japanese ARIB/TTC colleagues had been established within ETSI TC SMG. These contacts had started in spring 1997, 1 year earlier.

Discussions on the Technical Committee working level at the end of 1997 and the beginning of 1998 between ETSI, ARIB/TTC, and T1P1³ led to the hope that the creation of a common UMTS concept applicable in all territories – and thus de facto globally – was possible. Such a concept could be based on UMTS service innovation, UTRA and the GSM core network evolution.

In other words, there was from the beginning a lot of goodwill available from all sides to undertake something in common. But how to do it? It became clear that to perform the UMTS standardisation within the three (or more) existing organisations would have been nearly unmanageable. Three committees in different continents could have developed the

³ More information is in Chapter 8, Section 8.2.6.2.3.

UMTS radio specifications whilst several other committees would have worked on network aspects. The situation in other key areas, such as services, Subscriber Identification Module (SIM), and Operation and Maintenance would have been equally difficult. Furthermore, there would have been no overall decision-making body for the resolution of possible conflicts. All these difficulties sketched out here simply called for a new and much more effective global organisational solution.

As the friends from ARIB were quite interested in developing a common radio interface whose key parameters had been agreed in Japan and in the UTRA radio interface decision in January 1997, a delegation from the ETSI TC SMG undertook an exploratory mission to Japan on 5 and 6 February 1998 in order to find out whether or not a kind of co-operation with them would be possible. Further information is given in Chapter 8, Section 8.2.6.2.3.

These informal contacts on the working level revealed that there was a good resonance on the Japanese side. In an association like ETSI, there is not only the working level, there are other levels as well, e.g. the General Assembly (GA), the highest ETSI authority, and the Board, a body with some 25 clearly identified powers delegated by the GA. In 1997/1998 the first ETSI Board could have looked back at about 18 months of existence and had, of course, to play its role... Without acting like a "donkey who eats up the grass that has grown over (above) an old and nasty story,"⁴ one has to admit that the communication/co-operation between the ETSI Board and the ETSI TC SMG suffered a little bit from irritations, misunderstandings, mal-perceptions, etc. In other words, it was far from optimum at that time... Nevertheless, there was a role to play from a more political strategic point of view. And now the question was what to do in order to make something useful happen?

What do you do, when you do not exactly know how to proceed? You create a committee. At least the politicians are supposed to do so. Well, within ETSI it was the Board that – after an interesting extraordinary meeting at the Frankfurt Airport on 27 February 1998 – decided to create an ETSI UMTS Globalisation Group (UGG), i.e. not a committee but an ad-hoc group, but what is the difference? The next section will tell you more.

Coming back to the extraordinary ETSI Board meeting on 27 February 1998, to simply mention "it was an interesting one" is, of course, correct, but an understatement. We had already quite an emotional ETSI Board#11 meeting dealing, with among other items, the question of how to standardise UMTS in the most useful manner. As no consensus could be achieved, a specially convened Board meeting was required.

At the beginning, a recall of the ETSI Board#11 results concerning the third generation mobile standardisation was made. In addition, reports from ETSI TC SMG were given, especially about their exploratory contacts with potential partners.

Regarding the ETSI strategy and policy for the standardisation of a third generation mobile communications system, there were quite differing opinions and fears expressed. The two extreme positions were something like:

- create a new and independent 3G forum; and
- keep all 3G standardisation within ETSI.

With all shades of compromise in between – among others why not use an ETSI Partnership Project (EPP)? By the way, at that time it was not very clear what an EPP was. There existed a general description in the ETSI Rules of Procedure, but it dated from 1995/1996 and covered some basic characteristics only, allowing for a great variety of different implementations.

⁴ Wenn endlich Gras über eine (traurige) Angelegenheit gewachsen ist, kommt ein Esel, der das Gras frisst.

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The result of this heated discussion was the idea to create a kind of starter group, UGG. And the Board agreed that the group should consider the requirements for the globalisation of GSM-based UMTS and make recommendations as to how this may be achieved.

9.1.2 The ETSI UMTS Globalisation Group

The UMTS Globalisation Group (UGG) was an ad-hoc group established by the ETSI Board from where it got its first draft Terms of Reference. They have been refined since based on the experience gained in the meantime.

9.1.2.1 Terms of Reference of UGG

In the following you will find the UGG Terms of Reference as revised during the first UGG meeting and approved by correspondence by the ETSI Board.

9.1.2.1.1 Objectives of the Group

The objective of this Group was to consider the actions, which are required to enable UTRA and "GSM-based" UMTS specifications to be prepared and promoted in a manner, which makes them attractive to global partners such that they will be implemented world-wide.

To achieve this objective the Group should:

- provide strategic management of those activities which fall within the scope of this Group;
- investigate the development of relationships with external partners and identify their expectations for UMTS;
- propose an organisational structure which meets the expectations of the Institute and external partners, taking into account the recommendations of the ETSI GA ad-hoc Group on fixed/mobile convergence (after their approval by the ETSI GA);
- consider what transition arrangements are necessary to move towards a new organisational structure;
- propose a mechanism, which enables all active partners to take part in the approval of related specifications.

In their work the Group may need to take into account the following factors:

1. Management characteristics (*How do stakeholders define and approve strategic direction? How is the "work-programme" defined and approved to carry out the strategic objectives?*)
2. Business model (*How are "regional" priorities, based on their business model, defined such that the standards are truly global?*)
3. Financial model (*How are "overhead" costs assigned?*)
4. Operating principles (*How is actual standardisation work carried out? How are the standards approved in different regions/countries?*)
5. Maintenance work (*How are improvements, maintenance of standards performed?*)
6. European fall-back (*What is the fall-back solution for Europe if there are disagreements at*

- unanimously requested the ETSI Board (through its UMTS Globalisation Group) to complete the negotiations with potential partners and to oversee the creation of the Partnership Project;
- unanimously requested the ETSI Board to agree and maintain on behalf of ETSI the final versions of the Partnership Project Description, the Partnership Project Working Procedures, and the Partnership Project Agreement;
- unanimously authorised the director-general to sign the Partnership Project Agreement.

9.1.2.4.14 Happy End in Copenhagen

It was in Copenhagen where the last 3GPP preparatory meeting with all six OPs took place on 2–4 December 1998.

Here, the final fine-tuning of the 3GPP documentation was achieved. In addition, the 3GPP agreement⁸ was signed (in a nice framework provided by the host, TeleDenmark) by the following OPs: ARIB, ETSI, T1, TTA, and TTC.

Unfortunately, the partners from CWTS (China) were not authorised to sign the 3GPP agreement yet. Furthermore, owing to the fact that the UMTS Forum was unable to participate in Copenhagen, they were prevented from co-signing the 3GPP agreement as a first Market Representative Partner (MRP).

During that Copenhagen meeting, another discussion ensued about the role the MRPs should play. Finally, it was concluded that the high competence of MRPs should be used in order to identify market requirements, thus enabling 3GPP standardisation to meet the needs of the market. An MRP is an organisation invited by the OPs to participate in 3GPP with the objective of offering market advice to 3GPP and to bring into 3GPP a consensus view of market requirements.

9.1.3 What is 3GPP?

The 3GPP is a global standardisation initiative created in December 1998. Its task was to develop a complete set of globally applicable Technical Specifications for a third generation (3G) mobile telecommunications system based on the evolved GSM core network and an innovative radio interface known as UTRA. The Project is based on a concept devised by ETSI aimed at facilitating better co-operation between regional standards organisations, forums and other industry groupings. 3GPP is a collaborative activity between officially recognised SDOs, with the participation of other industry groups and individual members.

Partnership in 3GPP is open to all national, regional or other SDOs, irrespective of their geographical location – within the project the participating SDOs are referred to as OPs. The OPs may invite MRPs to participate: these may be any organisation from anywhere in the world that can offer market advice to 3GPP and bring a consensus view of market requirements that fall within the project's scope. Individual membership is open to companies and organisations within the communications industry that are active members of one of the OPs. The truly global nature and the breadth of the market interest in the task of specifying this 3G system is evident from the identity of the 3GPP partners (see further in sub-paragraph 9.1.3.2) and all agree that 3GPP is proving a highly successful initiative.

⁸ The 3GPP Agreement and the 3GPP Project Description can be found on the attached CD-ROM in 3GPP.

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The 3GPP has no legal status. Ownership (including copyright) of the specifications and reports it produces is shared between the partners. The 3GPP process includes a conversion (transposition) of the project's output into official standards and reports by one or more of the OPs.

The specifications being prepared by 3GPP are evolved in part from the enormously successful GSM standard, which is currently (February 2001) serving over 400 million subscribers in more than 140 countries. Building on this massive installed base, the system being specified by 3GPP will be an attractive upgrade path for existing operators and users. It also has an assured compatibility with GSM – good news for both operators and users who are unable, or unwilling, to upgrade to 3G.

Paramount among the 3GPP specifications is the definition of UTRA, the innovative radio access technology that is the key to the new system's high data rates and dramatically improved performance. UTRA is spectrum-efficient and supports FDD and TDD modes. This interface has been accepted by ITU as a member of the IMT-2000 family – or more correctly, as *two* family members: IMT-DS, the FDD mode; and IMT-TC, the TDD mode. IMT-2000 family membership requires the ability for users to roam globally and seamlessly, which implies interoperability with other family members: 3GPP thus co-operates closely with the 3GPP2 project which is specifying another family member, a 3G CDMA system based on an evolution of the ANSI-41 architecture.

9.1.3.1 How Does 3GPP Work?

3GPP has been designed to minimise delays and inefficiencies. As a result, it has a "flat" organisational structure and a large degree of distributed autonomy. Overall project planning and co-ordination is the responsibility of the PCG, with input primarily from the OPs, guided by the MRPs. It is mainly at this level that regulatory requirements, provided by the telecommunications administrations and governments around the world, are taken into account.

The development of the specifications is performed by TSGs and their subordinate working groups. Here, the main participation is by technical experts from the individual members of the OPs. Individual members in their capacity as ITU members are also responsible for carrying the results of the 3GPP work to the ITU.

At the time of the creation, 3GPP had structured around four principal aspects of the 3G system being defined as TSGs:

- TSG CN: core network
- TSG RAN: radio access network
- TSG SA: services and systems aspects
- TSG T: terminals

Each TSG is authorised to develop and approve specifications and reports within its scope, and TSG SA also has a role of co-ordinating the work of the TSGs at a more detailed level than the PCG. The result is a process that is able to rapidly produce and approve specifications and reports in response to the needs of the market, although it is important to note that the deliverables do not have a formal status until they have been transposed by one or more of the OPs.

The formal status is necessary for regulatory and other purposes in the various regions, and all the OPs have committed themselves to complete this process rapidly. Each OP will apply

its own procedures, appropriate to their respective regions. As the official European SDO within 3GPP, ETSI recognises the 3GPP output as ETSI Technical Specifications and ETSI Technical Reports without a need for any further endorsement within the Institute. This means that the 3GPP documents are published – within a matter of a few weeks – as identical text directly as ETSI deliverables. In addition, ETSI is transposing, i.e. adapting, a few of the initial 3GPP specifications into ENs for specific European regulatory requirements. This is happening in parallel with the publication of the initial Technical Specifications and will not impede the implementation of 3G in Europe.

9.1.3.1.1 Electronic Working

3GPP has taken a leading role in changing the traditional ways of standards making. A very heavy dependence is now placed on electronic working, both outside and within meetings, advancing a trend that started in ETSI a year or two ago. This means that paper copies of draft documents have been almost entirely eliminated, saving time and expense, and making a significant contribution to the environment.

Given that 3GPP has participants from all over the world, the use of the Internet, e-mail exploders and other such facilities have proved invaluable for distributing and sharing information, working drafts and so on. Delegates to meetings had already become used to downloading working documents from the Internet and having updates to the documents distributed in meetings on CD-ROM. But in recent months, in meetings around the world, participants have experienced the benefits of a local area network (LAN) solution as the latest step in improving working methods. ETSI's headquarters premises already have LANs in all its meeting rooms, but most other venues currently rely on temporary LANs (wired or radio), using equipment and support kindly donated by individual members.

Such facilities permit delegates to access all the meeting documents electronically from their laptop computers. As a result, the huge burden of producing paper copies (as many as 10 000 pages per delegate for some meetings) can be eliminated. Delegates can access new documents as soon as they are available, rather than having to wait for paper copies to be made or for the documents to be distributed by other means, such as diskette or CD-ROM.

9.1.3.1.2 Project Support

For administrative and support purposes the 3GPP Partners have established a Mobile Competence Centre (MCC) which is hosted by ETSI at its premises in Sophia Antipolis, Southern France. The MCC was created in March 1999 to provide support not only to the 3GPP but also to ETSI's own studies in mobile technologies. A full description of MCC including the financing is given in Chapter 15, Section 3.

9.1.3.2 Who are the Stakeholders in 3GPP?

3GPP has attracted a very strong commitment from organisations and companies around the world, reflecting the truly global nature of the project. There are currently six OPs (in alphabetical order):

- The Association of Radio Industries and Businesses (ARIB), Japan

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- The China Wireless Telecommunication Standards Organisation (CWTS)
- The European Telecommunications Standards Institute (ETSI)
- Committee T1, US
- The Telecommunications Technology Association (TTA), Korea
- The Telecommunication Technology Committee (TTC), Japan

ARIB, ETSI, T1, TTA and TTC can be considered as founding OPs of 3GPP who signed the agreement in Copenhagen on 4 December 1998. CWTS signed the 3GPP agreement during the OP meeting #1 in Seoul on 8 June 1999.

In addition to the six OPs mentioned above, there are now seven MRPs (in chronological order of joining 3GPP):

- The UMTS Forum (December 1998 at Antibes/Juan les Pins)
- The Global Mobile Suppliers Association (GSA) (February 1999 at Cannes)
- The GSM Association (OP meeting #1 in Seoul)
- The Universal Wireless Communications Consortium (UWCC) (September 1999 at Geneva)
- The IPv6 Forum (OP meeting #2 at Sophia Antipolis)
- The Multimedia Wireless Internet Forum (MWIF) (during OP meeting #3 in Beijing)
- The 3G.IP Focus Group (during OP meeting #3 in Beijing)

In addition, by January 2000 3GPP had 284 companies participating as individual members, and the numbers continue to grow; their affiliation with the OPs is as follows:

ETSI (Europe)	173 companies	(61%)
T1 (US)	22 companies	(8%)
ARIB (Japan)	37 companies	(13%)
TTC (Japan)	18 companies	(6%)
TTA (Korea)	25 companies	(9%)
CWTS (China)	nine companies	(3%)

The brackets at the end indicate the percentage of individual OP members active in 3GPP. From this, one can deduce that the representation from the three continents involved in 3GPP is as follows:

Asia	89 (31%)
Europe	173 (61%)
North America	22 (8%)

9.1.3.2.1 Leadership positions

During the first meeting of the 3GPP PCG and the OPs in Fort Lauderdale, US in March 1999, a lot of effort was undertaken in order to establish a good regional balance regarding the leadership positions within 3GPP. Fortunately, that goal was achieved as can be seen in the following:

PCG for the first 2 years: chairman from Europe, vice-chairmen from Asia (ARIB) and North America.

From 2001 on there will be an annual rotation. For 2001 the PCG chairman comes from Asia (ARIB).

Regarding the four TSGs: CN, RAN, SA&T, with one chairman and two vice-chairmen each, we can register the following situation as of the end of the year 2000:

- Europe has five (of 12) leadership positions;
- North America has four (of 12) leadership positions;
- Asia has three (of 12) leadership positions.

9.1.3.3 3GPP Meetings

Regarding the meetings within 3GPP, we have to distinguish basically between three different levels:

- PCG/OP meetings;
- TSG meetings; and
- WG meetings underneath the TSG level.

PCG/OP meetings are not that frequent. Until April 2001, the following meetings took place:

PCG#1	1–4 March 1999 in Fort Lauderdale, US
PCG#2	6–7 July 1999 at Sophia Antipolis, France
PCG#3	19–20 January 2000 at Sophia Antipolis, France
PCG#4	17 July 2000 in Beijing, China
PCG#5	14 November 2000 in San Francisco, US
PCG#6	10 April 2001 at Sophia Antipolis, France

The composition of PCG, the project co-ordination group, is as follows:

- Six OPs with a maximum five delegates each;
- Seven MRPs with a maximum of three delegates each;
- Five TSGs with one chairman and two vice-chairmen each;
- Two observers with one delegate each;
- ITU-T and -R with three delegates as special observers,
- One secretary, Mr Adrian Scrase.

Thus – ignoring any guests – the PCG may encompass up to about 70 delegates. This high amount of delegates within PCG – although most of the delegations do not send the maximum number of delegates allowed – does not correspond anymore to the “light structure” originally intended.

Decisions within PCG are taken by consensus among the OPs. In “unavoidable cases” a vote may be taken.

Most of the OP meetings were organised in connection with the PCG meetings as follows:

OP#1	27–28 May 1999 in Seoul, Korea
OP#2	18 January 2000 at Sophia Antipolis, France
OP#3	18–19 July 2000 in Beijing, China
OP#4	15 November 2000 in San Francisco, US
OP#5	11 April 2001 at Sophia Antipolis, France

The OP meetings are composed of delegations stemming from the participating OPs. They are normally chaired by a representative of the hosting OP. The delegation number is not fixed, but as most OP meetings are joined with a PCG meeting, the delegations from the OPs do not differ very much from PCG meetings with the difference that the TSG chairmen and vice-chairmen are now part of the OP delegations. Up to now the MRPs have been invited to participate as guests within the OP meetings.

There is a 3GPP Funding and Finance Group, chaired by Mr Phil Davidson, active and reporting to the OP meetings providing appropriate advice.

The TSGs meet quarterly in parallel (CN, RAN, T) and in sequence with SA. The TSGs have met 11 times since the creation of 3GPP.

TSG#1	Sophia Antipolis (December 1998), France
TSG#2	Fort Lauderdale (March 1999), US
TSG#3	Yokohama (April 1999), Japan
TSG#4	Miami (June 1999), US
TSG#5	Kyongju (October 1999), South Korea
TSG#6	Nice (December 1999), France
TSG#7	Madrid (March 00), Spain
TSG#8	Düsseldorf (June 00), Germany
TSG#9	Hawaii (September 00), US
TSG#10	Bangkok (December 00), Thailand
TSG#11	Palm Springs (March 01), US

At those TSG meetings between 400 and 600 delegates can be expected. During the recent ones we have been closer to 600 – quite a challenge from the logistics point of view!

The working groups belonging to the TSGs may even meet more frequently. Therefore, it does not make much sense to refer to them here in more detail. But it should be clearly pointed out that the bulk of the 3GPP work is being done there...

9.1.3.4 What Progress has been Made in 3GPP?

In little over 1 year, the project had already produced the first series of more than 300 specifications and reports in what is called Release 99. The specifications in Release 99 include those that define UTRA, the radio interface, and these have been submitted by the 3GPP OPs to the ITU-R for reference in its IMT-RSPC Recommendation, which forms the compendium of 3G terrestrial radio interfaces.

In addition to UTRA, this initial release of specifications includes the definition of around 50 services including multimedia messaging, plus architectural aspects, other features and enhancements. Release 99 has enabled industry to proceed with the development of the system, which, as noted earlier, is planned to come into service in Japan in 2001, with progressive launches around the world thereafter. These incredibly short timescales have necessitated an extremely efficient, and yet open, specification process. The fact that around 300 vital specifications have been produced so quickly confirms both the commitment of all concerned and the effectiveness of the 3GPP process.

The Project's specification activities will continue as it develops Release No. 4 (scheduled for March 2001) and beyond, providing more enhancements and features including an "all-IP" based network, specification of a UTRA repeater, further refinements of radio access

modes, seamless service provisioning, enhancements to security, emergency calls, languages and alphabets, optimisation of power, spectrum and quality of service, and numerous other aspects. The task also entails an updating of the Release 99 specifications as needed (the technology is still evolving), for which a mechanism for handling quarterly updates has been established.

9.1.4 What is the Relationship Between 3GPP and ITU?

The 3GPP has been recognised by the ITU as one of the sources of technical specifications for the IMT-2000 family. There is thus a clear understanding between the two parties, which includes that 3GPP results will be submitted to the ITU where appropriate. However, because of the Project's status it does not contribute directly to the ITU. Formal contributions to ITU Study Groups, based on 3GPP Technical Specifications and Technical Reports, are made by individual members or OPs who are also members of the ITU.

The ITU entrusts the work of developing the standards needed for 3G systems to groups such as 3GPP, 3GPP2, UWCC and ETSI. For its part, the ITU is focusing on the interfaces between IMT-2000 family members to ensure seamless operation for users. A large number of 3GPP specifications, notably those for UTRA, have been accepted by the ITU as an essential component of its IMT-RSPC Recommendation, and 3GPP will continue to contribute to this process as the ITU updates and enhances the Recommendation.

In order to improve the exchange of information with the two sectors of the ITU, ITU-R and ITU-T, 3GPP agreed during its recent PCG/OP meetings in San Francisco to provide a special observer status for the ITU within the PCG of 3GPP.

9.1.5 What is the Relationship Between 3GPP and Other Initiatives?

The technologies that form the terrestrial component of IMT-2000 are being developed in several different communities: 3GPP is producing the specifications for the UTRA FDD (W-CDMA) mode and the UTRA TDD modes (high and low chip rates, the low chip rate mode

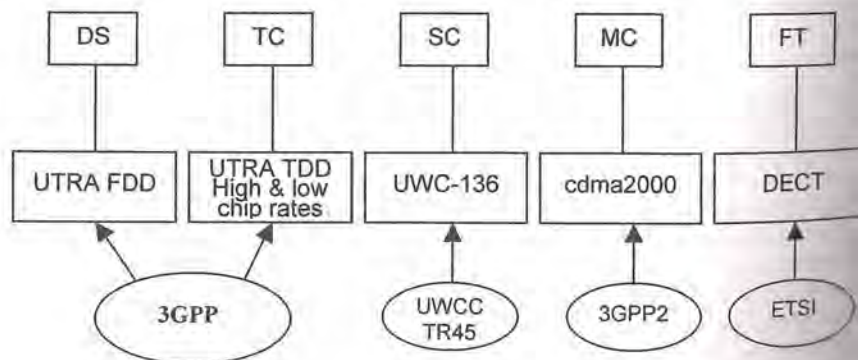


Figure 9.1.1 The five IMT-2000 terrestrial interfaces agreed by ITU-R

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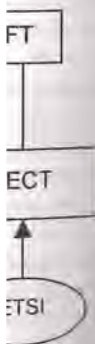
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being TD-SCDMA, proposed by CWTS. A similar group, 3GPP2, is preparing the cdma2000 specifications, UWC-136 TDMA specifications are being developed principally by UWCC, and DECT specifications are defined by a set of ETSI standards (Figure 9.1.1).

Since the UWCC and ETSI are both partners in 3GPP (as an MRP and OP respectively), there is direct liaison between the Project and these two sources of specifications for other IMT-2000 family members.

When 3GPP and 3GPP2 were created it was felt that the interests of each group were sufficiently different to require them to remain separate but here again many of the OPs and MRPs are common to both groups, so there are natural channels for information exchange. Particular instances of formal co-operation between the groups were the two joint 3GPP-3GPP2 workshops held in 1999 to address the "Hooks and Extensions" issue aimed at ensuring interworking between the respective technologies.

In addition to all this, the 3GPP TSGs and their working groups are encouraged to liaise directly with relevant technical bodies within the Project as well as among the Partners.

9.1.6 Conclusions

The attentive reader, and let's assume that you are one, may still be astonished to learn what big efforts have been necessary in order to establish 3GPP.

In the meantime, i.e. in the course of year 2000 nearly the whole work of the former ETSI TC SMG has been incorporated into 3GPP, to a large extent within the new TSG GERAN.

Well, our Japanese friends were not happy about this shift because they feared that it could result in delays in the 3G introduction in their country. They accepted this because a separate TSG for the GSM work was created.

Trying to recall the heated discussions within ETSI about the scope of 3GPP from 1998, one has to admit that such a move would have been violently rejected by a lot of ETSI members, maybe even by the majority. Using a philosophic approach, one can, of course, state that time helps healing (even wounds).

Today, i.e. February 2001, we can conclude from ETSI's point of view that all standardisation work related to further evolution of the second generation mobile system, i.e. GSM, and to UMTS is being done well within 3GPP. Thus, the objective to avoid parallel work within ETSI TBs and 3GPP has been fully achieved.

The ability of organisations and individuals around the world to co-operate and make available a full set of stable, agreed 3GPP specifications in 1 year is a remarkable achievement, one that is unprecedented in the world of standardisation. 3GPP meetings have taken place in many parts of the world, emphasising the strong commitment of the SDOs from China, Europe, Japan, Korea and the US. The MRPs have also lent very strong support to the work. Thanks to this widespread and determined commitment it has been possible to meet the very aggressive targets for 3G.

But Release 99 was only the first step – the workload has continued to intensify this year, as the initial specifications are refined and many new ones added, opening the path to full, seamless, global 3G services, changing forever the way that people communicate.

In the meantime, 3GPP has changed the designation of the releases and dropped to mention one year in order to avoid irritations and wrong expectations. Release 99 was first established in December 1999 and got its maturity in the course of year 2000. In 2000, more than 5700 change requests were implemented. The next big event will be Release #4 as a result of the

series of TSG meetings scheduled for March 2001 in Palm Springs, US. This will obviously result in a further stabilisation and extension of the UMTS specifications.

3GPP is running very well. The individual members from the six OPs seem to be very satisfied with this arrangement – and the production line is in full swing.

Without exaggeration, one can give 3GPP the attribute of a success story. One may quote again here Mr Ed Roney who even addressed the 3GPP concept – prior to its realisation – as a “paradigm shift”.

As the results of the GSM and UMTS related standardisation work represent a great part of ETSI's deliverables, it might be justified to note here that during the year 2000, ETSI published more than seven new deliverables each working day (Monday through Friday), i.e. one deliverable per hour!

Further information may be found on the 3GPP website at <http://www.3gpp.org>.

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Chapter 9: The Third Generation Partnership Project (3GPP)

Section 2: UMTS in 3GPP (December 1998–May 2001)

Niels Peter Skov Andersen¹

9.2.1 A Change of Environment

In the period 1982 until end of 1998 the work on the GSM standard, and in the later part of the period on UMTS, had been performed in the same environment, starting under CEPT and later transferred into ETSI. The Technical Committee GSM, during this period renamed to SMG, and its working groups (Sub Technical Committees) had continuously existed and evolved. The same was the case for the working methods and procedures used within the work. Over time with the success of the GSM system more and more interested parties became involved in the work including parties from outside the original CEPT area. However, this was all a relatively slow evolution and no major revolutions in the organisation or the working methods occurred in this period.

After all these years of continuity in the work the discussions around the creation of 3GPP and the decision to establish 3GPP for the initial phase of UMTS² naturally created some uncertainty amongst the members of SMG. Especially the resulting split of the GSM standardisation, with the responsibility for the GSM core network transferred to 3GPP, but the responsibility for the GSM radio access Network maintenance remained in ETSI in SMG. This caused some concern amongst many delegates. Also the internal structure for the technical work within 3GPP was different from the well-known structure in SMG. SMG was based on a technical plenary with a number of working groups (SMG1, SMG2, ..., SMG12) performing the detailed technical work. The SMG plenary was the approving authority for the results of the work performed by the working groups. Also the plenary was the group responsible for approval of all new work items and the content of the releases. The structure for the work in 3GPP, as agreed by the partners, was quite different. The project

¹The views expressed in this section are those of the author and do not necessarily reflect the views of his affiliation.

²The term UMTS is throughout this section used to keep consistency of terminology with the other chapters and terms. The term UMTS do not appear in the 3GPP agreement, which defines the system as a third generation system based on an evolved GSM core network and UTRAN (including UTRAN (FDD and TDD modes)).

was organised with four equal Technical Specification Groups (TSGs), who had complete autonomy for their area of responsibility, i.e. they were responsible for approval of new work items and final approval of deliverables. The four technical groups originally defined were:

TSG-CN	Responsible for the core network development
TSG-RAN	Responsible for the radio access network based on UTRAN (FDD and TDD modes)
TSG-SA	Responsible for services and system aspects
TST-T	Responsible for Terminal and UIM

In addition to the technical groups the 3GPP organisation has a Project Coordination Group (PCG). However, the role of this PCG cannot be compared to the role the SMG plenary played. The SMG plenary was an open technical group with the approving authority in all technical questions including approval of new work items. The 3GPP PCG is a closed group with a defined membership consisting of a limited number representative of each of the partners (SDOs, MRPs) and the leadership (chairman and two vice-chairmen) of each TSG. Thus as a closed group the role of the PCG becomes more like a board overlooking the overall well being of the project.

This structure made many long-term SMG delegates concerned about how the overall coordination of the project could be ensured. This new structure was not introduced to overcome known deficits of the SMG organisation, but in my opinion, by political considerations to ensure that no single individual, individual member, organisational partner could obtain a controlling position in the project.

9.2.2 The First Two TSG Meetings

The inauguration meeting of the 3GPP TSGs was held in December 1998 in Sophia Antipolis, France. In the process of creation of 3GPP this was the first time that the 3GPPs real work force – the technical experts – met. The main objectives for this first meeting was to get the work started. One of the elements of the meeting was a presentation from the different partners on the status of their work on the third generation mobile system, the work, which they now were in the process of handing over to 3GPP.

Listening to the presentations and the discussions during the breaks it was very obvious that the background for standardization amongst the delegates was quite different. As an example, I remember that during the coffee break just after I, as chairman of ETSI SMG2, had presented the status of the UMTS radio work in ETSI, and had ended my presentation by stating that the UMTS radio work would only be on the agenda of one more meeting of ETSI SMG2. This was in order to complete the documentation to be handed over to 3GPP and then the work on UMTS radio in ETSI would cease, a small group of non-ETSI delegates came to me and asked "if all work on UMTS radio in ETSI ceases, how do the Europeans then coordinate their views on 3GPP?" Coming from the ETSI SMG background this was a completely unexpected question, as the working procedures for 3GPP were very similar to those of ETSI, it was clear to me that the contributions to 3GPP in general should come from the individual members – the companies, regulators etc. – in their own name and not as regional contributions. I explained this, but I also understood that for delegates with a background in international standardization from, e.g. ITU this was the normal way of thinking. During the

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first meeting a lot of small explanations similar to this were given over a cup of coffee and already by the second meeting there was a far better common understanding on how the work in the groups was intended to be performed.

Even though the partners, already before the first meeting of the TSGs, had made the principle decision of having four TSGs and had elaborated draft terms of references for the groups, the definition of the area of responsibility for the TSGs and refinement of the terms of references was a key item on the agenda. Each of the TSGs adjusted their terms of references and with some subsequent adjustments at the second meeting, the terms of reference for the TSGs have until now (March 2001) stayed the same except for few minor adjustments.

In order to get the detailed work started and not lose the momentum, which had existed in the SDOs before the creation of 3GPP, it was a very important task at the first meeting of the TSGs to get the detailed work within the TSGs organised so technical work could commence and progress in the period up to the second meetings of the TSGs in March 1999 in Fort Lauderdale. This part of the programme for the first meetings of the TSGs went well, and by the end of the meeting each of the TSGs had established between three and five working groups, outlined their area of responsibility and appointed convenors for the groups. With the establishment of the working groups the detailed technical work was ready to start, and already by the second meeting of the TSGs significant progress was reported.

By the second meeting of the TSGs, which took place in Fort Lauderdale, the complete atmosphere had changed from the general uncertainty and procedural questions to a far more technical focus, even though a few items of a management and organisational nature still needed to be sorted out. In addition, at this second meeting the leadership (chairman and vice-chairmen) for the individual TSGs was elected for the next 2-year period.

As indicated, one of the main differences with the 3GPP organisation compared to the organisation of SMG was the lack of a superior technical group with an open plenary with responsibility for the technical coordination, final decision making, conflict resolution and the project management including adaptation of work items, etc. Already the original description for the role of TSG SA, which was elaborated by partners together with the 3GPP agreement in Copenhagen in early December 1998, contained a paragraph on giving TSG SA the role of

"High level co-ordination of the work performed in other TSGs and monitoring of progress". This role was subsequently reflected in the terms of references for TSG SA agreed at the first meeting of TSG SA (TSG SA#01). At the second meeting of TSG SA the TSG SA convenor Mr Fred Harrison, BT, provide a proposal³ for how the TSG SA could fulfil its project coordination role. The key principles of the proposal were:

- To establish a project management function to create and maintain a cross TSG project programme including status of technical specification and reports.
- To establish close co-operation with TSG CN; TSG RAN and TSG T. Requiring the chairman or vice-chairman of each TSG to attend the TSG-SA meetings and bring new work items, issues and progress information to the attention of TSG-SA.

At the meeting another proposal⁴ was received from a group of companies⁵ who suggested that a TSG plenary be created, i.e. a fifth TSG with plenary function similar to that of ETSI

³ SP 99050: proposals for managing the TSG project co-ordination role.

⁴ SP 99068: TSG plenary.

⁵ AT&T, BT, FRANCE TELECOM, NTT DOCOMO, TIM, TMOBIL.

SMG. The argument for this proposal was that a TSG plenary would help to ensure overall project coordination and elaboration of a consistent and complete set of UMTS specifications.

After long discussions a compromise not requiring changes to the TSG structure was found and agreed. This compromise⁶ was based on the following principles for the TSG SA's project coordination role:

- At least while performing its project co-ordination role, the TSG SA will not meet at the same time as other TSGs.
- At least one representative of TSGs RAN, CN and T and their working groups will attend each TSG SA meeting, to report on the activities of their respective TSG. They shall be responsible for bringing new work items, issues and progress statements on work such as specifications and existing work items from their respective TSGs to the attention of TSG SA.
- The TSG SA plenary will also include reports from its own working groups and facilitate information exchange between those working groups and the other TSGs.
- The TSG SA shall have arbitration responsibility to resolve disputes between TSGs.

As can be seen from the principles, the independence and the rights of the other TSGs was not touched by the compromise. Each TSG maintained its right to approve work items and deliverables, etc. As a result of the way forward on the TSG SA management role, the TSG meetings in Fort Lauderdale were the last meetings where all four TSGs met in parallel. At the subsequent TSG meetings in Shin-Yokohama in Japan at the end of April TSG CN, TSG RAN and TSG T met in parallel followed by TSG SA and the chairmen of TSG CN, TSG RAN and TSG T provided to TSG SA a status report on the work and progress in their respective TSGs. The TSG SA meetings starting from the third meeting in Shin-Yokohama then had a three part structure. A part related to TSG SA internal matters where the different TSG SA working groups report the progress of their work and submit their contributions for approval, this part is similar to the work in the other TSGs. A second part related to the technical coordination with the other TSGs and a third part dealt with general project management issues such as working methods, document handling, etc.

By the end of the second TSG meetings most of the "beginners" difficulties had been resolved, the interaction between the TSGs defined and TSG SA was ready to take on-board its role in the coordination role. Also the second TSG meetings showed that the detailed work in the working groups had got a good start, the work handed over from the partners was well received and progressing well. All in all, the definition and establishment phase of the technical work in 3GPP had been completed successfully and the transfer of work from the partners to 3GPP had been performed without causing any major disruption in ongoing technical work.

9.2.3 The First Release – Release 99

After the two first two meetings of the TSGs where especially TSG SA had used time to organise the work, the third meetings were into their routine and could fully concentrate on the technical specification work.

The work in 3GPP followed the same basic methodology as was used for the GSM work in ETSI. The specifications generally are based on a three stage approach, with a scope

⁶ SP-99087: proposals for managing the TSG project co-ordination role.

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the other TSGs was to have work items and a management role, the TSG met in parallel. At the April TSG CN, TSG SA and TSG RAN of TSG CN; TSG SA did progress in their work in Shin-Yokohama where the different contributions for the part related to the 3rd general project

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description containing the functional requirements, stage 2 containing the overall functional description and architecture for a given functionality and stage 3 being the detailed technical specification down to the bit level. Working with this methodology the idea is of course that the stage 1 description is first completed or nearly completed so the requirements are clear. The next step is then to complete the stage 2 description and thereby define the overall architecture and functional split for the technical realisation of the functionality. When stage 2 is complete or close to completion the third step the stage 3 specifications containing the detailed technical specification is complete.

However, it was not possible for 3GPP to do this work serially, because of the very short timescale for completion of the first set of specifications in December 1999 only 1 year from 3GPP's creation in December 1998. Thus the work on stage 1, 2 and 3 specifications had to a large degree to be performed in parallel. Doing so TSG SA WG2, which is responsible for system architecture, quickly became a bottleneck in the process, as it was difficult, especially for TSG CN (core network) to draft the detailed specification before the architectural decisions were made. This problem peaked at the fourth TSG SA meeting in June 1999, when going through the status report from TSG SA WG2, where it became clear to the full membership that an extraordinary effort was needed to ensure that the architectural work was speeded up.

Standardisation by committee is not a traditional project, where the project leader can reallocate resources to the most urgent task. In standardisation the important task is to ensure that all the participants know and understand where additional effort is most urgently needed, so the volunteer work effort is pointed in the right direction. The recognition of the need for an extraordinary effort in TSG SA WG2 helped to speed up the architectural work and minimise the problem of TSG SA WG2 being a bottleneck. The initial delay of course made the work schedule even tougher for the groups responsible for the detailed stage 3 specifications.

As you can imagine it is not possible here to go into the details of the work, which led to the first set of specification from 3GPP in December 1999. In the following I will therefore only provide a few of examples of items, which required resolution by TSG SA.

For UMTS a new ciphering and authentication mechanism providing a higher degree of security has been developed. The SIM card (for UMTS USIM) is involved in the authentication process and calculates the necessary keys for the authentication and ciphering. Thus new SIM cards are required, or to be technically correct, cards with the USIM application are required. In the following I will use the short term USIM to indicate the card supporting the new security algorithms and SIM for the old cards supporting the GSM level of security. At the third meeting of the TSGs there was the question of whether the UMTS networks should only support USIM and thus always provide the highest possible degree of security or whether it should be possible to access a UMTS network with terminals with a SIM only. On one hand a number of delegates believed that it was preferable only to allow the usage of USIMs in the UMTS terminals, this on the other hand was questioned by operators that could foresee a slower roll-out of UMTS, e.g. due to the expected licensing time. For them a requirement for usage of USIM only in the UMTS terminals would leave them with two alternatives; either to issue USIMs even though they did not yet have a UMTS network, or be in a situation where their customers could not roam to, e.g. Japan and Korea with no GSM networks but only UMTS networks. This led to a long discussion where it could have been tempting to perform a quick vote; however, to keep the good spirit of cooperation and

consensus based work I as 3GPP TSG SA chairman considered voting as an emergency solution if everything else failed. As almost always the attempt to find a solution for which consensus could be obtained succeeded. The compromise was found based on the following elements:⁷

- Support access to UMTS access networks while using cards equipped with either the SIM, the USIM functionality or both; and
- Allow a serving UMTS operator the option to block access to the UMTS access network when a card equipped only with a SIM functionality is used.

As usual when compromises of this type were obtained it was the assumption of the meeting that the companies/members who required the capability should do the work to specify the signalling and other mechanisms required.

At the fourth TSG meetings the very rare situation of one of the other TSGs raising an issue to TSG SA for resolution occurred. TSG CN had completed the feasibility study of the Gateway Location Register (GLR). TSG CN had then decided not to start specification work for the GLR. However, as some members of TSG CN had expressed strong interest in the GLR, it had been proposed to let the interested parties elaborate the specifications required for the GLR outside TSG CN and submit the result to TSG CN. This decision had caused some problems and the TSG CN raised the question to TSG SA of how to proceed, e.g. should a vote be taken. I as chairman of TSG SA indicated to the meeting that votes were to be seen as an emergency solution when everything else has failed. First, an attempt should be made to find a solution for which consensus can be obtained. For this explicit case it seemed clear that the resistance to start work on the GLR was coming from operators not seeing the need for a GLR and fearing that the introduction would impact existing networks and other networks without a GLR. On the other hand especially operators with no GSM legacy network showed a strong interest in the GLRs as a way to reduce the amount of international signalling caused by roamers moving around in very densely populated areas. Taking into account the strong interest and the concerns expressed, it was found, that there would be no problem, if a GLR could be done in such a way, that it had no impact on an existing HLR⁸ (pre-3G), if a subscriber belonging to a HLR roamed onto a network utilising a GLR. Similarly the support of the GLR in one network should not impact networks not utilising the GLR. Based on this analysis, TSG SA recommended that TSG CN adopt a work item on GLR requiring a GLR to be fully compatible with old and new non-GLR networks. As hopefully can be seen from this example it is and has been a key priority in 3GPP to as far as possible base decisions on consensus as it also was the case for the GSM development at ETSI.

Another type of problem, which every now and then needs resolution at TSG level is the specific national or regional requirement often caused by the local regulation. Requirements that often can cause problems in relation to roaming. One example of this is the emergency call where TSG SA at meeting number 5 received a proposal⁹ for national variation in terminals to cater for the differences in emergency call requirements. When GSM introduced one unique number for initiating emergency calls had been defined (112), this ensured that a roaming user would always be able to perform a emergency call without

⁷ SP-99208.

⁸ HLR = home location register.

⁹ SP-99481.

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knowing a any specific local situation. When GSM entered into new parts of the world this function had been improved by letting the local operator store a number on the SIM card which should be considered as the emergency call number, and thus, e.g. and American user could use 911 wherever he brought his mobile. However, there are other differences in the handling of emergency calls other than just the number to dial. The GSM solution only allows routing of emergency calls to one central emergency centre and does not differentiate the type of service needed such as ambulance, fire brigade or police. However, some operators had a regulatory requirement to route directly emergency calls to the relevant service and thus needed different numbers per service. Therefore, they had suggested having a national variation of terminals. After some discussion in TSG SA the proposal was rejected. The main reasons for this was that it was seen as essential to avoid local variations of terminals and secondly a solution based on local variation of terminals would not solve the problem of subscribers roaming from other parts of the world with terminals without the specific local variation. Anyhow, the rejection of the proposal did not mean that the problem was ignored; on the contrary the relevant working groups were tasked to find a generic solution, which would satisfy the local regulations without causing problems with roaming or requiring variation in terminals.

That the previous examples from the elaboration of 3GPP Release 99 all come from the TSG SA does not mean that this type of problem does not appear in the other TSGs. As also can be imagined, the specification of a complete new radio access network in TSG RAN in the timeframe of 1 year was one of the most demanding tasks during the elaboration of the first set of specifications from 3GPP (Release 99).

As mentioned earlier, when 3GPP started in December 1998 a target date of December 1999 was set for the first set of specifications. So the sixth meetings of the TSGs in Nice, France in December 1999 were the meetings where the status for the first year of 3GPP was to be made. In order to get a full overview of the status of the work and the degree of completion, the process for documenting the remaining open issues had been agreed amongst the chairs and vice-chairs of all of the TSGs.

The principle for this was relatively simple and building on the assumption and desire that a set of specifications should be completed and frozen at the sixth meetings of the TSGs. The term frozen meant that there should be no functional changes or additions made to the set of specifications, but only strictly necessary corrections of errors or omissions which if uncorrected risk making the system malfunction. The idea behind the principle was that at the next meetings of the TSGs all proposed changes to the specifications, which could not be justified as an essential correction should be rejected, unless an exception for that specific item had been given in December 1999. In order to document these exceptions all working groups and TSGs had prepared and forwarded to TSG SA sheets describing the non-completed functionality for which they wished to have granted an exception from the general rule of no functional changes. In addition to the description of the functionality, the sheet also indicated the consequences if this functionality was completely removed from Release 99.

TSG SA collected the status reports from the different groups and created a relatively large table¹⁰ where on one side was the different functionalities and on the other side the different groups and in the table an indication if a group had requested an exception for completion of the functionality. After having created this table based on the status reports, TSG SA went through the table on a per functionality basis and evaluated the expected completion date and

¹⁰ 3GPP TS 34.999

the necessity of the function in Release 99. In order to maximise the stability of the set of specifications, especially in the case where several groups had items open for the same functionality, specifications were scrutinised in detail and in several cases the functionality was completely removed from 3GPP Release 99. This review led to the removal of functionalities such as Enhanced Cell Broadcast, Tandem Free Operation for AMR, Support of Localised Service Area and a reduction in the location service functionality in Release 99.

At the end of the December 1999 TSG SA meeting approximately 80 exceptions from the rule of no functional changes were granted. At the following meeting of the TSGs in Madrid in March 2000 the status and the list of open items was once again reviewed and the number of open items was reduced from 80 to approximately 30. At the TSG meetings in June 2000 the remaining open items were completed and since then only necessary corrections could be made. However, it is to be understood, that when such a substantial set of specifications for the 3GPP Release 99 have been elaborated in the time frame of approximately 1 year, it is unavoidable that there are some ambiguities and errors in the specifications. It is a very important task to have these errors corrected in the specification as soon as they are discovered, as this is the only way to avoid small differences in implementation due to different solutions to errors. Differences which if not avoided could lead to problems of interoperability, etc. Also it should be noted that there will continuously be errors discovered in the specifications which need to be corrected, at least until every detail has been implemented and made operational in the field.

9.2.4 Introduction of Project Management

As indicated, one of the main differences with the 3GPP organisation compared to the organisation of SMG was the lack of a superior technical group with an open plenary with responsibility for the technical coordination, final decision making, conflict resolution and the project management including adaptation of work items, etc. Instead the different TSGs approved work items and technical work on their own. Even though they reported the status of their work to TSG SA there was no simple way to for linking a given functionality with the work being performed in the different TSGs. This was clearly a problem during the elaboration of Release 99, as it was difficult for the delegates to get an overview of which functionalities were on the critical path for completion. To get an overview actually required that key experts from the different areas sit together and fit the different parts of the puzzle. It therefore, required quite some effort in and outside the TSG meetings of December 1999 to provide an overview, which allowed the meetings to make conscious decisions.

As this potential problem was clear to me from the start of the project, I had, already at the second meeting of the TSGs in March 1999, had discussions with the chairmen of TSG SA WG1 and TSG SA WG2 on introducing a model for the project co-ordination which would follow the work from the initial requirements to completion. This model was then introduced for initial discussion to the leadership (chairmen and vice-chairmen) of the other TSGs at the third meeting of the TSGs. During the rest of 1999 additional background work was done in order to prepare for the introduction of the model for project co-ordination. At the December 1999 TSG SA the model was presented to TSG SA for approval and became the model for the organization of the work for the following releases and the basis for the overall project plan.

The model was based on the introduction of the Feature, Building Block and Work Task concept, and categorization and linkage of the work items. The model was thought of as a

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reference model for structuring the work. It was not the intention to rigorously enforce the usage of the model on all ongoing work, but merely to use the model as a common reference model across the TSGs and to structure future work. The model took its origin from the typical flow for creation of a new feature or service and can briefly be described as follows.

TSG SA is through TSG SA WG1 responsible for defining the features and services required in the 3GPP specifications. TSG SA WG1 is responsible for producing the stage 1 descriptions (requirement) for the relevant features and passing them on to TSG SA WG2. TSG SA WG1 can also forward their considerations on possible architecture and implementation to TSG SA WG2, but is not responsible for this part of the work.

TSG SA WG2 should then define the architecture for the features and the system, and then divide the features into building blocks based on the architectural decisions made in TSG SA WG2. TSG SA WG2 will then forward the building blocks to the relevant TSGs for the detailed work. These proposals will be reviewed and discussed in an interactive way together with TSGs/WGs, until a common understanding of the required work is reached. During the detailed work of the TSGs and their working groups, TSG SA WG2 is kept informed about the progress.

The TSGs and their WGs treat the building block as one or several dedicated Work Tasks (WTs). The typical output of a given WT would be new specification(s), updated specification(s), technical report(s) or the conclusion that the necessary support is already provided in the existing specifications.

A part of TSG SA WG2's role is in co-operation with the TSGs and their WGs to identify if synergy can be obtained by using some of the building blocks or extended building blocks for more than one feature. Part of TSG SA WG2's task is to verify, that all required work for a full system specification of the features relevant take place within 3GPP without overlap between groups. In order for TSG SA WG2 to be successful, this has to be done in co-operation with other TSGs/WGs.

About the project scheduling: TSG SA WG1 sets a target, TSG SA WG2 performs a first technical review and comments on the target. TSG SA WG2 indicates some target for time schedule together with allocation of the defined building blocks. The TSGs and their WGs comment back on these targets. TSG SA WG2 tries if necessary to align the new target between the involved parties. TSG SA WG1 and TSG SA are kept informed of the overall schedule.

It was also in the model, it was identified as a task for TSG SA, TSG SA WG1 and TSG SA WG2 to ensure early involvement of TSG SA WG3 (working group responsible for security) to ensure that the potential security requirements, service requirements and the architectural requirements are aligned and communicated to the TSGs and their WGs.

In order for TSG T and its subgroups to plan and perform its horizontal tasks on conformance testing and mobile station capabilities, it was foreseen to invite TSG T to evaluate the potential impact of a new feature. Also work on the horizontal tasks is required to be included in the overall work plan.

With the acceptance of the modeling of the work based on the work breakdown into features, building blocks and work tasks, the next step was to map the work onto the model, create the corresponding work items for the features and building blocks and establish a first version of an overall project plan for 3GPP. In order to kick-start this process a number of Inter Group Coordination groups were established within TSG SA WG2. The purpose of these groups was to try to establish a first version of a project plan for a given area. To ensure

the correctness of the information rapporteurs and representatives from the different working groups were invited to either participate or provide status and planning information, which then was used to establish a "traditional" project plan. Also the groups identified and informed the relevant groups if, e.g. building blocks or WTs were missing.

After the establishment of stable versions of the project plan covering ongoing activities for all of the TSGs and their working groups. The responsibility for maintenance of the project plan, was shifted so each TSG was made responsible for keeping updated the parts of the work plan, which correspond to their work. The practical maintenance of the project plan was then transferred to the MCC, the team of technical experts functioning as technical secretaries for the groups and responsible for implementation of the decisions of the meetings. The MCC corresponds to the Permanent Nucleus later known as PT12 during the elaboration of GSM.

Today the project plan is just another well functioning and convenient tool, which allows delegates and their organizations a quick overview of the status of the ongoing activities. However, this is only possible because the different groups and the MCC make a significant effort in keeping the plan up to date.

In the August 2000 TSG SA held an ad-hoc release planning, which recommended entirely controlling the 3GPP work program via the work plan, and doing this independent of releases. This recommendation, which later was confirmed by TSG SA further proposed that approved work items introduced into the plan are given calendar target dates and not particular release target dates. These "calendar" work item target dates will need to be monitored and adjusted as work and knowledge about the work items progress. For this purpose reasonable milestones shall be defined. The work plan calendar should then also indicate planned future release dates with reasonable frequency to allow for stability, e.g. approximately every 12 months, depending on whether there would be enough completed work to justify the issue of a release.

The content of each release could then be easily deduced from the work plan, i.e. those items scheduled for completion by the closing day for the release being included in that particular release, a 3GPP road map. The definition of the content of a release could then be based upon the work plan, with a review of the release content starting approximately 6-9 months before the initial predicted closing date of the release. Work items not completed at the chosen closing time of the release are not included in that particular release. Maintaining the closing date of a release is a priority. Only when it is identified that no substantial new features would be available at the target date, is shifting the date considered to be an option.

In addition, independently of the actual release date, upon completion of a particular work item, the work item is frozen, denying any further functional change on the completed work item, permitting only essential technical corrections. This helps stabilize the specifications and the availability of the draft new release versions of the specifications can assist companies wanting to start developing the new features.

In all, the definition and establishment of an overall project plan was successful and has provided a high degree of visibility of 3GPP's activities. Especially, when the second set of specifications from 3GPP (Release 4) was completed in March 2001. The advantage of having the project plan to identify the completed features showed a major advantage and helped simplify the work compared to when Release 99 was completed. Also the process has changed from a release centric approach to a project plan approach with individual planning for each function or feature. To mark this change the naming of the releases was decoupled from the calendar and changed to refer to the version number on the specification and then

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9.2.5 Technical Work in 3GPP Following the First Release

About the first release of specification from 3GPP, one can in short describe the system specified as a core network evolution where the circuit switched domain provides circuit oriented services based on nodal MSCs (an evolution of GSM). Similarly the packet switched domain provides IP-connectivity between the mobiles and IP-networks based on an evolved GSM GPRS core network. In contrast to this the radio access network is a complete revolution with a brand new radio access technology. From this background it was not a major surprise that the most significant changes to come in the next releases are focused on the core network side.

Already when the work after Release 99 was discussed for the first time at the fourth meeting of the TSGs in Miami, this trend was clear. It was at this meeting that 3GPP accepted the idea of specifying an all IP based architecture option, i.e. an architectural option not requiring the traditional nodal MSC. The work on an all IP based architectural option started with a short feasibility study to identify the implications and to plan the time-scales. However, this work progressed so fast and in parallel with the time critical task of completing Release 99 that several organization, especially those amongst the smaller operators had problems following the work. Also the architectural analysis progressed much faster than the work on requirements. Therefore, in order to bring everybody level again, it was, at the TSG meetings in December 1999, decided to hold a workshop on the subject of the "All IP" option. This workshop took place in Nice, France in February 2000.

The "All IP" workshop in February 2000 was organized as a two part event, the first part where members were invited to present their vision for the "All IP" work, being about operational scenarios, technical visions, etc. The second part of the workshop was used to draw up the general trends from the presentations and thereby identify the goals by going "All IP", the requirements for the solutions and the way forward.

From the discussions it was clear that the key motivator for moving toward the "All IP" option was to establish a flexible service creation environment, allowing for quick service/application creation with well defined APIs allowing for third party applications and thus allowing gain from Internet as well as intranet services. Further, the development should provide for real time applications including multimedia services, this to allow the operators to market new and interesting services allowing the creation of additional revenue streams. Further, the introduction of IP based architecture was seen as providing the option for independence of access type and thus allowing seamless services across different access networks. Also the independence of access type could allow savings through the common development of services for several access types. Clearly one of the key motivators for the operators' interest in an IP based architecture was the expectation of cost reduction due to the possibility of leveraging the IP technology cost factor and the expected gains from the better scalability compared to nodal switched based networks.

From the discussions at the workshop it was also clear that a hybrid circuit switched and packet switched network would exist for a long time. It was also clear that the changes towards the IP based architecture should not be done at any price. Especially, the need for an open multi-vendor environment with at least the same quality and security levels as the

"state of the art" mobile networks at the time of introduction. Another requirement identified due to the co-existence of the circuit switched and packet switched domains was the requirement for service transparency across domains. Finally, an important and far from trivial requirement to fulfill, was the need to respect spectrum efficiency. It was noted at the workshop, that the IP header was actually larger than a standard 20 ms speech frame in the cellular system, which on its own clearly made the spectrum efficiency requirement a challenge. During 2000 the need for being economical with spectrum was clearly illustrated by the prices paid at the 3G spectrum auctions, with payments of approximately US\$35 billion in the UK and approximately US\$50 billion in Germany for the licenses to install and operate 3G networks.

At the workshop in February 2000, there were different opinions about what would be a reasonable and realistic timescale for the specification of the IP based architecture option. Some of the large operators indicated that they felt that a target date of December 2000 was too aggressive and not realistic, whilst other large operators indicated that they believed it could be completed by December 2000 and wanted to keep a target date of December 2000. Even though it was never said, one of the reasons for the aggressive timescale was clearly to ensure that the focus especially from the manufacturers was kept on this development, and not risk unnecessary delays, due to a time schedule, which people might regard as relaxed.

Even though the initial time schedule kept a target date of December 2000, in the further work the size of the task quickly became clear and some more realism appeared in the definition of targets in terms of content and completion dates. With respect to this it should not be forgotten that in difference to when working on the creation of the first release (Release 99), 3GPP now had a major task to perform in parallel to all new developments, that was the maintenance and error correction of Release 99. As mentioned earlier the first years of maintenance of a brand new standard are very time consuming, and thus it was very ambitious to plan for a next release already 1 year after the first. Even though the GSM work in ETSI used an annual release schedule, one should not forget that it took more than 3 years from the stable specification for GSM phase 1 before it was followed by the second set of specification for GSM phase 2.

Anyhow the second release (Release 4) was planned for and completed in March 2001, this without the result of the ongoing IP based work, which is the target for the next release (Release 5) expected approximately 1 year later than Release 4. Thus Release 4 does not contain significant revolutionary news, but instead it contains a number of smaller features and functionalities, which can be seen as an important complement to Release 99.

The work on the IP based architecture for Release 5 is focusing on the introduction of an IP multimedia subsystem, the part of the IP based network providing the capabilities for multimedia services. This choice has been made in order to ensure that the first results of the "All IP" work do not only provide for alternative methods of providing already existing and well known services, but also allow the operators to create new innovative services and new revenue streams which can justify the investment in the IP based architecture. The service drivers for Release 5 have evolved to be compatible with Release 99 and Release 4, with the addition of IP based multimedia services, including efficient support for voice over IP over the radio for the multimedia services. In Release 5 it is foreseen that the circuit switched domain is retained and provides 100% backward compatibility for the circuit switched services. Similarly the existing packet service domain is kept and the IP multi-subsystem

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is added and provides new IP multimedia services that complement the already existing services.

In the longer term, the IP multimedia subsystem might evolve to the extent to where it can provide all services previously provided by the CS-domain, and thus the specification will need to support all the commercial interesting services from today's circuit switched domain in the packet switched domain in the IP based architecture.

9.2.6 The Transfer of the Remaining GSM Activities into 3GPP

As described earlier, the original terms of reference for 3GPP covered a third generation mobile system based on an evolved GSM core network and UTRAN (including UTRAN (FDD and TDD modes)) and not covering the GSM/EDGE Radio Access Network (GERAN) part. This work together with a few other GSM only items remained in ETSI under the responsibility of SMG. This resulting split of the GSM standardization caused concern when 3GPP was created. However, time showed that it was possible to co-ordinate the work between 3GPP and SMG. For most areas, except for the GERAN specific work, co-locating the meetings of the SMG working groups with their corresponding 3GPP groups enabled the co-ordination. However, it was also clear that there was no longer one single forum with an overall responsibility for GSM as a system. This overall co-ordination was to some degree made during the TSG meetings, in the corridors and in the meetings by delegates, who ensured that the service, architectural and core network decisions would be compatible with the GERAN. However, this way of working reduced transparency of the background for arguments and decisions, both for those interested in the further development of GSM as a system and for those not interested in the GSM legacy.

In September 1999, Committee T1 sent a liaison to its 3GPP Organizational Partners requesting that the terms of reference of 3GPP be expanded to include evolved GSM radio access; that all evolutionary work of GSM should be transferred to 3GPP. The reasoning provided was that for the foreseeable future, the GSM/EDGE radio access would co-exist with the 3G radio access and there would be a clear benefit for all parties in ensuring co-ordination between the further GSM/EDGE development and the work related to the UTRAN access. Also the liaison statement indicated that by including the remaining GSM/EDGE radio work in 3GPP the overall number of meetings, liaison statements, etc. could be reduced and thus the efficiency increased.

At the 3GPP PCG meeting in January 2000, the responses from the other partners was tabled and discussed. ETSI indicated that they could support the proposal from T1 and suggested that the transfer should be effective from June 2000. ARIB indicated that 3GPP activities were based on common interest, meaning that each participating SDO and individual member needs to commit to the 3GPP objective and scope. ARIB continued that unfortunately, ARIB had no requirements to produce standards of GSM radio access including EGPRS in Japan. In conclusion ARIB could not support the request of ARIB individual members to take part in the study related to GSM radio access in 3GPP. Also the response from ARIB indicated concerns regarding potential impact on the timescales for the UMTS work as well as concern regarding financing of the project if not all parties had equal benefit of the work performed. TTA's response was very similar to that of ARIB additionally commenting that the existing process was functioning well.

At the PCG meeting CWTS indicated that they could support a transfer of the GSM radio

work into 3GPP. After some short discussions it was agreed to form an "Ad-Hoc Group on Movement of Work into 3GPP" to assess the impacts and appropriate program structure to support the transfer of appropriate ETSI/SMG and T1 programs related to the GSM/EDGE radio access into a 3GPP. It was agreed that the work should be based on the following key assumptions:

- Any proposed new 3GPP work items should have no negative impact on current Release 99/Release 4 schedules, resources and funding.
- Only those parties within 3GPP interested in contributing to 3GPP developments in the area of GSM/EDGE radio access will be required to resource and fund this specific activity.

The ad-hoc group, which was lead by a member of the T1 delegation to 3GPP, meet three times in order to elaborate on a detailed report covering the concerns, potential advantages and disadvantages of the transfer, and the proposal for how the transfer could be performed, in terms of organization, funding, timing, etc. At the final meeting of the ad-hoc group in late March 2000 in Tokyo the report of the ad-hoc group was completed and contained the following proposals:

- A new TSG should be created – TSG GERAN – into which essentially all current SMG2 work would be moved.
- The work of SMG7 would be moved into the proposed TSG GERAN.
- The generic operations and maintenance work of SMG 6 would be transferred to 3GPP TSG SA WG5, while radio-specific GERAN work in SMG 6 would be transferred into the proposed TSG GERAN.
- The work of SMG9 that is specific to GSM and 3GPP systems would be transferred into 3GPP T3.
- The other ETSI SMG groups already have direct SMG-3GPP correlation, and the corresponding groups are already meeting in parallel or at least in close collaboration. Therefore this proposal recommends the formal transfer of this work.

This proposal from the ad-hoc group was accepted by all the partners in 3GPP at the PCG and OP meetings in July 2000 in Beijing. At these meetings also the corresponding modifications to the 3GPP working procedures, project description, and partnership agreement was approved. At this meeting, terms of references for TSG GERAN was approved and I was appointed convener for TSG GERAN with the task of convening the first meetings of TSG GERAN.

TSG GERAN held its first meeting in Seattle at the end of August 2000 on the days originally planned for the meeting of ETSI SMG2, which held its last meeting in late May 2000. With the transfer of the remaining GSM work from ETSI to 3GPP, the first part of the GSM era in standardization had finished and the forming of 3GPP completed.

The transfer of the GSM/EDGE radio activities to 3GPP went without any major problems and without causing any delays to ongoing GSM/EDGE or UMTS activities. The work in TSG GERAN is now focusing on upgrading the GSM/EDGE radio access network to support the Iu interface as defined for UMTS, as well as supporting the IP multimedia subsystem. This is in order to allow full independence for the core network from the type of radio access network used, being either UTRAN or GERAN. This of course only as long as the required

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As a part of the decision of transferring the remaining GSM activities into 3GPP it was agreed to perform an organizational review in a 6 month time frame after the transfer. This review was performed during early 2001 and at the PCG meeting in April 2001 it was as a result of this review concluded, that there was no need for changes to the 3GPP organizations. It was further noted that the current organization of 3GPP had been able to evolve and handle the changes and challenges appearing.

In all, 3GPP is now a mature organization able to continue the good work and the co-operative spirit, which was always the trademark of the GSM/SMG group.

Annex 2: Organisation Evolution of the Technical Groups

Section 3: 3GPP

Adrian Scrase¹

A2.3.1 December 1998 to Mid-1999

During the preparatory talks that led to the creation of 3GPP, many discussions took place to find the optimum organizational structure. The ETSI TC SMG model had worked well for many years and it was very tempting to adopt a similar structure and just widen the sphere of participation. However, some voices called for a more radical approach in order to streamline the structure and to reduce the time taken for specifications production. As a result of these discussions, the following key principles were established on which 3GPP was structured:

- Minimum number of hierarchical levels;
- Large degree of distributed autonomy;
- Clear separation of technical activities from political and administrative activities.

When 3GPP was created, four Technical Specification Groups (TSGs) were formed to undertake the preparation of technical specifications. The four TSGs were as follows:

- TSG CN – core network
- TSG RAN – radio access network
- TSG SA – services and system aspects
- TSG T – terminals

Each of the TSGs was authorized to develop and approve specifications and reports within its terms of reference. This represented a departure from the more traditional approach where a single entity (i.e. a plenary) within a project has the authority to approve a project's output. It was believed that by distributing the approval authority, the time taken to produce specifications would be reduced since this effectively removes one level of hierarchy from the approval procedure. However, it was apparent from the outset that distributing the approval of specifications would lead to a greater requirement for technical co-ordination and thus TSG SA was tasked to perform a co-ordination role across all TSGs. This co-ordination role

¹ The views expressed in this section are those of the author and do not necessarily reflect the views of his affiliation entity.

has been aided by the collocation of the TSG meetings and by concerted efforts from the industrial members within 3GPP.

On the creation of 3GPP, a large amount of the work previously undertaken by ETSI TC SMG was transferred to the four TSGs. It was important for all involved to track the transfer of work carefully and meticulous care was taken to map the work from its old home in SMG to its new home in the 3GPP TSGs. This mapping information was made openly available on the 3GPP and ETSI websites to ensure that the telecommunications community could, as a whole, follow the work. This transfer of work was a form of "soft handover", with groups existing in parallel within SMG and within 3GPP for a period of time and items of work being transferred at the most appropriate point. The complete transfer of work was achieved within a period of 6 months.

The scope of 3GPP had been a subject of much debate and at the time of creation the scope covered the 3G system incorporating the UTRA radio access technology. This implied that not all of the work that existed within ETSI TC SMG was to be transferred to 3GPP. There remained a lot of work to be done for the evolving GSM radio interface (i.e. GPRS and EDGE) and this work would remain within SMG for the time being. In addition, the generic work relating to IC cards did not belong in 3GPP either and this too remained within ETSI TC SMG. SMG also retained the responsibility for European issues relating to both 2G and 3G, particularly for regulatory matters, and was also responsible for the transposition of 3GPP specifications into ETSI deliverables.

3GPP had no responsibility for the long-term evolution of the 3G system nor any responsibility for the fixed access component of UMTS. An ETSI project was therefore created (EP UMTS) to take care of these aspects.

A2.3.2 Mid-1999 to Mid-2000

3GPP was an entirely new concept and the first few months of operation were, in effect, experimental. However, in a very short time the project proved to be successful, and the industrial members gained confidence in the new method of working. The preparation of the first release of specifications proceeded at an alarming speed with more than 300 specifications being completed within the first year of operation. At the same time, the development of GPRS and EDGE continued within the ETSI TC SMG environment with active participation from North America. It was not long before serious consideration was to be given to the transfer of all remaining work and the closure of ETSI TC SMG.

An ad-hoc group was created within 3GPP in January 2000 to give full consideration to the widening of the 3GPP scope, particularly to include GPRS and EDGE. It was clear that not all 3GPP partners had a commercial interest in GPRS and EDGE and assurances were required that the ongoing UTRA based activities would not be unduly delayed by such a change in the 3GPP scope. By July 2000 the necessary agreements had been obtained by each 3GPP partner and the scope of 3GPP was formally changed to include the development and maintenance of GSM specifications, including the GSM evolved radio access technologies (such as the General Packet Radio Service (GPRS) and Enhanced Data Rates for GSM Evolution (EDGE)). This was achieved by the creation of a new TSG called TSG GERAN – GSM/EDGE Radio Access Network.

The scope of 3GPP was also modified to make clear that the responsibility for the long-

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term evolution of the 3G system was vested there. This enabled the ETSI group EP UMTS to be closed, thus focusing efforts firmly within 3GPP.

With the transfer of GSM into 3GPP it was a natural progression for ETSI TC SMG to be closed. However, ETSI still had the important task of transposing the 3GPP results into ETSI deliverables and the preparation of harmonised standards required to meet European regulations. This activity was not expected to be particularly onerous but it was nevertheless of high importance for the European industry. To accommodate this work, the ETSI TC Mobile Standards Group (TC MSG) was created.

The only remaining activity to be accommodated was the generic activity pertaining to IC cards. ETSI had earned a high reputation for this work and since it was not specific to mobile telecommunications systems it was not appropriate for this to be placed within 3GPP. This led to the creation of an ETSI project later to be called Smart Card Platform (EP SCP).

A2.3.3 Mid-2000 Onwards

By mid-2000 the focus of attention was now clearly on 3GPP where all UTRA based and GSM radio based activities were now taking place within five TSGs. The European regulatory interests were being taken care of by ETSI TC MSG, and the generic IC card activities by EP SCP. (The former TC SMG and EP UMTS had been closed by this time).

Within Europe, interest had been shown by the railway community to adapt the GSM system and to use it as the basis for a European railway telecommunications system. This work had progressed well within the former ETSI TC SMG with much of the work having been completed before its closure. The systems were now close to deployment and it was desirable to have a permanent home for these activities. This led to the creation of a new ETSI Project called Railway Telecommunications (EP RT).

By late 2000, 3GPP had grown used to having five TSGs and had gained some experience of operating with its expanded scope. Part of the agreement reached for the expansion of the scope was that a review should be held after 6 months of operation to ensure that the best organizational structure had been found. At the time of writing that review had just begun.

A3.3 List of the Chairpersons in T1P1 and JTC²

Group	Name	Terms of Office Start	Terms of Office End
T1P1			
T1P1 chairs	Mel Woinsky	February 1994	February 1998
	Asok Chatterjee	February 1998	Expires February 2002
T1P1 vice-chairs	Mel Woinsky	February 1991	February 1994
	Jim Papadoupilis	February 1994	February 1996
	Stephen Hayes	February 1996	June 1996
	Asok Chatterjee	June 1996	February 1998
	Mark Younge	February 1998	Expires February 2002
T1P1 working groups			
T1P1.4 chair	Ed Ehrlich	April 1995	July 1996
T1P1.5 chair	Ed Ehrlich	February 1996	February 2000
T1P1.5 vice-chair	Quent Cassen	February 1996	February 1998
	Don Zelmer	February 1998	February 2000
JTC			
Co-chairs	Gary Jones	February 1993	July 1996
	Charles Cook	February 1993	April 1995
	Ed Ehrlich	April 1995	July 1996

A3.4 Officials of 3GPP³

TSG/WG	Position	Name	Start date	End date
CN	Convenor	Stephen Hayes	1998-12-07	1999-03-03
	Chairman	Dettner Harald	1999-03-03	2000-03-15
	Chairman	Stephen Hayes	2000-03-15	
CN 1	Convenor	Hannu Hietalahti	1998-12-07	1999-03-22
	Chairman	Hannu Hietalahti	1999-03-22	
CN 2	Convenor	Masami Yabasaki	1998-12-07	1999-03-01
	Chairman	Ian David Chalmer Park	1998-12-07	2000-03-17
	Convenor	Keiijo Palviainen	2000-03-17	2000-05-26
	Chairman	Keiijo Palviainen	2000-05-26	
CN 3	Joint	Oscar Lopez-Torres and	1998-12-07	1999-03-15
	Convenors	Norbert Klehn		
	Chairman	Norbert Klehn	1999-03-15	
CN 4	Convenor	Yun Chao Hu	2000-05-26	
	Chairman	Yun Chao Hu	1999-11-04	2000-03-17

² Editor: Don Zelmer

³ Editor: Adrian Scrase

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9-03-15

10-03-17

TSG/WG	Position	Name	Start date	End date
CN 5	Convenor	Lucas Klostermann	2000-03-17	2000-05-25
	Chairman	Lucas Klostermann	2000-05-26	
CN ITU-T	Chairman	Masami Yabusaki	2000-03-17	
	Convenor	Niels Peter Skov Andersen	2000-07-31	2001-04-02
GERAN	Chairman	Niels Peter Skov Andersen	2001-04-02	
	Convenor	Niels Peter Skov Andersen	2000-08-28	2001-04-03
GERAN 1	Chairman	Niels Peter Skov Andersen	2001-04-03	
	Convenor	Jean-Francois Minet	2000-09-04	2000-11-10
GERAN 2	Chairman	Bruno Landais	2000-11-10	
	Convenor	Ake Busin	2000-08-28	2000-11-06
GERAN 3	Chairman	Ake Busin	2000-11-06	
	Convenor	Jean Marc Recouvreux	2000-08-28	2000-11-22
GERAN 4	Chairman	Jean-Marc Recouvreux	2000-11-23	
	Convenor	Akio Sasaki	1998-12-07	1999-03-01
RAN	Chairman	Yukitsuna Furuya	1999-03-01	2001-03-13
	Chairman	Francois Courau	2001-03-13	
RAN 1	Convenor	Yukitsuna Furuya	1998-12-07	1999-02-22
	Chairman	Antti Toskala	1999-02-22	
RAN 2	Convenor	Denis Fauconnier	1998-12-07	1999-03-08
	Chairman	Denis Fauconnier	1999-03-09	
RAN 3	Convenor	Per Willars	1998-12-07	1999-04-26
	Chairman	Per Willars	1999-04-26	2001-02-26
RAN 4	Chairman	Martin Israelsson	2001-02-26	
	Convenor	Howard Benn	1998-12-07	1999-02-15
SA	Chairman	Howard Benn	1999-02-15	
	Convenor	Fred Harrison	1998-12-07	1999-03-01
SA 1	Chairman	Niels Peter Skov Andersen	1999-03-01	
	Convenor	Alan Cox	1998-12-07	1999-03-10
SA 2	Chairman	Alan Cox	1999-03-10	2001-02-08
	Chairman	Kevin Holley	2001-02-08	
SA 3	Convenor	Yukio Hiramatsu	1998-12-07	1999-03-01
	Chairman	Teuvo Jarvela	1999-03-01	2001-02-26
SA 4	Chairman	Mikko Puuskari	2001-02-26	
	Convenor	Michael Walker	1998-12-07	1999-03-27
SA 5	Chairman	Michael Walker	1999-03-27	
	Convenor	Kari Järvinen	1998-12-07	1999-03-01
T	Chairman	Alain Ohana	1999-03-01	2000-06-28
	Chairman	Kari Järvinen	2000-06-28	
T	Convenor	Inaki Cabrera	1998-12-07	1999-03-01
	Chairman	Albert Yuhan	1999-03-01	
T	Convenor	Sang Keun Park	1998-12-07	1999-03-01
	Chairman	Sang Keun Park	1999-03-01	

TSG/WG	Position	Name	Start date	End date
T 1	Convenor	Remi Thomas	1998-12-07	1999-03-01
	Chairman	Bjarke Nielsen	1999-03-01	
T 2	Convenor	Kevin Holley	1998-12-07	1999-03-01
	Chairman	Kevin Holley	1999-03-01	
T 3	Convenor	Klaus Vedder	1998-12-07	1999-03-01
	Chairman	Klaus Vedder	1999-03-01	
PCG	Chairman	Karl Heinz Rosenbrock	1999-03-04	2000-12-31
	Chairman	Akio Sasaki	2001-01-01	

A3.5 List of the Chairpersons in the GSM MoU Group/Association and GSM Association⁴

Name	Start date	End Date
Armin Silberhorn	September 1987	March 1988
Philippe Dupuis	March 1988	September 1988
Renzo Failli	September 1988	March 1989
Ted Beddoes	March 1989	September 1989
Gunnar Fremin	September 1989	March 1990
Dick Hoefsloot	March 1990	September 1990
Petter Blikrud	September 1990	March 1991
Miguel Menchen	March 1991	September 1991
Arne Foxman	September 1991	March 1992
Kari Martinen	March 1992	March 1993
George Schmitt	March 1993	March 1994
Bruno Massiet du Biest	March 1994	March 1995
Mike Short	March 1995	March 1996
Gretel Holcomb Hoffman	March 1996	March 1997
Adriana Nugter	March 1997	April 1998
Richard Midgett	May 1998	April 1999
Michael Stocks	May 1999	April 2000
Jim Healy	May 2000	April 2001
Scott Fox	May 2001	April 2002

⁴ Editor: Friedhelm Hillebrand.

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Appendix C

Third Generation Partnership Project

3GPP

Working Procedures

7 July 1999

Foreword

These Working Procedures of the Third Generation Partnership Project (3GPP) are effective from 7 July 1999.

An electronic version of these Partnership Project Working Procedures is available from the following address:

<http://www.3gpp.org>

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SECTION A: GENERAL

Article 1: Description

The Partnership Project is not a legal entity but is a collaborative activity between the following recognized Standards Development Organizations:

ARIB (Japan)
CWTS (China)
ETSI (Europe)
T1 (US)
TTA (Korea)
TTC (Japan)

The Partnership Project is entitled the “THIRD GENERATION PARTNERSHIP PROJECT” and may be known by the

Article 2: Purpose

The purpose of 3GPP is to prepare, approve and maintain globally applicable Technical Specifications and Technical Reports for a 3rd Generation Mobile System based on the evolved GSM core network, and the Universal Terrestrial Radio Access (UTRA), to be transposed by the Organizational Partners into appropriate deliverables (e.g., standards).

Article 3: Scope and objectives

The 3rd Generation Mobile System and its capabilities shall be developed in a phased approach. Initially, 3GPP shall prepare, approve and maintain the necessary set of Technical Specifications and Technical Reports for the first phase of a 3rd Generation Mobile System including:

- UTRAN (including UTRA; W-CDMA in Frequency Division Duplex (FDD) mode and TD-CDMA in Time Division Duplex (TDD) mode);
- 3GPP Core Network (Third Generation networking capabilities evolved from GSM . These capabilities include mobility management and global roaming);
- Terminals for access to the above (including specifications for a UIM);
- Service and system aspects.

The Technical Specifications and Technical Reports shall be developed in view of global roaming and circulation of terminals.

The set of 3GPP Technical Specifications and Technical Reports for the first phase of the 3GPP core network and the specifications for the GSM core network should be common to the greatest extent possible and should not be unnecessarily different.

The results of the 3GPP work may form the basis of member contributions to the ITU in accordance with existing procedures.

3GPP shall take account of emerging ITU recommendations on interworking between IMT-2000 family members.

In the framework of agreed relationships, 3GPP shall prepare Technical Specifications and Technical Reports that are intended to form the basis of standards, or parts of standards, of the Organizational Partners.

SECTION B: PARTICIPATION

Article 4: Categories

Participation in 3GPP shall be classified into one of the following categories:

- Partners;
- Individual Members.
- Observers and Guests

Article 5: Partnership

Partners in 3GPP shall be classified into one of the following two categories:

- Organizational Partners;
- Market Representation Partners.

Article 6: Organizational Partnership

Organizational Partnership is open to any Standards Organization, irrespective of its geographical location, which has:

- a national, regional or other officially recognized status and the capability and authority to define, publish and set standards within the 3GPP scope, in that nation or region;
- an Intellectual Property Rights (IPR) Policy which is compatible with those of the Organizational Partners;
- committed itself to all or part of the 3GPP scope;
- signed the Partnership Project Agreement.

Standards Organizations may apply to become an Organizational Partner by writing to any of the existing Organizational Partners.

Article 7: Market Representation Partnership

The Organizational Partners may invite Market Representation Partners to take part in 3GPP.

An invitation for Market Representation Partnership is open to any organization, irrespective of its geographical location, which:

- has the ability to offer market advice to 3GPP and to bring into 3GPP a consensus view of market requirements (e.g. services, features and functionality) falling within the 3GPP scope;
- does not have the capability and authority to define, publish and set standards within the 3GPP scope, nationally or regionally;
- has committed itself to all or part of the 3GPP scope;
- has signed the Partnership Project Agreement.

Organizations may apply to become Market Representation Partners by writing to any of the existing Partners.

Article 8: Individual Membership

Membership in an Organizational Partner is a pre-requisite for Individual Membership of 3GPP. All entities registered as members of an Organizational Partner and eligible for participation in the technical work of that Organizational Partner, can become Individual Members of 3GPP if they are committed to support 3GPP and:

- to contribute technically or otherwise to one or more of the Technical Specification Groups within the 3GPP scope;
- to use the 3GPP results to the extent feasible.

An Individual Member has the right to participate in the work of 3GPP by attending meetings of the Technical Specification Groups and subtending groups.

Applications for Individual Membership of a Technical Specification Group shall be made in writing to the relevant Organizational Partner using the form given at **Annex C**.

Individual Members act in 3GPP in their own right and carry the full responsibility for their contributions.

Article 9: Termination of Individual Membership

Individual Membership of 3GPP may be terminated by dissolution, abolition, resignation or expulsion from the related Organizational Partner.

Article 10: Observership and Guests

The status of Observer may be granted by the Organizational Partners to an entity which has the qualifications to become a future Partner.

An Observer may send a single representative to an Organizational Partners or PCG meeting. An Observer may also have representatives at TSG meetings. Representatives of Observers may participate in discussions, receive and contribute documents but may not take part in decision making or hold any leadership positions.

Additional participation rights of an Observer shall be decided by the Organizational Partners on a case-by-case basis.

The status of Guest may be granted for a limited period, by the Organizational Partners to an entity which has the qualifications to become a future Individual Member. The limited period shall be decided by the Organizational Partners on a case-by-case basis.

A Guest may have representatives at TSG and subtending group meetings. Representatives may participate in discussions, receive and contribute documents but may not take part in decision making or hold any leadership positions.

SECTION C: STRUCTURE

Article 11: Structure of 3GPP

3GPP shall consist of a Project Co-ordination Group (PCG) and Technical Specification Groups (TSGs). The Technical Specification Groups may establish Working Groups if required.

The Organizational Partners may decide to call a meeting of the full 3GPP membership if required.

SECTION D: PARTNERS' COLLECTIVE RESPONSIBILITIES

Article 12: Organizational Partners' Collective Responsibilities

The Organizational Partners shall determine the general policy and strategy of 3GPP.

In addition the Organizational Partners shall perform the following tasks:

- approval and maintenance of the 3GPP scope;
- maintenance the Partnership Project Description
- taking decisions on the creation or cessation of Technical Specification Groups, and approving their scope and terms of reference;
- approval of Organizational Partner funding requirements;
- allocation of human and financial resources provided by the Organizational Partners to the Project Co-ordination Group;
- acting as a body of appeal on procedural matters referred to them.

Article 13: Collective responsibilities of all Partners

Organizational Partners and Market Representation Partners shall perform the following tasks:

- maintenance of the Partnership Project Agreement
- approval of applications for 3GPP partnership;
- taking decisions relating to the dissolution of 3GPP.

SECTION E: PROJECT CO-ORDINATION GROUP (PCG)

Article 14: PCG tasks

The PCG shall perform the following tasks:

- appointment of PCG Chairman and Vice Chairmen;
- allocation of human and financial resources provided by Organizational Partners to TSGs;
- allocation of voluntary human and financial resources provided by Market Representation Partners and Individual Members;
- management of the 3GPP Support Team;
- handling of appeals from Individual Members on procedural matters referred to them;
- propose and approve modifications to the Partnership Project Working Procedures
- handling of appeals from Individual Members on technical matters referred to them;

- determination of the overall time frame and manage overall work progress;
- final adoption of new and stopped work items proposed by the TSGs within the agreed 3GPP scope and objectives;
- when a work item is outside the scope of the 3GPP, and where a common global solution is desired, recommend how to achieve a global solution;
- appointment or dismissal of TSG Chairmen and Vice-Chairmen, as proposed by TSGs based on election results. (The proposed candidate shall be appointed unless there are extraordinary reasons that prevent such an appointment, e.g., severe company or geographical imbalance within 3GPP. In such cases the TSG shall be requested to elect an alternative candidate. The decision not to appoint a candidate shall be made by consensus.);
- authorizing requests from the TSGs for approval to liaise with external organizations, and maintain a list of approved requests
- maintenance of the register of Individual Members eligible to participate in 3GPP;
- maintenance of the register of IPR declarations relevant to 3GPP, received by the Organizational Partners;

The PCG may decide to call a meeting of the full 3GPP membership if required.

Article 15: PCG participation

The following shall have a right to participate in the PCG:

- Three representatives of each Organizational Partner;
- Three representatives of each Market Representation Partner;
- The Chairmen and Vice Chairmen of the TSGs as ex-officio members.
- One representative of each Observer

Article 16: PCG appointment of Chairman and Vice Chairman

The PCG shall appoint their Chairman and Vice Chairmen from amongst the Organizational Partner representatives.

The Chairman and Vice Chairmen shall be appointed for a one year term of office.

The Chairman and Vice Chairmen shall normally serve one term of office. If no other candidates are available, the Chairman or Vice Chairmen may be appointed for a further term.

Successive Chairmen and Vice Chairmen should not be from the same Organizational Partner, the same region or from the same group of companies, unless no other candidate is available.

Article 17: PCG Chairman Responsibilities

The PCG Chairman is responsible for the overall management of the co-ordination work within 3GPP.

The Chairman has the overall responsibility to ensure that the Partnership Project Agreement, Partnership Project Description and Partnership Project Working Procedures are followed.

The Chairman may nominate officials to assist in the work.

The Chairman may be assisted by the Support Team.

The Chairman may delegate tasks to the Vice Chairmen.

In performing his tasks, the Chairman and Vice Chairmen shall maintain strict impartiality and act in the interest of the 3GPP.

Article 18: PCG meetings

A meeting of the PCG shall be held at least twice per year.

At least thirty days before the due date, a calling notice, draft agenda and supporting documents shall be issued.

Article 19: PCG decision making

In any meeting of the PCG, the quorum required for decision making shall be 50% of the total number of Organizational Partners. Proxies shall not be permitted.

The PCG shall endeavour to reach consensus on all issues. The views and opinions of the Market Representation Partners and the Chairmen and Vice Chairmen of the TSGs shall be taken into account during the consensus building process. If consensus cannot be achieved, the Chairman can decide to take a vote. The vote may exceptionally be performed by a secret ballot if decided by the PCG.

Each Organizational Partner shall have one vote. A proposal shall be deemed to be approved if 71% of the votes cast are in favour. Abstentions or failure to submit a vote shall not be included in determining the number of votes cast.

SECTION F: TECHNICAL SPECIFICATION GROUPS

Article 20: TSG tasks

The TSGs shall prepare, approve and maintain the 3GPP Technical Specifications and Technical Reports.

The TSGs shall also perform the following tasks:

- Propose to the PCG for appointment TSG Chairman and Vice Chairmen based on election results;
- Creation of TSG Working Groups and approval of their terms of reference;
- When a new Working Group is created, the appointment of TSG Working Group Convenor ;
- Allocation of resources within the TSG;
- Allocation of voluntary human and financial resources provided by Market Representation Partners and Individual Members;
- Handling of appeals from Individual Members on technical matters;
- Preparation of a detailed time frame and management of detailed work progress;
- Management of work items;
- Technical Co-ordination;
- Proposal and approval of work items within the agreed scope and terms of reference of the TSG.
- Where a work item is outside the scope of the 3GPP, but a common global solution is desired, recommend an approach to the PCG;

- Assignment of work to Partners. (Specification development may be accomplished using various methods, including the assignment of work to Partners.)
 - Maintenance of the list of Individual Members eligible to vote within the TSG (Voting Members).
-

Article 21: TSG participation

The following shall have a right to participate in the TSGs:

- Representatives of members of participating Organizational Partners (i.e. Individual Members);
 - Representatives of Organizational Partners
 - Representatives of Market Representation Partners.
 - Representatives of Observers and Guests
-

Article 22: TSG and WG election of Chairman and Vice Chairman

The TSG Chairman and Vice Chairmen, to be proposed to the PCG for appointment, shall be elected by the Technical Specification Group from amongst the Individual Member representatives. Each TSG shall elect a maximum of two Vice Chairmen.

The Working Group Chairman and Vice Chairmen shall be elected by the Working Group from amongst the Individual Member representatives. Each Working Group shall elect a maximum of two Vice Chairmen.

A candidate for TSG or Working Group election shall provide a letter of support from his Organization and nominations may be made up to the point when an election takes place.

The TSG Chairman and Vice-Chairmen shall be appointed by the PCG on the proposal of the TSG.

The Chairman and the Vice-Chairmen shall be appointed for a two year term of office. The Chairman and Vice-Chairmen may be appointed for one further consecutive term. If no other candidates are available, the Chairman or Vice Chairmen may be appointed for a further term.

Chairman and Vice Chairmen should not be from the same region, Organizational Partner, or from the same group of companies, unless no other candidate is available.

Successive Chairmen should not be from the same Organizational Partner, the same region or from the same group of companies, unless no other candidate is available

When a new TSG is established, the Organizational Partners shall appoint a convenor for the first two TSG meetings. The initial election for TSG Chairman and Vice Chairmen shall take place at the second TSG meeting.

When a new TSG Working Group is established, the TSG shall appoint a Convenor for the first two Working Group meetings. The initial election for Working Group Chairman and Vice Chairmen shall take place at the second Working Group meeting.

Article 23: TSG Chairman responsibilities

The TSG Chairman is responsible for the overall management of the technical work within the TSG and its Working Groups. The Chairman has an overall responsibility to ensure that the activities of the TSG follow the Partnership Project Working Procedures.

The Chairman may nominate officials to assist in the work.

The Chairman may delegate tasks to the Vice Chairmen.

The Chairman may be assisted by the Support Team.

Recognizing the need to balance the requirement of rapid specification development with the limited resources of participants, the Chairman should encourage a minimum number of meetings, especially parallel meetings, and maximize the use of electronic means to advance the work.

In performing TSG tasks, the Chairman shall maintain strict impartiality and act in the interest of 3GPP.

Article 24: TSG and WG Chairman and Vice Chairmen dismissal

A secret ballot shall be taken for the proposal to dismiss a TSG or WG Chairman or Vice-Chairman because of a failure to effectively perform their duties, if requested by 30% of the TSG or WG membership list. 71% of the votes cast are required to recommend dismissal.

The PCG shall dismiss a Chairman or Vice Chairman on the proposal of the TSG.

Article 25: TSG and WG decision making

TSGs and WGs shall endeavour to reach consensus on all issues, including decisions on Technical Specifications and Technical Reports. If consensus cannot be achieved, the Chairman can decide to take a vote. The vote may exceptionally be performed by a secret ballot if decided by the TSG or WG. A vote may be conducted during a TSG or WG meeting or by correspondence.

A proposal shall be deemed to be approved if 71% of the votes cast are in favour. Abstentions or failure to submit a vote shall not be included in determining the number of votes cast.

It is the responsibility of the Chairman to ensure that questions to be voted upon are phrased in a positive yes/no manner, with 71% required to approve the question. Questions should not be phrased as the TSG shall not do something. Examples of appropriate questions are; Shall the TSG approve the Specification and send it to the SDOs? Shall the liaison be approved? Shall the new WI be approved? Shall the existing WI be stopped? If the issue is to choose option A or B, the question should be split into two questions, with the Chairman selecting the order. First, shall the TSG take option A as the way forward? If this question fails the second question is, shall the TSG take option B as the way forward?

Contributions on which decisions will be based should be made available in good time before each meeting. TSGs may establish informal guidelines for dealing with late contributions.

Article 26: TSG and WG voting during a meeting

The following procedures apply for voting during a TSG or WG meeting:

- before voting, a clear definition of the issues shall be provided by the Chairman;
- Voting Members shall only be entitled to one vote;
- if an Voting Member has more than one representative present, only one representative may vote;
- each Voting Member may only cast the vote once;
- each Voting Member may carry proxy votes for up to five other Voting Members. All proxy votes shall be accompanied by a letter of authority from the authorising Voting Member. Proxies will not be taken into account when determining the quorum;
- the quorum required for voting during a TSG or WG meeting shall be 30% of the total number of Voting Member companies on the TSG or WG membership list;
- the result of the vote shall be recorded in the meeting report.

Article 27: TSG or WG voting by correspondence

The following procedures apply for voting by correspondence:

- before voting, a clear definition of the issues shall be provided by the Chairman and disseminated to all on the TSG or WG membership list;
- Voting Members shall only be entitled to one vote;
- each Voting Member may only cast the vote once within the voting period;
- the voting period shall be 30 days;
- there are no quorum requirements;
- The result of the vote should be disseminated to everybody on the TSG or WG active participants list.

Article 28: TSG or WG voting for the election of TSG or WG Chairman and Vice-Chairman

In the case where there is more than one candidate for TSG or WG Chairman or Vice-Chairman, a secret ballot shall be used. For interpreting the result of the secret ballot the following procedure shall apply:

When, in the first ballot, no candidate has obtained 71% of the votes cast, a second ballot shall be held. In the second ballot, in cases where there are only two candidates, the candidate obtaining the higher number of votes is elected. In cases where there are more than two candidates, if none of them has obtained 71% of the votes, a third and final ballot shall be held among the two candidates who have obtained the highest number of votes in the second ballot. The candidate obtaining the higher number of votes in the third ballot is then elected.

The TSG or WG Chairman shall be responsible for the voting process and shall ensure that confidentiality is maintained.

Article 29: TSG or WG Chairman's decision appeal process

An Individual Member of 3GPP who opposes a Chairman's ruling on a vote taken within a TSG or WG may submit its case to the PCG for decision. In such cases the Individual Member shall also inform the relevant TSG or WG Chairman.

When a TSG or WG Chairman has made a ruling, his decision shall be taken as the basis for future operations, unless or until overturned by the PCG.

Article 30: TSG and WG meetings

TSGs and WGs shall meet as necessary to complete their work within the prescribed timeframe. TSGs should endeavour to hold their meetings at the same time and place to assist in the overall co-ordination of the work.

Meeting locations should reflect the geographical diversity of the TSG and WG participants.

Article 31: TSG and WG meeting invitation

The invitation to a TSG or WG meeting and the necessary logistical information shall be disseminated at least 21 days before the meeting to all on the TSG or WG membership list.

Article 32: TSG and WG meeting agenda

The draft agenda for a TSG or WG meeting shall be disseminated by the responsible Chairman to all on the TSG or WG membership list at least 21 days before a meeting. The draft agenda should indicate subject matters where voting may be required.

Article 33: TSG and WG meeting registration

Every attendee shall register on arrival at each TSG or WG meeting. Each attendee who represents an Individual Member shall declare the precise name of that Individual Member. An attendee may only register to represent one Individual Member. This information shall be used for the preparation of voting forms.

Article 34: TSG and WG meeting document and file naming

Documents for a TSG or WG meeting shall follow a consistent numbering system as shown in the following example:

3GPP/TSGx.m#y(nn)-zzz

This numbering system has four logical elements:

- 1) **3GPP**: to indicate that it is a 3GPP document;
- 2) **/TSGx**: the name of the TSG;
 where x : **R** (Radio Access Network)
 N (Core Network)
 S (Service and System Aspects)
 T (Terminals)
- 3) **m** Working Group identity (if required)
- 4) **#y**: TSG or WG meeting number
- 5) **(nn)**: to indicate the year, e.g. (99);
- 6) **zzz**: unique number of the document or its status, etc.

Electronic document files shall follow an 8+3 naming convention as follows:

Gxmnnzzz.ext

This numbering system has four logical elements:

- 1) **/Gx**: the name of the *TSG* Group;
 where x : **R** (Radio Access Network)
 N (Core Network)
 S (Service and System Aspects)
 T (Terminals)
- 2) **m** Working Group identity (if required)
- 3) **nn**: to indicate the year, e.g. (98);

- 4) **zzz:** unique number of the document or its status, etc.
- 5) **.ext:** file type extension e.g. pdf, rtf

No provision is made for the use of revision numbers. Documents which are a revision of a previous version should indicate the document number of that previous version.

Article 35: TSG and WG Participant and Membership List

Each TSG shall maintain a list of active participants and voting members. To qualify for either list it is necessary to attend TSG or WG meetings. Individuals who fail to attend three consecutive meetings of a TSG or WG without justification shall be removed from the active participants list. A member or company (or agency) which is not represented at three consecutive meetings of the TSG or WG without justification shall be removed from the voting members list. In either case, those removed shall be re-instated after attending one meeting. The right to vote is reinstated at the next meeting attended.

The active participants list shall be used for document distribution. The voting member list shall be used to establish quorum and for determining those eligible to take part in a vote.

Voting members shall designate a Principal and Alternate individual for document distribution and voting. Either of these individuals may designate a replacement in writing to represent them. This is not considered a proxy if the person designated registers as representing the same Individual Member.

Any group that wants to call an electronic meeting (audio, video, document distribution by posting or e-mail, etc) may do so, although this works best with smaller groups. Therefore, all electronic meetings are allowed and count towards attendance. However, if a meeting is designated as face-to-face, provision of bridge and speakerphone capabilities for those requesting it would be at the discretion of the host. Also, in this case for those only participating by speakerphone they would not be counted toward quorum, attendance or allowed to vote (TSG, WG).

Article 36: TSG Sub Working Groups

A Working Group may establish a Sub Working Group (SWG) with defined Terms of Reference. The Working Group shall appoint a SWG Chairman. The SWG shall work by consensus. The meeting notice requirements for a SWG meeting are the same as for TSGs and WGs.

SECTION G: WORK PROGRAMME AND TECHNICAL CO-ORDINATION

Article 37: Work Programme

The 3GPP Work Programme shall consist of Work Items defined by the TSGs.

Article 38: Work Items

A 3GPP Work Item is a specification task defined in terms of the following principle parameters:

- title;
- intended output (ie Technical Specifications or Technical Reports);
- impact on other Technical Specifications and Technical Reports;

- technical scope, including the field of application of the intended output;
 - impact on other 3GPP Work Items;
 - the schedule of tasks to be performed;
 - the identities of the supporting Individual Members;
 - the identity of the Work Item Rapporteurs.
-

Article 39: Work Item creation

Each proposed new Work Item shall be supported by at least four Individual Members, and their names shall be recorded in the Work Item definition prepared for the TSG approval. One or more persons shall be named as Rapporteur for the proposed Work Item, and the Rapporteur shall act as the prime contact point on technical matters and for information on progress throughout the drafting phases. The supporting Individual Members are expected to contribute to and progress the new work item throughout the drafting phases.

In addition to the above, TSGs shall approve new Work Items, giving all essential parameters. The proposal shall be entered into the 3GPP work programme, clearly marked as a new entry, for which a unique reference identity shall be allocated.

Article 40: Work Item adoption by PCG

The 3GPP work programme shall be made available to all Individual Members. A new Work Item shall remain flagged as "new" until the end of the month following the month during which the 3GPP work item was entered into the 3GPP work programme. A new Work Item shall be adopted by the PCG unless a substantial objection is received from an Individual Member or Partner during this period. At the end of the period, the "new" flag shall be removed (even if there is an objection) and it is the responsibility of any objecting Individual Member or Partner to discuss their objections with the TSG Chairman. If it is not possible to resolve the objection, it is the responsibility of the Individual Member or Partner to raise the issue with the PCG.

The TSGs shall ensure that the 3GPP Work Item details are maintained at regular intervals.

Article 41: Work Item stopping

Prior to completion of the intended 3GPP output, the responsible TSG may conclude that a Work Item is no longer required. Any Work Item shall automatically be considered by a TSG for stopping, if no progress has been achieved in a given period of time, typically one year. In such cases, the Work Item shall be flagged as "stopped" in the Work Programme. The proposal to stop a Work Item shall be fully justified.

The Work Programme shall be updated accordingly, and shall show the Work Item as "stopped" until the end of the month following the month during which the Work Item was initially flagged.

The Work Item will be stopped by the PCG unless substantial objection is received from an Individual Member during this period. It is the responsibility of any objecting Individual Member to discuss their objections with the TSG Chairman. If it is not possible to resolve the objection, it is the responsibility of the Individual Member to raise the issue with the PCG.

Article 42: Technical co-ordination

The PCG shall be responsible for determining the overall time frame and for managing the overall work progress. The System Aspects TSG shall have a particular responsibility for the technical co-ordination of work being undertaken within 3GPP, and for overall system architecture and system integrity. Problems encountered in performing this technical co-ordination role shall be reported immediately to the PCG.

SECTION H: DELIVERABLES

Article 43: Deliverable types

3GPP shall prepare, approve and maintain documents known as Technical Specifications and Technical Reports. Such documents shall be drawn up by the TSGs and shall, following approval at that level, be submitted to the participating Organizational Partners to be submitted to their respective standardization processes.

Article 44: Approval process

Approval of Technical Specifications and Technical reports by a TSG shall normally be by consensus.

Where consensus cannot be achieved in the TSG a vote may be taken.

When Technical Specifications and Technical Reports become sufficiently stable, they shall be put under change control of the relevant TSG. The further elaboration of these Technical Specifications and Technical Reports shall be achieved by change requests to be approved by the TSG.

Article 45: Drafting rules

The Technical Specifications and Technical Reports drafted by the TSGs shall follow the 3GPP drafting rules, using document processing facilities, format, languages and notations agreed by the Organizational Partners, and on a medium suited for electronic document handling and publishing.

Article 46: Copyright and ownership

The Organizational Partners will have joint ownership (including copyright) of the Technical Specifications and Technical Reports produced by 3GPP.

Article 47: Conversion by Organizational Partners

Organizational Partners shall use their best endeavours to convert the Technical Specifications and Technical Reports approved by the Partnership Project into national/regional deliverables in a timely manner through their normal processes.

The Organizational Partners are urged not to change the technical parts of the Technical Specifications and Technical Reports; they may add non-technical parts required by their own deliverable schemes and they may add descriptions of options selected.

Organizational Partners should ensure that all un-resolved comments raised during their public enquiry and approval phases are delivered to the appropriate TSG.

SECTION I: REPORTING

Article 48: Chairman's reporting obligations

A report shall be prepared by the Chairman following all PCG and TSG meetings.

Article 49: Changes to structure and officials

The Chairman of each TSG shall inform the PCG of all organizational changes concerning Working Groups and their officials. An up to date record of the 3GPP structure shall be maintained.

Article 50: Calendar of meetings

The PCG and TSGs shall maintain an up to date calendar of the dates and venues for future meetings.

SECTION J: EXTERNAL RELATIONS

Article 51: Relationship with the ITU

3GPP results should be submitted to the ITU as appropriate.

3GPP will not contribute directly to the ITU. Formal contributions to ITU Study Groups shall be made by Individual Members who are also members of the ITU. 3GPP Technical Specifications and Technical Reports may be taken as the technical content of such contributions.

Article 52: Relations with other groups

TSGs and WGs are encouraged to liaise directly with the relevant technical bodies within the 3GPP and Partners as appropriate.

A liaison statement shall clearly communicate what is expected from the receiver, i.e., which parts are for information, which questions are expected to be clarified and by whom (especially if there are multiple receivers), and also when an answer is needed, e.g., when is the next meeting of the group sending the liaison statement.

The PCG shall maintain a list, based on proposals received from the TSGs, of external organizations with whom the TSGs and subtending WGs are authorised to liaise directly. External liaisons can not be approved by SWGs or Ad Hoc groups.

The external liaison approval process is described in Annex D.

SECTION K: MISCELLANEOUS

Article 53: Resources

The resources for the operation of 3GPP shall be managed by the Organizational Partners. The resources are allocated to the TSGs by the PCG.

Article 54: Support Team

The Partners shall provide logistical support to, and assist in the operation of, 3GPP. The support shall be in the form of a Support Team which shall operate under the overall management of the PCG and the day to day management of TSGs.

Article 55: Intellectual Property Rights (IPR) Policy

Individual Members shall be bound by the IPR Policy of their respective Organizational Partner.

Individual Members should declare at the earliest opportunity, any IPRs which they believe to be essential, or potentially essential, to any work ongoing within 3GPP.

Organizational Partners should encourage their respective members to grant licences on fair, reasonable terms and conditions and on a non-discriminatory basis.

The PCG shall maintain a register of IPR declarations relevant to 3GPP, received by the Organizational Partners.

Article 56: Working language

The working language for 3GPP shall be English.

Meetings of the PCG and TSGs shall be conducted in English.

3GPP Technical Specifications and Technical Reports shall be prepared in English (as defined by the Shorter Oxford English Dictionary).

Article 57: Duration

3GPP shall be task oriented and on completion of the tasks the future of 3GPP shall be re-considered. The continuation of 3GPP shall therefore be confirmed by the Organizational Partners on an annual basis.

Article 58: Review of activities

An evaluation of the activities of 3GPP should be made by the Organizational Partners at regular intervals.

Article 59: Dissolution, winding up

In the event of a voluntary dissolution of 3GPP, the Partners shall determine the terms of liquidation by consensus. All issues shall be documented and distributed at least 30 days prior to decisions being made.

Article 60: Amendments to 3GPP Working Procedures

These Partnership Project Working Procedures may only be amended by decision taken by the PCG.

Annex A: Definitions

Attendee:	An individual taking part in a TSG/WG meeting physically or by electronic means, if not designated as a face-to-face meeting.
Consensus:	General agreement, characterized by the absence of sustained opposition to substantial issues by any important part of the concerned interest and by a process that involves seeking to take into account the views of all parties concerned and to reconcile any conflicting arguments. (Note: consensus need not imply unanimity).
Conversion:	The transformation of a 3GPP output document into an Organizational Partners deliverable following the Organizational Partners' recognized processes.
Drafting Rules:	A document approved by the Organizational Partners providing rules for the drafting of 3GPP Technical Specifications and Technical Reports.
Election:	The voting process used to identify an individual from a number of individuals.
Guest:	An entity fulfilling the criteria to become a future Individual Member, which has been granted temporary participation rights in the 3GPP
Individual Member:	A member of an Organizational Partner having participation rights within that Organizational Partner and which has registered to take part in 3GPP.
Market Representation Partner:	An Partner invited by the Organizational Partners to participate in 3GPP to offer advice and to bring into 3GPP a consensus view of market requirements.
Observer:	An Organization fulfilling the criteria to become a future Partner which has been granted temporary participation rights in the 3GPP Organizational Partner: A recognized Standards Organization which has been accepted as a Partner in 3GPP.
Partner:	An Organizational Partner or a Market Representation Partner of 3GPP.
Partnership Project Agreement:	The document signed by 3GPP Partners defining their rights and obligations.
Partnership Project Description:	A document which describes the overall structure and operation of 3GPP.
Sub Working Group	A subordinate body of a Working Group.
Support Team:	A number of persons dedicated to support 3GPP.
Technical Report:	A 3GPP output document containing mainly informative elements approved by a Technical Specification Group.
Technical Specification:	A 3GPP output document containing normative provisions approved by a Technical Specification Group.
Voting Member	An Individual Member who has voting rights within a TSG/WG.
Work Item:	The documented record of a specific technical activity of 3GPP.
Work Programme:	The documented record of the all technical activities of 3GPP.
Working Group:	A subordinate body of a Technical Specification Group.

Annex B: Abbreviations

3GPP	Third Generation Partnership Project
ARIB	Association of Radio Industries and Businesses
CDMA	Code Division Multiple Access
CWTS	China Wireless Telecommunications Standards Group
ETSI	European Telecommunications Standards Institute
FDD	Frequency Division Duplex
GSM	Global System for Mobile Communication
IMT-2000	International Mobile Telecommunication
ITU	International Telecommunication Union
PCG	Project Co-ordination Group
SWG	Sub Working Group
T1	Standards Committee T1
TDD	Time Division Duplex
TSG	Technical Specification Group
TTA	Telecommunications Technology Association
TTC	Telecommunication Technology Committee
UIM	User Identity Module
UTRA	Universal Terrestrial Radio Access
UTRAN	Universal Terrestrial Radio Access Network
W-CDMA	Wideband CDMA
WG	Working Group

Annex C: Individual member application form

APPLICATION FORM
for INDIVIDUAL MEMBERSHIP
of the THIRD GENERATION PARTNERSHIP PROJECT
Please complete this form and return it to your Organizational Partner

COMPANY NAME

Please indicate below which ORGANIZATIONAL PARTNER you are a member of

ARIB	
CWTS	
ETSI	
T1	
TTA	
TTC	

Please indicate below which Technical Specification Groups you wish to participate in:

Radio Access Network	
Core Network	
Terminals	
Service and System Aspects	

Signed by (Authorized Representative)	
Print name	
Position	
Date	
Telephone	
Fax	
Email	
Company Web site URL	

Contact persons family name	
Contact persons given name	
Job title	
Mailing address	
Telephone	
Fax	
Email	

ANNEX D: EXTERNAL LIAISON APPROVAL PROCESS

The following process shall be used in order for a TSG to gain approval to liaise with an external organization;

- TSG Chairman, or Vice-Chairman at the Chairmans direction, shall send a request to the PCG Secretary containing the following information:
 - (a) Name of Organization
 - (b) Contact information (including URL)
 - (c) Purpose of the liaison request (brief description)
 - (d) Urgency of decision-minimum 3 days (e.g. 3 days, 5 days, 2 weeks)
- PCG Secretary shall send request to the PCG exploder list giving deadline for negative comments
- Request shall be considered approved unless negative comments received
- PCG Secretary will inform PCG members and update the web page accordingly
- A TSG or any subtending Working Group may send individual liaisons to any external organization on that TSGs approved list without further PCG approval, except if the statement is considered "sensitive" by the TSG Chairman, in which case PCG clearance is needed.
- It is not necessary to have all external liaisons copied to the PCG and/or TSG SA. The liaison originating TSG should decide, at its own discretion, who should be copied. External liaisons that may have management implications such as schedules, organization, process, procedures, and policy shall be copied to the PCG, or approved by the PCG if "sensitive".

Appendix D



New Query

Selected categories:

Individual Members (all partners)

Choose csv separator :

,

 export to csv file

INDIVIDUAL MEMBERS

Organization	Country	Partner
3in (Industrial Internet Innovation Center (Shanghai) Co.,Ltd.)	CHINA	CCSA
450connect GmbH (450connect GmbH)	GERMANY	ETSI
5G WIN (5G Wireless Intelligent Networks)	ISRAEL	ETSI
7LAYERS GmbH (7LAYERS GmbH)	GERMANY	ETSI
A.S.T.R.I.D. SA/NV (A.S.T.R.I.D. SA)	BELGIUM	ETSI
ABP, NRTA (Academy of Broadcasting Planning, NRTA)	CHINA	CCSA
ABS (Academy of Broadcasting Science)	CHINA	CCSA
AccelerComm Ltd (AccelerComm Ltd)	UNITED KINGDOM	ETSI
Acer Incorporated (Acer Incorporated)	TAIWAN, PROVINCE OF CHINA	ETSI
adare GmbH (adare GmbH)	GERMANY	ETSI
Airbus (Airbus DS SLC)	FRANCE	ETSI
Airwave Solutions Limited (Airwave Solutions Limited)	UNITED KINGDOM	ETSI
albis-elcon system GermanyGmbH (albis-elcon system Germany GmbH)	GERMANY	ETSI
Alibaba (China) Group., Ltd. (Alibaba (China) Group., Ltd.)	CHINA	CCSA
Allot Ltd (Allot Ltd)	ISRAEL	ETSI
Altan Redes S.A.P.I. de C.V. (Altan Redes S.A.P.I. de C.V.)	MEXICO	ETSI
Amdocs Software Systems Ltd (Amdocs Software Systems Limited)	IRELAND	ETSI
Anemone Technology (Anemone Technology)	DENMARK	ETSI
Anritsu Corporation (ANRITSU CORPORATION)	JAPAN	ARIB
Anritsu EMEA Ltd (Anritsu EMEA Ltd)	UNITED KINGDOM	ETSI
Anterix (Anterix)	UNITED STATES	ATIS
Apple (Apple Purchase Operation management)	CHINA	CCSA

Apple (Guizhou) (Apple Technology Services (Guizhou) Ltd.)	CHINA	CCSA
Apple (UK) Limited (Apple (UK) Limited)	UNITED KINGDOM	ETSI
Apple (Ulanqab) (Apple Technology Services (Ulanqab) Ltd)	CHINA	CCSA
Apple AB (Apple AB)	SWEDEN	ETSI
Apple AB Denmark (Apple AB, filial AF Apple Aktiebolag, Sverige)	DENMARK	ETSI
Apple AB Finland (Apple AB, filial I Finland)	FINLAND	ETSI
Apple AB NUF (Apple AB NUF)	NORWAY	ETSI
Apple Advertising (Beijing) (Apple Advertising (Beijing) Ltd.)	CHINA	CCSA
Apple Benelux B.V. (Apple Benelux B.V.)	NETHERLANDS	ETSI
Apple Benelux B.V. - Belgium (Apple Benelux B.V. - Belgium Branch)	BELGIUM	ETSI
Apple Computer Trading Co. Ltd (Apple Computer Trading (Shanghai) Co., Ltd.)	CHINA	CCSA
Apple Czech s.r.o. (Apple Czech s.r.o.)	CZECH REPUBLIC	ETSI
Apple Distribution Intl Ltd (Apple Distribution International Limited)	IRELAND	ETSI
Apple Electronics (Apple Electronics Products Commerce (BeiJing) Company Limited)	CHINA	CCSA
Apple EPE (Apple EPE)	GREECE	ETSI
Apple Europe Limited (Apple Europe Limited)	UNITED KINGDOM	ETSI
Apple France (Apple France)	FRANCE	ETSI
Apple Gesellschaft m.b.H. (Apple Gesellschaft m.b.H.)	AUSTRIA	ETSI
Apple GmbH (Apple GmbH)	GERMANY	ETSI
Apple Hungary Kft. (Apple Hungary Kft.)	HUNGARY	ETSI
Apple Inc (Apple Inc)	UNITED STATES	ATIS
Apple Italia S.R.L. (Apple Italia S.R.L.)	ITALY	ETSI
Apple Lithuania UAB (Apple Lithuania UAB)	LITHUANIA	ETSI
Apple Marketing Iberia (Apple Marketing Iberia, S.A.U.)	SPAIN	ETSI
Apple Operations Europe Ltd (Apple Operations Europe Limited)	IRELAND	ETSI
Apple Poland Sp. z.o.o. (Apple Poland Sp. z.o.o.)	POLAND	ETSI
Apple Portugal (Apple Portugal)	PORTUGAL	ETSI
Apple R&D (Apple R&D)	CHINA	CCSA
Apple Solutions (Apple Solutions Consulting Services (Beijing) Company Limited)	CHINA	CCSA
Apple Switzerland AG (Apple Switzerland AG)	SWITZERLAND	ETSI
Apple Technical Services (Apple Technical Services (Shanghai) Company Limited)	CHINA	CCSA
Apple Trading (Apple Trading (Shanghai) Company Limited)	CHINA	CCSA
AQSACOM S.A.S. (AQSACOM S.A.S.)	FRANCE	ETSI

ARTICLE19 (ARTICLE19)	UNITED KINGDOM	ETSI
ASELSAN (ASELSAN Inc.)	TÜRKIYE	ETSI
Asia Pacific Telecom co. Ltd (Asia Pacific Telecom co. Ltd)	TAIWAN, PROVINCE OF CHINA	ETSI
AsialInfo (AsialInfo Technologies (China), Inc.)	CHINA	CCSA
AsialInfo Technologies Inc (AsialInfo Technologies Inc)	CHINA	ETSI
ASR (ASR Microelectronics Technology Co., Ltd)	CHINA	CCSA
ASTRI (Hong Kong Applied Science & Technology Research Institute)	HONG KONG	ETSI
Astrome Technologies Pvt Lt (Astrome Technologies Pvt Lt)	INDIA	TSDSI
ASUSTEK COMPUTER (SHANGHAI) (ASUSTEK COMPUTER (SHANGHAI) CO. LTD.)	CHINA	CCSA
AT&T (AT&T)	UNITED STATES	ATIS
AT&T GNS Belgium SPRL (AT&T Global Network Services Belgium SPRL)	BELGIUM	ETSI
ATEME (ATEME SA)	FRANCE	ETSI
Attorney-General's Department (Attorney-General's Department, Australian Government)	AUSTRALIA	ETSI
Avanti (Avanti Communications Ltd)	UNITED KINGDOM	ETSI
Azimuth (Azimuth Systems)	UNITED STATES	ETSI
BAE Systems AI Ltd (BAE Systems Applied Intelligence Limited)	UNITED KINGDOM	ETSI
Baicells Technologies Co. Ltd (Baicells Technologies Co. Ltd)	CHINA	CCSA
BankID BankAxept (BankID BankAxept AS)	NORWAY	ETSI
BBA (BMW Brilliance Automotive Ltd.)	CHINA	CCSA
BBC (BRITISH BROADCASTING CORPORATION)	UNITED KINGDOM	ETSI
B-Com (B-Com)	FRANCE	ETSI
BDBOS (Federal Agency for Public Safety Digital Radio)	GERMANY	ETSI
BeammWave AB (BeammWave AB)	SWEDEN	ETSI
Beijing Lenovo Software Ltd. (Beijing Lenovo Software Ltd.)	CHINA	CCSA
BEIJING SAMSUNG TELECOM R&D (BEIJING SAMSUNG TELECOM R&D CENTER)	CHINA	CCSA
Beijing Xiaomi Electronics (Beijing Xiaomi Electronics)	CHINA	CCSA
Beijing Xiaomi Mobile Software (Beijing Xiaomi Mobile Software Co., Ltd)	CHINA	CCSA
Beijing Xiaomi Mobile Software (Beijing Xiaomi Mobile Software Co., Ltd.)	CHINA	ETSI
Beijing Xiaomi Software Tech (Beijing Xiaomi Software Technology)	CHINA	CCSA
Bell Mobility (Bell Mobility)	CANADA	ETSI
BfV (Bundesamt für Verfassungsschutz)	GERMANY	ETSI
Bharat Electronics Limited (Bharat Electronics Limited)	INDIA	TSDSI
Bharti Airtel Limited (Bharti Airtel Limited)	INDIA	TSDSI

BIPT (BIPT - Belgian Institute for Postal services & Telecommunications)	BELGIUM	ETSI
Bittium Wireless Ltd. (Bittium Wireless Ltd.)	FINLAND	ETSI
BJTU (Beijing Jiaotong University)	CHINA	CCSA
BAK (Bundeskriminalamt)	GERMANY	ETSI
Bluetest AB (Bluetest AB)	SWEDEN	ETSI
BMF (Austrian Federal Ministry of Finance)	AUSTRIA	ETSI
BMWK (Bundesministerium für Wirtschaft und Klimaschutz)	GERMANY	ETSI
BOCRA (Botswana Communications Regulatory Authority)	BOTSWANA	ETSI
BOUYGUES Telecom (BOUYGUES Telecom)	FRANCE	ETSI
Broadcast Networks Europe (Broadcast Networks Europe)	BELGIUM	ETSI
Broadcom (EU) (Broadcom Europe Ltd)	UNITED KINGDOM	ETSI
BROADCOM CORPORATION (BROADCOM CORPORATION)	UNITED STATES	ETSI
BSI (DE) (Bundesamt für Sicherheit in der Informationstechnik)	GERMANY	ETSI
BSNL (Bharat Sanchar Nigam Limited)	INDIA	TSDSI
BT plc (British Telecommunications plc)	UNITED KINGDOM	ETSI
BTL Inc. (BTL Inc.)	CHINA	ETSI
BTPDI (Beijing Telecom Planning & Designing Institute Co.,LTD.)	CHINA	CCSA
Bull SAS (Bull SAS)	FRANCE	ETSI
BUPT (Beijing University of Posts and Telecommunications)	CHINA	CCSA
Bureau Veritas ADT (Bureau Veritas Consumer Products Services (Hong Kong) Limited, Taoyuan Branch)	TAIWAN, PROVINCE OF CHINA	ETSI
C Spire Wireless (C Spire Wireless)	UNITED STATES	ATIS
CableLabs (CableLabs)	UNITED STATES	ETSI
Cadence Design Systems Inc. (Cadence Design Systems Inc.)	UNITED STATES	ETSI
CAICT (China Academy of Information and Communications Technology)	CHINA	CCSA
CALTTA (CALTTA TECHNOLOGIES CO., LTD.)	CHINA	CCSA
Cambium Networks Limited (Cambium Networks Limited)	UNITED KINGDOM	ETSI
CAMBRIDGE CONSULTANTS LTD (CAMBRIDGE CONSULTANTS LTD)	UNITED KINGDOM	ETSI
CANON Research Centre France (CANON Research Centre France SAS)	FRANCE	ETSI
Casa Systems Inc. (Casa Systems Inc.)	UNITED STATES	ETSI
Catapult (Satellite Applications Catapult Ltd)	UNITED KINGDOM	ETSI
CATT (China Academy of Telecommunications Technology (CATT))	CHINA	ETSI
CATT (China Academy of Telecommunication Technology - (Datang Telecom Technology and Industry Group))	CHINA	CCSA
CBN (China Broadcasting Network Group Corporation Ltd.)	CHINA	CCSA

CCU (National Chung Cheng University)	TAIWAN, PROVINCE OF CHINA	ETSI
C-DAC (Centre for Development of Advanced Computing)	INDIA	TSDSI
C-DOT (C-DOT)	INDIA	TSDSI
CEA-LETI (Commissariat à l'Energie Atomique et et aux Energies Alternatives)	FRANCE	ETSI
Cellnex (Cellnex Telecom)	SPAIN	ETSI
CENC (CETC Network & Communications Group Co., Ltd.)	CHINA	CCSA
CEPRI (China Electric Power Research Institute)	CHINA	CCSA
Ceragon Networks AS (Ceragon Networks AS)	NORWAY	ETSI
CERTH (CENTRE FOR RESEARCH AND TECHNOLOGY HELLAS)	GREECE	ETSI
cetecom advanced GmbH (cetecom advanced GmbH)	GERMANY	ETSI
CEWIT (Centre of Excellence in Wireless Technology (CEWiT))	INDIA	TSDSI
Charter Communications, Inc (Charter Communications, Inc)	UNITED STATES	ATIS
Chengdu OPPO Telecommunication (Chengdu OPPO Mobile Telecommunications Corp., Ltd.)	CHINA	CCSA
CHENGDU TD TECH LTD. (CHENGDU TD TECH LTD.)	CHINA	CCSA
China Mobile (Hangzhou) Inf. (China Mobile (Hangzhou) Information Technology Co., Ltd.)	CHINA	CCSA
China Mobile (Suzhou) Software (China Mobile (Suzhou) Software Technology Co., Ltd.)	CHINA	CCSA
China Mobile Com. Corporation (China Mobile Communications Corporation (CMCC))	CHINA	CCSA
China Mobile E-Commerce Co. (China Mobile E-Commerce Co.)	CHINA	CCSA
China Mobile Group Device Co. (China Mobile Group Device Co., Ltd)	CHINA	CCSA
China Mobile International Ltd (China Mobile International Limited)	CHINA	CCSA
China Mobile M2M Company Ltd. (China Mobile M2M Company Ltd.)	CHINA	CCSA
China Southern Power Grid Co. (China Southern Power Grid Co., Ltd.)	CHINA	CCSA
China Telecom Corporation Ltd. (China Telecom Corporation Ltd.)	CHINA	CCSA
China Telecommunications (China Telecommunications Corporation)	CHINA	ETSI
China Telecommunication Corp. (China Telecommunication Corporation)	CHINA	CCSA
China Unicom (China Unicom)	CHINA	CCSA
Chinatelecom Cloud (China Telecom Cloud Technology Co., Ltd)	CHINA	CCSA
Chongqing Angying (Chongqing Angying Telecommunications Technology Corp., Ltd.)	CHINA	CCSA
Chongqing University (Chongqing University)	CHINA	CCSA
Chosun University (Chosun University)	KOREA (REPUBLIC OF)	TTA
CHTTL (Chunghwa Telecommunication Laboratories, Chunghwa Telecommunication Co.)	TAIWAN, PROVINCE OF CHINA	ETSI
CICT (China Information Communication Technologies Group Corporation)	CHINA	CCSA
CICT (China Information Communication Technologies Group)	CHINA	ETSI

CIS (Center for Internet Security)	UNITED STATES	ETSI
CISA ECD (Cybersecurity and Infrastructure Security Agency (CISA) ECD)	UNITED STATES	ATIS
Cisco Systems (Cisco Systems)	UNITED STATES	ATIS
Cisco Systems Belgium (Cisco Systems Belgium)	BELGIUM	ETSI
Cisco Systems France (Cisco Systems France)	FRANCE	ETSI
Cisco Systems India Pvt. Ltd. (Cisco Systems India Pvt. Ltd.)	INDIA	TSDSI
CITC (CHINA INFORMATION TECHNOLOGY DESIGNING&CONSULTING INSTITUTE CO.,LTD.)	CHINA	CCSA
CKH IOD UK LIMITED (CKH IOD UK LIMITED)	UNITED KINGDOM	ETSI
Classon Consulting (Classon Consulting)	UNITED STATES	ATIS
CMDI (China Mobile Group Design Institute Co., Ltd)	CHINA	CCSA
CNC (CLAP-N-CLANK)	JAPAN	ETSI
CNES (CNES - Centre National d'Etudes Spatiales)	FRANCE	ETSI
Cobham SatCom A/S (Thrane & Thrane A/S)	DENMARK	ETSI
Cognyte (Cognyte Technologies Israel Ltd.)	ISRAEL	ETSI
Comba (Comba Network Systems Company Limited)	CHINA	CCSA
Comcast (Comcast)	UNITED STATES	ATIS
Commsat (Beijing Commsat Technology Development Co.,Ltd.)	CHINA	CCSA
Comprion GmbH (Comprion GmbH)	GERMANY	ETSI
Comtech Telecommunications Cor (Comtech Telecommunications Corp)	UNITED STATES	ATIS
Consort Digital (Consort Digital Private Limited)	INDIA	ETSI
Continental Automotive (Continental Automotive Technologies GmbH)	GERMANY	ETSI
Convida Wireless (Convida Wireless, LLC)	UNITED STATES	ETSI
Cosmian (Cosmian Tech SAS)	FRANCE	ETSI
CQUPT (Chongqing University of Posts and Telecommunications)	CHINA	CCSA
CSA (Cyber Security Agency of Singapore)	SINGAPORE	ETSI
CSIRO (Commonwealth Scientific and Industrial Research Organisation)	AUSTRALIA	ETSI
CSPIA (CHINA SECURITY & PROTECTION INDUSTRY ASSOCIATION)	CHINA	CCSA
CTSI (China Telecom System Integration Co., Ltd)	CHINA	CCSA
CTTC (Centre tecnologic de Telecomunicacions de Catalunya)	SPAIN	ETSI
CU Digital Technology (China Unicom Digital Technology Co., Ltd.)	CHINA	CCSA
CUC (Communication University of China)	CHINA	CCSA
CUG (China Unicom Global Limited)	CHINA	CCSA
CUJO (CUJO AI)	FINLAND	ETSI

Cygnusemi (Cygnusemi)	CHINA	CCSA
Czech Telecommunication Office (Czech Telecommunication Office)	CZECH REPUBLIC	ETSI
DAC-UPC (Departamento de Arquitectura de Computadores de la Universidad Politécnica de Cataluna (DAC-UPC))	SPAIN	ETSI
DanKook University (DanKook University)	KOREA (REPUBLIC OF)	TTA
Datang Linktester Technology (Datang Linktester Technology Co., Ltd.)	CHINA	CCSA
Datang Mobile Com. Equipment (Datang Mobile Communications Equipment Co., Ltd)	CHINA	CCSA
DECT Forum (DECT Forum)	SWITZERLAND	ETSI
DEKRA (DEKRA testing and Certification, S.A.U.)	SPAIN	ETSI
Dell Technologies (Dell Technologies)	UNITED STATES	ATIS
Deloitte Tohmatsu Cyber LLC (DTCY)	JAPAN	TTC
DENSO CORPORATION (DENSO CORPORATION)	JAPAN	ARIB
Department of Telecom (Department of Telecommunications)	INDIA	TSDSI
Deutsche Telekom AG (Deutsche Telekom AG)	GERMANY	ETSI
DFH Satellite Co., LTD (DFH Satellite Co., LTD)	CHINA	CCSA
DISA (Defense Information Systems Agency)	UNITED STATES	ATIS
Dish Network (Dish Network)	UNITED STATES	ATIS
DKK Co., Ltd. (DKK Co., Ltd.)	JAPAN	ARIB
DLR (Deutsches Zentrum für Luft- und Raumfahrt e.V.)	GERMANY	ETSI
DOCOMO Beijing Labs (DOCOMO Beijing Communications Laboratories Co., Ltd)	CHINA	CCSA
DOCOMO Communications Lab. (DOCOMO Communications Laboratories Europe GmbH)	GERMANY	ETSI
Dolby France SAS (Dolby France SAS)	FRANCE	ETSI
Dolby Germany GmbH (Dolby Germany GmbH)	GERMANY	ETSI
Dolby Laboratories Inc. (Dolby Laboratories Inc.)	UNITED KINGDOM	ETSI
Dolby Sweden AB (Dolby Sweden AB)	SWEDEN	ETSI
Dongguan OPPO Precision Elec. (Dongguan OPPO Precision Electronic Corp., Ltd.)	CHINA	CCSA
Douyin (Beijing Douyin Information Service Co., Ltd.)	CHINA	CCSA
DP (DigitalPlatforms SpA)	ITALY	ETSI
DSIT (Department for Science, Innovation and Technology)	UNITED KINGDOM	ETSI
DTS Licensing Limited (DTS Licensing Limited)	IRELAND	ETSI
EAST SA (EAST SA)	LUXEMBOURG	ETSI
EBU (EBU - European Broadcasting Union)	SWITZERLAND	ETSI
ECO (European Communications Office)	DENMARK	ETSI
EDF Recherche et Développement (EDF)	FRANCE	ETSI

EFORT (Etudes et Formations en Telecommunication)	FRANCE	ETSI
Elbit Systems (Elbit Systems C4I and Cyber Ltd)	ISRAEL	ETSI
Element Materials Technology (Element Materials Technology Warwick Ltd)	UNITED KINGDOM	ETSI
EMITE (EMITE Ingenieria S.L.)	SPAIN	ETSI
ENENSYS (ENENSYS Technologies SA)	FRANCE	ETSI
Ericsson España S.A. (Ericsson España S.A.)	SPAIN	ETSI
Ericsson France S.A.S (Ericsson France S.A.S)	FRANCE	ETSI
Ericsson GmbH, Eurolab (Ericsson GmbH, Eurolab - Unternehmensbereich Forschung und Entwicklung)	GERMANY	ETSI
Ericsson Hungary Ltd (Ericsson Hungary Ltd)	HUNGARY	ETSI
Ericsson Inc. (Ericsson Incorporated)	UNITED STATES	ATIS
Ericsson India Private Limited (Ericsson India Private Limited)	INDIA	TSDSI
Ericsson Japan K.K. (Ericsson Japan K.K.)	JAPAN	ARIB
Ericsson Limited (Ericsson Limited)	UNITED KINGDOM	ETSI
Ericsson LM (Ericsson Telefonaktiebolaget LM)	SWEDEN	ETSI
Ericsson Telecomunicazioni SpA (Ericsson Telecomunicazioni SpA)	ITALY	ETSI
Ericsson-LG Co., LTD (Ericsson-LG Co., LTD)	KOREA (REPUBLIC OF)	TTA
Erillisverkot (Suomen Erillisverkot Oy)	FINLAND	ETSI
ERNET India (ERNET India)	INDIA	TSDSI
ESA (ESA - European Space Agency)	NETHERLANDS	ETSI
ESSEN INNOVATION (ESSEN INNOVATION COMPANY LIMITED)	CHINA	CCSA
E-surfing Digital (E-surfing Digital Life Technology Co., Ltd)	CHINA	CCSA
Esurfing IoT (Esurfing IoT Tech Co., Ltd)	CHINA	CCSA
ETELM (Electronique Telematique ETELM)	FRANCE	ETSI
Etherstack Wireless Limited (Etherstack Wireless Limited)	UNITED KINGDOM	ETSI
ETRI (Electronics & Telecommunications Research Institute)	KOREA (REPUBLIC OF)	TTA
ETS-Lindgren Europe (ETS-Lindgren Europe)	FINLAND	ETSI
EURECOM (EURECOM)	FRANCE	ETSI
Eurofins Digital Testing (Eurofins Digital Testing Belgium NV)	BELGIUM	ETSI
Eurofins KCTL (Eurofins KCTL Co. Ltd)	KOREA (REPUBLIC OF)	ETSI
European Commission (EC - European Commission)	BELGIUM	ETSI
European Patent Organisation (European Patent Organisation)	GERMANY	ETSI
EUTC (European Utilities Telecom Council (EUTC))	BELGIUM	ETSI
Eutelsat S.A. (Eutelsat S.A.)	FRANCE	ETSI

EVE Compliancy Solutions (EVE Compliancy Solutions)	NETHERLANDS	ETSI
Everactive (Everactive)	UNITED STATES	ATIS
F5 (F5, Inc.)	UNITED STATES	ETSI
Fabasoft AG (Fabasoft AG)	AUSTRIA	ETSI
Facebook India (Facebook India Online Services Pvt Ltd)	INDIA	TSDSI
Facebook Japan K.K. (Facebook Japan K.K.)	JAPAN	ARIB
Fastweb S.p.A. (Fastweb S.p.A.)	ITALY	ETSI
FAU (Friedrich-Alexander-Universität Erlangen-Nürnberg)	GERMANY	ETSI
FBK (Fondazione Bruno Kessler)	ITALY	ETSI
FCC (Federal Communications Commission)	UNITED STATES	ATIS
Federated Wireless (Federated Wireless)	UNITED STATES	ETSI
FGI (FG Innovation Company Limited)	CHINA	CCSA
Fiberhome Technologies Group (Fiberhome Technologies Group)	CHINA	CCSA
FirstNet (FirstNet)	UNITED STATES	ATIS
FORCE Technology (FORCE Technology)	DENMARK	ETSI
Ford (Ford Motor Company)	UNITED STATES	ETSI
France Brevets (France Brevets)	FRANCE	ETSI
Fraunhofer FOKUS (Fraunhofer Institute for Open Communication Systems FOKUS)	GERMANY	ETSI
Fraunhofer HHI (Fraunhofer Institute for Telecommunications, Heinrich Hertz Institute)	GERMANY	ETSI
Fraunhofer IIS (Fraunhofer Institut für Integrierte Schaltungen IIS)	GERMANY	ETSI
Frequentis AG (Frequentis AG)	AUSTRIA	ETSI
Fudan University (Fudan University)	CHINA	CCSA
FUJITSU CONNECTED TECHNOLOGIES (FUJITSU CONNECTED TECHNOLOGIES LIMITED)	JAPAN	ARIB
Fujitsu Limited (Fujitsu Limited)	JAPAN	TTC
Fujitsu Limited (Fujitsu Limited)	JAPAN	ARIB
Fujitsu Limited (Fujitsu Limited)	JAPAN	ETSI
Futurewei (Futurewei Technologies Inc.)	UNITED STATES	ETSI
Futurewei Technologies (Futurewei Technologies)	UNITED STATES	ATIS
G+D MS (Giesecke+Devrient Mobile Security GmbH)	GERMANY	ETSI
GANPAT UNIVERSITY (GANPAT UNIVERSITY)	INDIA	TSDSI
Gatehouse Satcom A/S (Gatehouse Satcom A/S)	DENMARK	ETSI
GDCNI (Guangdong Communicaions and Networks Institute)	CHINA	CCSA
GEESPACE (ZHE JIANG GEESPACE TECHNOLOGY CO., LTD.)	CHINA	CCSA

Gigaset Communications GmbH (Gigaset Communications GmbH)	GERMANY	ETSI
Gilat (Gilat Satellite Networks Ltd)	ISRAEL	ETSI
GLOBALSTAR Inc. (GLOBALSTAR Inc.)	UNITED STATES	ETSI
GM - ATCI (General Motors - ATCI)	ISRAEL	ETSI
GOHIGH DATA NETWORKS TECH. (GOHIGH DATA NETWORKS TECHNOLOGY CO., LTD)	CHINA	CCSA
Google Inc. (Google Inc.)	UNITED STATES	ATIS
Group 2000 (Group 2000 Nederland B.V.)	NETHERLANDS	ETSI
GTRC (Georgia Tech Research Corporation)	UNITED STATES	ETSI
GUANGDONG GENIUS TECHNOLOGY CO (GUANGDONG GENIUS TECHNOLOGY CO., LTD.)	CHINA	CCSA
Guangdong OPPO Mobile Telecom. (Guangdong OPPO Mobile Telecommunications Corp., Ltd)	CHINA	CCSA
GW (Greenerwave)	FRANCE	ETSI
HA/ST (HARTING Stiftung & Co. KG)	GERMANY	ETSI
Haier W. W. (Qingdao Haier Technology Co., Ltd.)	CHINA	CCSA
Hangzhou Douku (Hangzhou Douku Software Technologies Co., Ltd.)	CHINA	CCSA
Hangzhou Mengyuxiang (Hangzhou Mengyuxiang Network Technology Corp., Ltd.)	CHINA	CCSA
Hansung University (Hansung University)	KOREA (REPUBLIC OF)	TTA
Harman GmbH (Harman Becker Automotive Systems GmbH)	GERMANY	ETSI
HEAD acoustics GmbH (HEAD acoustics GmbH)	GERMANY	ETSI
Hewlett-Packard Enterprise (Hewlett-Packard Enterprise)	FRANCE	ETSI
HFCL (HFCL)	INDIA	TSDSI
HiSilicon Technologies Co. Ltd (HiSilicon Technologies Co.Ltd)	CHINA	CCSA
HISPASAT SA (HISPASAT SA)	SPAIN	ETSI
HOME OFFICE (HOME OFFICE)	UNITED KINGDOM	ETSI
Honda Motor Co., Ltd (Honda Motor Co., Ltd)	JAPAN	ARIB
Honor (Honor Device Co., Ltd.)	CHINA	CCSA
Honor (Honor Device Co., Ltd)	CHINA	ETSI
Huawei Device Co., Ltd (Huawei Device Co., Ltd)	CHINA	CCSA
HUAWEI TECH. GmbH (HUAWEI TECHNOLOGIES Duesseldorf GmbH)	GERMANY	ETSI
Huawei Tech.(UK) Co.. Ltd (Huawei Technologies (UK) Co., Ltd.)	UNITED KINGDOM	ETSI
Huawei Technologies (Korea) (Huawei Technologies (Korea))	KOREA (REPUBLIC OF)	TTA
HUAWEI TECHNOLOGIES Co. Ltd. (Huawei Technologies Co. Ltd.)	CHINA	ETSI
HuaWei Technologies Co., Ltd (HuaWei Technologies Co., Ltd)	CHINA	CCSA
Huawei Technologies France (Huawei Technologies France)	FRANCE	ETSI

HUAWEI Technologies Japan K.K. (HUAWEI Technologies Japan K.K.)	JAPAN	ARIB
Huawei Technologies Japan K.K. (Huawei Technologies Japan K.K.)	JAPAN	TTC
Huawei Technologies R&D UK (Huawei Technologies Research & Development (UK) Limited)	UNITED KINGDOM	ETSI
Huawei Technologies Sweden AB (Huawei Technologies Sweden AB)	SWEDEN	ETSI
Huawei Telecommunication India (Huawei Telecommunication (India) Co. Pvt. Ltd.)	INDIA	TSDSI
HUGHES Network Systems Ltd (HUGHES Network Systems Ltd)	UNITED KINGDOM	ETSI
Huizhou Speed Wireless (Huizhou Speed Wireless Technology Co., Ltd.)	CHINA	CCSA
Husqvarna AB (Husqvarna AB (publ))	SWEDEN	ETSI
Hytera Communications Corp. (Hytera Communications Corporation Limited)	CHINA	CCSA
Hyundai Motor Company (Hyundai Motor Company)	KOREA (REPUBLIC OF)	TTA
IBM Europe (IBM Europe)	GERMANY	ETSI
ICS (Institute for Communication Systems - University of Surrey)	UNITED KINGDOM	ETSI
IDEMIA (IDEMIA)	FRANCE	ETSI
IDRBT (Institute for Development and Research in Banking Technology)	INDIA	TSDSI
III (Institute for Information Industry)	TAIWAN, PROVINCE OF CHINA	ETSI
IIIT Bangalore (International Institute of Information Technology - Bangalore)	INDIA	TSDSI
IIIT Delhi (Indraprastha Institute of Information Technology Delhi)	INDIA	TSDSI
IIIT Hyderabad (International Institute of Information Technology, Hyderabad)	INDIA	TSDSI
IISc, Bangalore (Indian Institute of Science, Bangalor)	INDIA	TSDSI
IIT Bhilai (Indian Institute of Technology Bhilai)	INDIA	TSDSI
IIT Bombay (Indian Institute of Technology Bombay)	INDIA	TSDSI
IIT Delhi (Indian Institute of Technology Delhi)	INDIA	TSDSI
IIT JODHPUR (Indian Institute of Technology Jodhpur)	INDIA	TSDSI
IIT Kanpur (Indian Institute of Technology Kanpur)	INDIA	TSDSI
IIT Mandi (Indian Institute of Technology Mandi)	INDIA	TSDSI
IIT Roorkee (Indian Institute Of Technology–Roorkee)	INDIA	TSDSI
IIT, Kharagpur (IIT, Kharagpur)	INDIA	TSDSI
IMDA (Infocomm Media Development Authority)	SINGAPORE	ETSI
Indian Institute of Tech (H) (Indian Institute of Technology Hyderabad)	INDIA	TSDSI
Indian Institute of Tech (M) (Indian Institute of Technology Madras)	INDIA	TSDSI
INFINEON TECHNOLOGIES (Infineon Technologies)	GERMANY	ETSI
Inmarsat (Inmarsat)	UNITED KINGDOM	ETSI
INSPUR (Inspur Software Technology Co. , Ltd.)	CHINA	CCSA

Institut Mines-Telecom (Institut Mines-Telecom)	FRANCE	ETSI
Institute VEDECOM (Institute VEDECOM)	FRANCE	ETSI
Intel (Intel)	UNITED STATES	ATIS
Intel Belgium SA/NV (Intel Belgium SA/NV)	BELGIUM	ETSI
Intel China Ltd. (Intel China Ltd.)	CHINA	CCSA
Intel Corporation (UK) Ltd (Intel Corporation (UK) Ltd)	UNITED KINGDOM	ETSI
Intel Corporation Italia SpA (Intel Corporation Italia SpA)	ITALY	ETSI
Intel Corporation SAS (Intel Corporation SAS)	FRANCE	ETSI
Intel Deutschland GmbH (Intel Deutschland GmbH)	GERMANY	ETSI
Intel Finland Oy (Intel Finland Oy)	FINLAND	ETSI
Intel Ireland (Intel Ireland Ltd)	IRELAND	ETSI
Intel K.K. (Intel K.K.)	JAPAN	ARIB
Intel Korea, Ltd. (Intel Korea, Ltd.)	KOREA (REPUBLIC OF)	TTA
Intel Romania (Intel Romania)	ROMANIA	ETSI
Intel Sweden AB (Intel Sweden AB)	SWEDEN	ETSI
Intel Technology India Pvt Ltd (Intel Technology India Pvt. Ltd.)	INDIA	TSDSI
Intel Technology Poland SP Zoo (Intel Technology Poland SP Zoo)	POLAND	ETSI
Intelsat (Intelsat)	UNITED STATES	ATIS
InterDigital Belgium. LLC (InterDigital Belgium, LLC)	BELGIUM	ETSI
InterDigital Communications (InterDigital Communications Corporation)	UNITED STATES	ATIS
InterDigital Finland Oy (InterDigital Finland Oy)	FINLAND	ETSI
InterDigital France R&D, SAS (InterDigital France R&D, SAS)	FRANCE	ETSI
InterDigital, Europe, Ltd. (InterDigital, Europe, Ltd.)	UNITED KINGDOM	ETSI
InterDigital, Inc. (InterDigital, Inc.)	UNITED STATES	ETSI
Intersec (Intersec SA)	FRANCE	ETSI
Intertek (Intertek)	UNITED KINGDOM	ETSI
INVAS Technologies Pvt Ltd (INVAS Technologies Pvt Ltd)	INDIA	TSDSI
IPCom GmbH & Co.KG (IPCom GmbH & Co.KG)	GERMANY	ETSI
IPLOOK (IPLOOK Networks Co., Ltd.)	CHINA	CCSA
iQoo (iQoo Software Technology (Shanghai) Co., Ltd.)	CHINA	CCSA
IRT Saint Exupery (Institut de recherche technologique Saint Exupery)	FRANCE	ETSI
ISED (Innovation, Science and Economic Development Canada)	CANADA	ETSI
ISRO (Indian Space Research Organisation)	INDIA	TSDSI

ITL (Innovative Technology Lab Co., Ltd)	KOREA (REPUBLIC OF)	TTA
ITOCHU Techno-Solutions Corp (ITOCHU Techno-Solutions Corporation)	JAPAN	TTC
ITRI (Industrial Technology Research Institute)	TAIWAN, PROVINCE OF CHINA	ETSI
ITRON SAS (ITRON SAS)	FRANCE	ETSI
Japan Radio Co., Ltd (Japan Radio Co., Ltd)	JAPAN	ARIB
Jetflow (Jetflow Technologies Co., Ltd)	CHINA	CCSA
Jio (Jio Estonia OÜ)	ESTONIA	ETSI
JMA Wireless (JMA Wireless)	UNITED STATES	ATIS
John Deere GmbH & Co. KG (John Deere GmbH & Co. KG)	GERMANY	ETSI
Johns Hopkins University APL (Johns Hopkins University Applied Physics Laboratory)	UNITED STATES	ATIS
JSI GmbH (JSI GmbH)	GERMANY	ETSI
Juniper Networks (Juniper Networks)	UNITED STATES	ETSI
Kapsch TrafficCom AG (Kapsch TrafficCom AG)	AUSTRIA	ETSI
KDDI Corporation (KDDI Corporation)	JAPAN	ARIB
KDDI Corporation (KDDI Corporation)	JAPAN	TTC
Kepler (Kepler Communications GmbH)	GERMANY	ETSI
Keysight Technologies UK Ltd (Keysight Technologies UK Ltd)	UNITED KINGDOM	ETSI
KIPO (Korean Intellectual Property Office)	KOREA (REPUBLIC OF)	TTA
Kontron Transportation France (Kontron Transportation France S.A.S)	FRANCE	ETSI
Korea Testing Laboratory (Korea Testing Laboratory)	KOREA (REPUBLIC OF)	TTA
KPN N.V. (Koninklijke KPN N.V.)	NETHERLANDS	ETSI
KRRI (Korea Railroad Research Institute)	KOREA (REPUBLIC OF)	TTA
KT Corp. (KT Corporation)	KOREA (REPUBLIC OF)	TTA
Kumu Networks (Kumu Networks)	UNITED STATES	ATIS
Kymeta Corporation (Kymeta Corporation)	UNITED STATES	ETSI
Kyocera Corporation (Kyocera Corporation)	JAPAN	ARIB
Kyonggi University (Kyonggi University)	KOREA (REPUBLIC OF)	TTA
L.M. Ericsson Limited (L.M. Ericsson Limited)	IRELAND	ETSI
L3Harris Technologies (L3Harris Technologies)	UNITED STATES	ATIS
Landis+Gyr AG (Landis+Gyr Switzerland AG)	SWITZERLAND	ETSI
Langbo (Shanghai Langbo Communication Technology Co., Ltd.)	CHINA	CCSA
LEGRAND FRANCE (LEGRAND FRANCE ISERE)	FRANCE	ETSI
Lekha Wireless Solutions (Lekha Wireless Solutions Pvt Ltd)	INDIA	TSDSI

Lenovo (Beijing) Ltd (Lenovo (Beijing) Ltd)	CHINA	CCSA
Lenovo Future Communications (Lenovo Future Communications Technology (Chongqing) Co., Ltd.)	CHINA	CCSA
Lenovo Information Technology (Lenovo (Beijing) Information Technology Co., Ltd.)	CHINA	CCSA
Leonardo SpA (Leonardo SpA)	ITALY	ETSI
LG Electronics Deutschland (LG Electronics Deutschland GmbH)	GERMANY	ETSI
LG Electronics Finland (LG Electronics Finland Lab Oy)	FINLAND	ETSI
LG Electronics France (LG Electronics France)	FRANCE	ETSI
LG Electronics Inc. (LG Electronics Inc.)	KOREA (REPUBLIC OF)	TTA
LG Electronics Polska (LG Electronics Polska Sp. z o.o.)	POLAND	ETSI
LG Electronics UK (LG Electronics UK Ltd)	UNITED KINGDOM	ETSI
LG Uplus (LG Uplus)	KOREA (REPUBLIC OF)	TTA
Ligado Networks (Ligado Networks)	UNITED STATES	ETSI
LKA Niedersachsen (Landeskriminalamt Niedersachsen)	GERMANY	ETSI
Locaila (Locaila)	UNITED STATES	ATIS
Lockheed Martin (Lockheed Martin)	UNITED STATES	ATIS
Lynk Global (Lynk Global)	UNITED STATES	ATIS
Magister Solutions Ltd (Magister Solutions Ltd)	FINLAND	ETSI
MATRIX Software (MATRIX Software, Inc.)	UNITED STATES	ETSI
Mavenir (Mavenir Systems, Inc)	UNITED STATES	ETSI
MediaTek (Chengdu) Inc. (MediaTek (Chengdu) Inc.)	CHINA	CCSA
MediaTek (Hefei) Inc. (MediaTek (Hefei) Inc.)	CHINA	CCSA
MediaTek (Shenzhen) Inc. (MediaTek (Shenzhen) Inc.)	CHINA	CCSA
MediaTek (Wuhan) Inc. (MediaTek (Wuhan) Inc.)	CHINA	CCSA
MediaTek Beijing Inc. (MediaTek Beijing Inc.)	CHINA	CCSA
MediaTek Inc. (MediaTek Incorporated)	TAIWAN, PROVINCE OF CHINA	ETSI
Mediatek India Technology Pvt. (Mediatek India Technology Pvt. Ltd.)	INDIA	TSDSI
MediaTek Korea Inc. (MediaTek Korea Inc.)	KOREA (REPUBLIC OF)	TTA
MeitY (Ministry of Electronics & Information Technology)	INDIA	TSDSI
Meizu Technology (Meizu Technology)	CHINA	CCSA
Mercedes-Benz AG (Mercedes-Benz AG)	GERMANY	ETSI
Mesagin.com s.r.o (Ltd.) (Mesagin.com s.r.o (Ltd.))	CZECH REPUBLIC	ETSI
Meta Ireland (Meta Platforms Ireland Ltd.)	IRELAND	ETSI
Meta USA (Meta USA)	UNITED STATES	ATIS

Microchip Technology, Inc. (Microchip Technology, Inc.)	UNITED STATES	ATIS
Microsoft Europe SARL (Microsoft Europe SARL)	FRANCE	ETSI
MinEA (Ministry of Economic Affairs and Climate Policy)	NETHERLANDS	ETSI
MINECO (MINISTRY OF ECONOMIC AFFAIRS AND DIGITAL TRANSFORMATION)	SPAIN	ETSI
MINISTERE DE L'INTERIEUR (MINISTERE DE L'INTERIEUR)	FRANCE	ETSI
Ministère Economie et Finances (Ministère de l'Economie et des Finances)	FRANCE	ETSI
Ministry of Transport SR (Ministry of Transport of the Slovak Republic)	SLOVAKIA	ETSI
MITRE Corporation (MITRE Corporation)	UNITED STATES	ETSI
Mitsubishi Electric Co. (Mitsubishi Electric Co.)	JAPAN	ARIB
Mitsubishi Electric Corp (Mitsubishi Electric Corporation)	JAPAN	TTC
Mitsubishi Electric RCE (Mitsubishi Electric R&D Centre Europe)	FRANCE	ETSI
Motorola Mobile Com Technology (MOTOROLA MOBILE COMMUNICATION TECHNOLOGY LTD.)	CHINA	CCSA
Motorola Mobility España SA (Motorola Mobility España SA)	SPAIN	ETSI
Motorola Mobility France S.A.S (Motorola Mobility France S.A.S)	FRANCE	ETSI
Motorola Mobility Germany GmbH (Motorola Mobility Germany GmbH)	GERMANY	ETSI
Motorola Mobility UK Ltd. (Motorola Mobility UK Ltd.)	UNITED KINGDOM	ETSI
Motorola Solutions Danmark A/S (Motorola Solutions Danmark A/S)	DENMARK	ETSI
Motorola Solutions Germany (Motorola Solutions Germany GmbH)	GERMANY	ETSI
Motorola Solutions Poland (Motorola Solutions Systems Polska s.p. z.o.o.)	POLAND	ETSI
Motorola Solutions UK Ltd. (Motorola Solutions UK Ltd.)	UNITED KINGDOM	ETSI
MTCC (Mobile Technology Convergence Center)	KOREA (REPUBLIC OF)	TTA
Murata Manufacturing Co Ltd. (Murata Manufacturing Co Ltd.)	JAPAN	ARIB
MVG Industries (MVG Industries)	FRANCE	ETSI
Nanjing Ericsson Panda Com Ltd (NANJING ERICSSON PANDA COMMUNICATIONS LTD)	CHINA	CCSA
Nanjing Weibo (Nanjing Weibo Software Technology Co., Ltd.)	CHINA	CCSA
National Instruments Corp. (National Instruments Corporation)	UNITED STATES	ETSI
National Radio Research Agency (National Radio Research Agency)	KOREA (REPUBLIC OF)	TTA
National Smart Grid Mission (National Smart Grid Mission)	INDIA	TSDSI
National Spectrum Consortium (National Spectrum Consortium)	UNITED STATES	ATIS
National Technical Assistance (National Technical Assistance Centre)	UNITED KINGDOM	ETSI
nbn co Limited (nbn co Limited (ABN 86 136 533 741))	AUSTRALIA	ETSI
NCI Agency (NATO Communication and Information Agency)	NETHERLANDS	ETSI
NCSC (National Cyber Security Centre)	UNITED KINGDOM	ETSI

NDRE (National Defence Radio Establishment)	SWEDEN	ETSI
NEC Corporation (NEC Corporation)	JAPAN	ETSI
NEC Corporation (NEC Corporation)	JAPAN	ARIB
NEC Corporation (NEC Corporation)	JAPAN	TTC
NEC Europe Ltd (NEC Europe Ltd)	UNITED KINGDOM	ETSI
NEC Telecom MODUS Ltd. (NEC Telecom MODUS Ltd.)	UNITED KINGDOM	ETSI
NEMERGENT (NEMERGENT SOLUTIONS SL)	SPAIN	ETSI
NERCDTV (Shanghai National Engineering Research Center of Digital Television Co.,Ltd.)	CHINA	CCSA
Netherlands Police (Netherlands Police, Division MDC)	NETHERLANDS	ETSI
Netscout Systems Inc. (Netscout Systems Inc.)	UNITED STATES	ETSI
Neustar, Inc. (Neustar, Inc.)	UNITED STATES	ATIS
New H3C Technologies Co., Ltd. (New H3C Technologies Co., Ltd.)	CHINA	CCSA
NextNav (NextNav)	UNITED STATES	ATIS
NHK (NHK (Japan Broadcasting Corporation))	JAPAN	ARIB
NICT (National Institute of Information and Communications Technology)	JAPAN	ARIB
NIST (National Institute of Standards and Technology)	UNITED STATES	ATIS
Nkom (Norwegian Communications Authority)	NORWAY	ETSI
Nokia (Nokia)	UNITED STATES	ATIS
Nokia Austria (Nokia Solutions and Networks Österreich GmbH)	AUSTRIA	ETSI
Nokia Belgium (Nokia Bell N.V.)	BELGIUM	ETSI
Nokia Corporation (Nokia Corporation)	FINLAND	ETSI
Nokia Denmark (Nokia Denmark A/S)	DENMARK	ETSI
Nokia France (Nokia Networks France)	FRANCE	ETSI
Nokia Germany (Nokia Solutions and Networks GmbH & Co. KG)	GERMANY	ETSI
Nokia Hungary (Nokia Solutions and Networks Kft.)	HUNGARY	ETSI
Nokia Italy (Nokia Solutions and Networks Italia SpA)	ITALY	ETSI
Nokia Japan (Nokia Japan)	JAPAN	ARIB
Nokia Korea (Nokia Korea)	KOREA (REPUBLIC OF)	TTA
Nokia Netherlands (Nokia Solutions and Networks Nederland B.V.)	NETHERLANDS	ETSI
Nokia Poland (Nokia Solutions and Networks Sp. z.o.o.)	POLAND	ETSI
Nokia Shanghai Bell (Nokia Shanghai Bell Co., Ltd)	CHINA	CCSA
Nokia Solutions & Networks (I) (Nokia Solutions and Networks India Pvt. Ltd.)	INDIA	TSDSI
Nokia UK (Nokia UK Ltd.)	UNITED KINGDOM	ETSI

Nordic Semiconductor ASA (Nordic Semiconductor ASA)	NORWAY	ETSI
NOVAMINT (NOVAMINT)	UNITED KINGDOM	ETSI
NTIA (National Telecommunications and Information Administration)	UNITED STATES	ATIS
NTPU (National Taipei University)	TAIWAN, PROVINCE OF CHINA	ETSI
NTT (Nippon Telegraph and Telephone Corporation (NTT))	JAPAN	TTC
NTT Advanced Technology Corpor (NTT Advanced Technology Corporation)	JAPAN	TTC
NTT corporation (Nippon Telegraph and Telephone Corporation)	JAPAN	ETSI
NTT DOCOMO INC. (NTT DOCOMO INC.)	JAPAN	ARIB
NTT DOCOMO INC. (NTT DOCOMO INC.)	JAPAN	TTC
Nubia Technology Co.,Ltd (Nubia Technology Co.,Ltd)	CHINA	CCSA
NUFRONT (Nufont (Beijing) Technology Co., Ltd.)	CHINA	CCSA
NVIDIA (NVIDIA Corporation)	UNITED STATES	ATIS
NXP Semiconductors Netherlands (NXP Semiconductors Netherlands B.V.)	NETHERLANDS	ETSI
NYCU (National Yang Ming Chiao Tung University)	TAIWAN, PROVINCE OF CHINA	ETSI
Ofcom (CH) (Ofcom (CH))	SWITZERLAND	ETSI
Ofcom (U.K.) (Ofcom - Office of Communications (U.K.))	UNITED KINGDOM	ETSI
Oki Electric Industry Co. Ltd. (OKI Electric Industry Co., Ltd)	JAPAN	TTC
Omnispace (Omnispace)	UNITED STATES	ATIS
ONE Media 3.0 LLC (ONE Media 3.0 LLC)	UNITED STATES	ATIS
one2many B.V. (one2many B.V.)	NETHERLANDS	ETSI
OnePlus (OnePlus (Shenzhen) Technology Co., LTD)	CHINA	CCSA
OneWeb (Network Access Associates Limited)	UNITED KINGDOM	ETSI
OPPO (Guangdong OPPO Mobile Telecommunications Corp.,Ltd.)	CHINA	ETSI
OPPO (chongqing) Intelligence (OPPO (chongqing) Intelligence Technology Limited)	CHINA	CCSA
OPPO Beijing (Beijing OPPO Telecommunications Corp., Ltd.)	CHINA	CCSA
OQTEC (OQ TECHNOLOGY)	LUXEMBOURG	ETSI
Oracle Corporation (Oracle Corporation)	UNITED STATES	ETSI
Orange (Orange)	FRANCE	ETSI
Orange Romania (Orange Romania)	ROMANIA	ETSI
Orange Spain (France Telecom España S.A.U.)	SPAIN	ETSI
Orange UK (Orange Brand Services Ltd)	UNITED KINGDOM	ETSI
ORS (Österreichische Rundfunksender GmbH & Co KG)	AUSTRIA	ETSI
OTD (Operational Technology Division (OTD))	UNITED STATES	ETSI

OTD_US (OTD_US)	UNITED STATES	ATIS
OTECH (OTECH Germany GmbH)	GERMANY	ETSI
Oy LM Ericsson AB (Oy LM Ericsson AB)	FINLAND	ETSI
P.I. WORKS (P.I. WORKS TR BILISIM HIZMETLERI A.S.)	TÜRKIYE	ETSI
Panasonic Holdings Corporation (Panasonic Holdings Corporation)	JAPAN	ARIB
PANASONIC R&D Center Germany (PANASONIC R&D Center Germany GmbH)	GERMANY	ETSI
PCCW Global B.V. (PCCW Global B.V.)	FRANCE	ETSI
Peking University (Peking University)	CHINA	CCSA
Pengcheng laboratory (Pengcheng laboratory)	CHINA	CCSA
Peraton Labs (Peraton Labs)	UNITED STATES	ATIS
Philips International B.V. (Philips International B.V.)	NETHERLANDS	ETSI
PHY Wireless (PHY Wireless)	UNITED STATES	ATIS
PIDS (PIDS)	NETHERLANDS	ETSI
Pivotal Commware (Pivotal Commware)	UNITED STATES	ATIS
Plan-S (Plan S Uydu ve Uzay Teknolojileri A.S)	TÜRKIYE	ETSI
PML (Purple Mountain Laboratories: Networking, Communications and Security)	CHINA	CCSA
Polaris Wireless (Polaris Wireless)	UNITED STATES	ATIS
Polisen (Polismyndigheten)	SWEDEN	ETSI
Polizia di Stato (Direzione Centrale Anticrimine della Polizia di Stato)	ITALY	ETSI
POST Luxembourg (POST Luxembourg)	LUXEMBOURG	ETSI
Potevio Company Limited (Potevio Company Limited)	CHINA	CCSA
Prasar Bharati (Prasar Bharati)	INDIA	TSDSI
Proximus Plc (Proximus Plc)	BELGIUM	ETSI
PSCE (Public Safety Communication Europe Forum)	BELGIUM	ETSI
PT PORTUGAL SGPS SA (PT Portugal SGPS SA)	PORTUGAL	ETSI
PTS (Swedish Post and Telecom Authority)	SWEDEN	ETSI
Public Safety Canada (Public Safety Canada)	CANADA	ETSI
Qihoo 360 (Qihoo 360 Technology Co., Ltd.)	CHINA	CCSA
Qorvo (Qorvo)	UNITED STATES	ETSI
Qualcomm Austria RFFE GmbH (Qualcomm Austria RFFE GmbH)	AUSTRIA	ETSI
Qualcomm CDMA Technologies (Qualcomm CDMA Technologies GmbH)	GERMANY	ETSI
QUALCOMM Europe Inc. - Italy (QUALCOMM Europe Inc. - Italy Branch Office)	ITALY	ETSI
QUALCOMM Europe Inc. - Spain (QUALCOMM Europe Inc. - Spain Branch Office)	SPAIN	ETSI

Qualcomm Europe Inc. Sweden (Qualcomm Europe Inc. Sweden)	SWEDEN	ETSI
Qualcomm Finland RFFE Oy (Qualcomm Finland RFFE Oy)	FINLAND	ETSI
Qualcomm France (Qualcomm France SARL)	FRANCE	ETSI
Qualcomm Incorporated (Qualcomm Incorporated)	UNITED STATES	ATIS
Qualcomm India Pvt Ltd (Qualcomm India Pvt Ltd)	INDIA	TSDSI
Qualcomm Israel Ltd. (Qualcomm Israel Ltd.)	ISRAEL	ETSI
QUALCOMM JAPAN LLC. (QUALCOMM JAPAN LLC.)	JAPAN	ARIB
Qualcomm Korea (Qualcomm Korea)	KOREA (REPUBLIC OF)	TTA
Qualcomm Tech. Netherlands B.V (Qualcomm Technologies Netherlands B.V.)	NETHERLANDS	ETSI
Qualcomm Technologies Int (Qualcomm Technologies International, Ltd)	UNITED KINGDOM	ETSI
Qualcomm Technologies Ireland (QT Technologies Ireland Limited)	IRELAND	ETSI
Quanray (Shanghai Quanray Electronics Co., Ltd.)	CHINA	CCSA
Quectel (Quectel Wireless Solutions Co., Ltd.)	CHINA	CCSA
RadiSys (RadiSys Inc.)	CANADA	ETSI
Rakuten Mobile, Inc (Rakuten Mobile, Inc)	JAPAN	ARIB
Rakuten Symphony (Rakuten Symphony)	UNITED STATES	ATIS
RATEL (Regulatory Agency For Electronic Communications and Postal Services)	SERBIA	ETSI
Reliance Jio (Reliance Jio)	INDIA	TSDSI
RICHTEK KOREA (RICHTEK KOREA)	KOREA (REPUBLIC OF)	TTA
RISE (RISE Research Institutes of Sweden)	SWEDEN	ETSI
ROBERT BOSCH GmbH (ROBERT BOSCH GmbH)	GERMANY	ETSI
Rogers Communications Canada (Rogers Communications Canada Inc.)	CANADA	ETSI
ROHDE & SCHWARZ (ROHDE & SCHWARZ GmbH & Co.KG)	GERMANY	ETSI
S&T Iskratel d.o.o. (S&T Iskratel, informacijske in komunikacijske rešitve, d.o.o.)	SLOVENIA	ETSI
Saankhya Labs (Saankhya Labs Private Limited)	INDIA	TSDSI
Sagemcom Broadband SAS (Sagemcom Broadband SAS)	FRANCE	ETSI
SAICT (Shenzhen Academy of Information and Communication Technology)	CHINA	CCSA
SAMEER (SAMEER - Centre for Electromagnetics)	INDIA	TSDSI
Samsung Electronics Austria (Samsung Electronics Austria GmbH)	AUSTRIA	ETSI
Samsung Electronics Benelux BV (Samsung Electronics Benelux BV)	NETHERLANDS	ETSI
Samsung Electronics Co., Ltd (Samsung Electronics Co., Ltd.)	KOREA (REPUBLIC OF)	TTA
Samsung Electronics Czech (Samsung Electronics Czech)	CZECH REPUBLIC	ETSI
Samsung Electronics France SA (Samsung Electronics France SA)	FRANCE	ETSI

Samsung Electronics GmbH (Samsung Electronics GmbH)	GERMANY	ETSI
Samsung Electronics Iberia SA (Samsung Electronics Iberia SA)	SPAIN	ETSI
Samsung Electronics Nordic AB (Samsung Electronics Nordic AB)	SWEDEN	ETSI
Samsung Electronics Polska (Samsung Electronics Polska)	POLAND	ETSI
Samsung Electronics Romania (Samsung Electronics Romania SRL)	ROMANIA	ETSI
Samsung Guangzhou Mobile R&D (Samsung Guangzhou Mobile R&D Center)	CHINA	CCSA
Samsung Nanjing (Samsung Electronic (China) R&D Center)	CHINA	CCSA
Samsung R&D Institute India (Samsung R&D Institute India - Bangalore Pvt. Ltd)	INDIA	TSDSI
SAMSUNG R&D INSTITUTE JAPAN (SAMSUNG R&D INSTITUTE JAPAN)	JAPAN	ARIB
Samsung R&D Institute UK (Samsung R&D Institute UK)	UNITED KINGDOM	ETSI
Samsung Research America (Samsung Research America)	UNITED STATES	ATIS
Samsung Shenzhen (Samsung Network R&D Center-Shenzhen)	CHINA	CCSA
Samsung Suzhou (Samsung Electronics Suzhou Computer Co., Ltd.)	CHINA	CCSA
Sandvine Incorporated (Sandvine Incorporated)	CANADA	ETSI
Sanechips (Sanechips Technology Co. , Ltd.)	CHINA	CCSA
Sateliot (Satelio IoT Services)	SPAIN	ETSI
Schindler (Schindler Elevator Ltd)	SWITZERLAND	ETSI
SDI Squared (SDI Squared LLC)	UNITED STATES	ETSI
Sectra Communications AB (Sectra Communications AB)	SWEDEN	ETSI
Security Service (Swedish Security Service)	SWEDEN	ETSI
Semtech Neuchatel SA (Semtech Neuchatel SA)	SWITZERLAND	ETSI
Sennheiser Electronic GmbH (Sennheiser Electronic GmbH & Co. KG)	GERMANY	ETSI
Sensorise (Sensorise Digital Services Pvt Ltd)	INDIA	TSDSI
Sensus UK (Sensus UK Systems Limited)	UNITED KINGDOM	ETSI
Sepura Ltd (Sepura Limited)	UNITED KINGDOM	ETSI
Sequans Communications (Sequans Communications)	FRANCE	ETSI
SES S.A. (SES S.A.)	LUXEMBOURG	ETSI
SEU (Southeast University)	CHINA	CCSA
SGDSN (Secrétariat Général de la Défense et de la Sécurité Nationale (SGDSN))	FRANCE	ETSI
SGS Wireless (SGS Wireless)	UNITED KINGDOM	ETSI
Shanghai Chen Si Electronics (Shanghai Chen Si Electronics Technology Co., Ltd)	CHINA	CCSA
Shanghai Jiao Tong University (Shanghai Jiao Tong University)	CHINA	CCSA
Shanghai Tejet Com Technology (Shanghai Tejet Communications Technology Co., Ltd.)	CHINA	CCSA

SHARP Corporation (SHARP Corporation)	JAPAN	ARIB
Shenzhen Heytap (Shenzhen Heytap Technology Corp.,Ltd.)	CHINA	CCSA
ShenZhen Zhongxing Shitong (ShenZhen Zhongxing Shitong Tech. Co.,Ltd.)	CHINA	CCSA
SIA (Shenyang Institute of Automation, Chinese Academy of Sciences)	CHINA	CCSA
Siemens AG (Siemens AG)	GERMANY	ETSI
Sierra Wireless. S.A. (Sierra Wireless, S.A.)	FRANCE	ETSI
Signalchip Innovations Pvt. (Signalchip Innovations Pvt. Ltd.)	INDIA	TSDSI
SIST (Slovenian Institute for Standardisation)	SLOVENIA	ETSI
Sisvel (Sisvel International S.A.)	LUXEMBOURG	ETSI
SITA (SITA OnAir Switzerland Sarl)	SWITZERLAND	ETSI
SK Telecom (SK TELECOM)	KOREA (REPUBLIC OF)	TTA
SKY Perfect JSAT Corporation (SKY Perfect JSAT Corporation)	JAPAN	ARIB
Skylo Technologies (Skylo Technologies)	UNITED STATES	ATIS
Skyworks Solutions Inc. (Skyworks Solutions Inc.)	UNITED STATES	ETSI
SmarterMicro Inc. (Smarter Microelectronics(Guangzhou) Co.,Ltd)	CHINA	CCSA
SnT - University of Luxembourg (Interdisciplinary Centre for Security, Reliability and Trust/University of Luxembourg)	LUXEMBOURG	ETSI
SoftBank Corp. (SoftBank Corp.)	JAPAN	ARIB
Softel Systems (Softel Systems Pty Ltd)	AUSTRALIA	ETSI
Softil Ltd (Softil Ltd)	ISRAEL	ETSI
Sony Corporation (Sony Corporation)	JAPAN	ARIB
Sony Europe B.V. (Sony Europe B.V.)	UNITED KINGDOM	ETSI
Sony Group Corporation (Sony Group Corporation)	JAPAN	ARIB
Sooktha Consulting Pvt Ltd (Sooktha Consulting Pvt Ltd)	INDIA	TSDSI
Southern Linc. (Southern Linc.)	UNITED STATES	ATIS
Southwest Jiaotong university (Southwest Jiaotong university)	CHINA	CCSA
SpaceX (SpaceX Services, Inc)	UNITED STATES	ETSI
Spark NZ Ltd (Spark NZ Ltd)	NEW ZEALAND	ATIS
Spirent Communications (Spirent Communications)	UNITED STATES	ETSI
Sporton International Inc (Sporton International Inc.)	TAIWAN, PROVINCE OF CHINA	ETSI
Spreadtrum Communications (Spreadtrum Communications (Shanghai) Co., Ltd.)	CHINA	CCSA
SRTC (The State Radio_monitoring_center Testing Center)	CHINA	CCSA
SS8 (SS8 Networks Inc.)	UNITED STATES	ETSI
SSNS (Special Service for the National Security of Hungary)	HUNGARY	ETSI

Starpoint (Beijing Starpoint Technology Company Limited)	CHINA	CCSA
STE IDIRECT IRELAND LTD (ST ENGINEERING IDIRECT (IRELAND) LIMITED)	IRELAND	ETSI
Stellar (Stellar telecommunications)	FRANCE	ETSI
Sterlite Technologies Ltd (Sterlite Technologies Ltd)	INDIA	TSDSI
STMicroelectronics (STMicroelectronics International NV)	SWITZERLAND	ETSI
Sumitomo Elec. Industries, Ltd (Sumitomo Electric Industries, Ltd.)	JAPAN	ARIB
Swift Navigation (Swift Navigation)	UNITED STATES	ATIS
SWISSCOM (SWISSCOM SA)	SWITZERLAND	ETSI
SWR (Südwestrundfunk)	GERMANY	ETSI
SyncTechno, Inc. (SyncTechno Inc.)	KOREA (REPUBLIC OF)	TTA
Syniverse (M/s Syniverse Technologies Services India Pvt. Ltd.)	UNITED KINGDOM	TSDSI
TA (Tantra Analyst)	UNITED STATES	ETSI
Tait Europe Limited (Tait Europe Limited)	AUSTRIA	ETSI
TCIL (Telecommunications Consultants India Ltd)	INDIA	TSDSI
TCL Communication Ltd. (TCL Communication Ltd.)	CHINA	CCSA
TCS (TATA Consultancy Services)	INDIA	TSDSI
TD Tech Ltd (TD Tech Ltd)	CHINA	CCSA
TDF (TDF SAS)	FRANCE	ETSI
Tech Mahindra Limited (Tech Mahindra Limited)	INDIA	TSDSI
Tejas Networks Ltd. (Tejas Networks Ltd.)	INDIA	TSDSI
Tektronix GmbH (Tektronix GmbH)	GERMANY	ETSI
TELECOM ITALIA S.p.A. (Telecom Italia S.p.A.)	ITALY	ETSI
Telefonica Germany GmbH (Telefónica Germany GmbH & Co OHG)	GERMANY	ETSI
TELEFONICA S.A. (TELEFONICA S.A.)	SPAIN	ETSI
Telekom Deutschland GmbH (Telekom Deutschland GmbH)	GERMANY	ETSI
TELENOR ASA (Telenor ASA)	NORWAY	ETSI
Telesat International Limited (Telesat International Limited)	UNITED KINGDOM	ETSI
Telia Company AB (Telia Company AB)	SWEDEN	ETSI
Telit Communications S.p.A. (Telit Communications S.p.A.)	ITALY	ETSI
Telstra Limited (Telstra Limited)	AUSTRALIA	ETSI
TELUS (TELUS)	CANADA	ATIS
Tencent (Shenzhen city Tencent computer system Co. Ltd.)	CHINA	CCSA
Tencent Cloud (Tencent cloud computing Beijing Co., Ltd)	CHINA	CCSA

Teradyne (Teradyne)	UNITED STATES	ATIS
TerreStar Solutions Inc. (TerreStar Solutions Inc.)	CANADA	ATIS
Tessares (Tessares S.A.)	BELGIUM	ETSI
Texas A&M University (Texas A&M University)	UNITED STATES	ETSI
TEXAS Instruments (Texas Instruments France)	FRANCE	ETSI
THALES (THALES)	FRANCE	ETSI
TII (Technology Innovation Institute)	UNITED ARAB EMIRATES	ETSI
T-Mobile Austria GmbH (T-Mobile AUSTRIA GmbH)	AUSTRIA	ETSI
T-Mobile Polska S.A. (T-Mobile Polska Spolka Akcyjna)	POLAND	ETSI
T-Mobile USA (T-Mobile USA, Inc.)	UNITED STATES	ETSI
T-Mobile USA Inc. (T-Mobile USA Inc.)	UNITED STATES	ATIS
TNO (TNO)	NETHERLANDS	ETSI
Tongji University (Tongji University)	CHINA	CCSA
Toshiba (Toshiba)	UNITED KINGDOM	ETSI
TOYOTA Info Technology Center (TOYOTA Info Technology Center USA, Inc.)	UNITED STATES	ETSI
TOYOTA MOTOR CORPORATION (TOYOTA MOTOR CORPORATION)	JAPAN	TTC
TRAFICOM (The Finnish Transport and Communications Agency)	FINLAND	ETSI
Trafikverket (Trafikverket)	SWEDEN	ETSI
Transsion Holdings (Transsion Holdings)	CHINA	CCSA
Trimble (Trimble)	UNITED STATES	ATIS
TTP plc (TTP plc)	UNITED KINGDOM	ETSI
Türk Telekomunikasyon A.S. (Türk Telekomunikasyon A.S.)	TÜRKIYE	ETSI
TURKCELL (Turkcell İletişim Hizmetleri A.S.)	TÜRKIYE	ETSI
TUV SUD BABT (TUV SUD BRITISH APPROVALS BOARD FOR TELECOMMUNICATIONS)	UNITED KINGDOM	ETSI
U.S. Department of Defense (U.S. Department of Defense)	UNITED STATES	ATIS
U.S. Department of Transport. (U.S. Department of Transportation)	UNITED STATES	ATIS
U.S. National Security Agency (US National Security Agency)	UNITED STATES	ATIS
Uangel (Uangel Corporation)	KOREA (REPUBLIC OF)	TTA
ubinexus (Beijing Ubinexus Technology Development Co., Ltd)	CHINA	CCSA
u-blox AG (u-blox AG)	SWITZERLAND	ETSI
UESTC (University of Electronic Science and Technology of China)	CHINA	CCSA
UIET Panjab University (UIET Panjab University Chandigarh)	INDIA	TSDSI
UL VS Ltd (UL VS Ltd)	UNITED KINGDOM	ETSI

UMA (Universidad de Malaga)	SPAIN	ETSI
umlaut (umlaut communications GmbH)	GERMANY	ETSI
UNIBO (ALMA MATER STUDIORUM Università di Bologna)	ITALY	ETSI
Unicom Broadband Online (Unicom Broadband Online Co., Ltd.)	CHINA	CCSA
Unicompay (Unicompay Co., Ltd.)	CHINA	CCSA
Union Inter. Chemins de Fer (Union Internationale des Chemins de Fer)	FRANCE	ETSI
Union Telephone Company (Union Telephone Company)	UNITED STATES	ATIS
Unisoc (Unisoc (Shanghai) Technologies Co., Ltd.)	CHINA	CCSA
Unisoc Beijing (Beijing Unisoc Communications Technology Co., Ltd.)	CHINA	CCSA
UPV/EHU (Universidad del País Vasco/Euskal Herriko Unibertsitatea)	SPAIN	ETSI
US Cellular Corporation. (US Cellular Corporation/TDS.)	UNITED STATES	ATIS
UTIMACO TS GmbH (UTIMACO TS GmbH)	GERMANY	ETSI
UTokyo (The University of Tokyo)	JAPAN	ETSI
Valeo (Valeo Telematik und Akustik GmbH)	GERMANY	ETSI
VALID SOLUCIONES TECNOLÓGICAS (VALID SOLUCIONES TECNOLÓGICAS S.A.U)	SPAIN	ETSI
Valid8 (Valid8.com, Inc.)	UNITED STATES	ETSI
Vanchip (Vanchip (Tianjin) Technology Co., Ltd.)	CHINA	CCSA
Verizon Denmark (Verizon Denmark A/S)	DENMARK	ETSI
Verizon Spain (Verizon Spain S.L.)	SPAIN	ETSI
Verizon Sweden (Verizon Sweden Aktiebolag 2116)	SWEDEN	ETSI
Verizon Switzerland AG (Verizon Switzerland AG)	SWITZERLAND	ETSI
Verizon UK Ltd (Verizon UK Ltd)	UNITED KINGDOM	ETSI
Vestel (Vestel Elektronik Sanayi ve Ticaret A.S)	TÜRKIYE	ETSI
ViaSat Satellite Holdings Ltd (ViaSat Satellite Holdings Ltd)	UNITED KINGDOM	ETSI
VIAVI Solutions (Viavi Solutions UK Ltd.)	UNITED KINGDOM	ETSI
vivo Communication Technology (vivo Communication Technology Co., Ltd.)	CHINA	CCSA
vivo Japan KK (vivo Japan KK)	JAPAN	ARIB
vivo Mobile Com. (Chongqing) (vivo Mobile Communication (Chongqing) Co., Ltd)	CHINA	CCSA
vivo Mobile Communication (H) (vivo Mobile Communication (Hangzhou) Co., Ltd.)	CHINA	CCSA
vivo Mobile Communication (S) (vivo Mobile Communication (Shenzhen) Co., Ltd.)	CHINA	CCSA
vivo Mobile Communication Co., (vivo Mobile Communication Co., Ltd)	CHINA	CCSA
VIVO TECH GmbH (VIVO TECH GmbH)	GERMANY	ETSI
VMware Bulgaria EOOD (VMware Bulgaria EOOD)	BULGARIA	ETSI

Vodafone España SA (Vodafone España SA)	SPAIN	ETSI
Vodafone GmbH (Vodafone GmbH)	GERMANY	ETSI
VODAFONE Group Plc (Vodafone Group Plc)	UNITED KINGDOM	ETSI
Vodafone Ireland Plc (Vodafone Ireland Plc)	IRELAND	ETSI
Vodafone Italia SpA (Vodafone Italia SpA)	ITALY	ETSI
Vodafone Romania S.A. (Vodafone Romania S.A.)	ROMANIA	ETSI
Vodafone Telekomünikasyon A.S. (Vodafone Telekomünikasyon A.S.)	TÜRKIYE	ETSI
VoiceAge Corporation (VoiceAge Corporation)	CANADA	ETSI
Volkswagen AG (Volkswagen AG)	GERMANY	ETSI
VSENS (Unicom Vsens Telecommunications Co., Ltd)	CHINA	CCSA
VTT (VTT Technical Research Centre of Finland)	FINLAND	ETSI
WE Certification Oy (WE Certification Oy)	FINLAND	ETSI
Western Digital (Western Digital Technologies, Inc.)	UNITED STATES	ETSI
Wiliot Ltd. (Wiliot Ltd.)	ISRAEL	ETSI
WILUS Inc. (WILUS Inc.)	KOREA (REPUBLIC OF)	TTA
Wipro Limited. (Wipro Limited.)	INDIA	TSDSI
Xiaomi Communications (Xiaomi Communications)	CHINA	CCSA
Xiaomi EV Technology (Xiaomi EV Technology Co., Ltd.)	CHINA	CCSA
Xiaomi Technology (Xiaomi Technology)	CHINA	CCSA
Xidian University (Xidian University)	CHINA	CCSA
Xilinx Ireland (Xilinx Ireland)	IRELAND	ETSI
ZEKU (ZEKU TECHNOLOGY (SHANGHAI) CORP., LTD.)	CHINA	CCSA
Zhejiang Lab (Zhejiang Lab)	CHINA	CCSA
Zhejiang University (Zhejiang University)	CHINA	CCSA
ZITiS (Central Office for Information Technology in the Security Sector)	GERMANY	ETSI
Zollkriminalamt (ZKA) (Zollkriminalamt (ZKA))	GERMANY	ETSI
ZONSON (ZONSON SAMRT AUTO CORPORATION)	CHINA	CCSA
ZTE Corporation (ZTE Corporation)	CHINA	ETSI
ZTE Corporation. (ZTE Corporation.)	CHINA	CCSA
ZTE FRANCE SASU (ZTE FRANCE SASU)	FRANCE	ETSI
ZTE Japan K.K. (ZTE Japan K.K.)	JAPAN	ARIB
ZTE Korea Limited (ZTE Korea Limited)	KOREA (REPUBLIC OF)	TTA
ZTE Photonics (ZTE Photonics Technology Co.,Ltd.)	CHINA	CCSA

ZTE Wistron Telecom AB (ZTE Wistron Telecom AB)	SWEDEN	ETSI
ZXNE (ZXNE CORPORATION)	CHINA	CCSA
Total : 816 Individual Members		



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Appendix E

The development of mobile is critically dependent on standards

F Harrison and K A Holley

The development of mobile standards has been a key factor in the widespread success and take-up of second generation (2G) cellular systems. Well thought through standards, including roaming aspects, have enabled operators, using equipment from different manufacturers, to create global mobile networks, which allow users to roam seamlessly and obtain largely the same services wherever they happen to be. Third generation (3G) standards have built on the success of 2G and have increased the global awareness and applicability. In this light, this paper discusses the background for mobile standards and the factors that are influencing their ongoing development for third generation and beyond.

1. Mobile standards background

The importance of standardisation to the mobile industry is probably best illustrated by the impact of the work on the second generation mobile systems, in particular the GSM (Global System for Mobile Communications) standard. The work was started in the mid-1980s, at about the same time as the launch of commercial first generation cellular networks. A variety of different first generation systems were deployed across Europe and the rest of the world. Network infrastructure and mobile terminals were relatively expensive and market adoption was mainly limited to business users. The objective of GSM standardisation was to create a new pan-European system, where users could continue to get service when roaming across country borders. Economies of scale of larger production volumes were expected to reduce prices.

The impact of the GSM standards work is now clear to see. GSM is effectively a *de facto* world standard, claiming around 60% of the total mobile telephone population, and with coverage in all the continents. GSM terminals and network costs have reduced to such low levels that consumer pre-pay packages can be retailed at £50 or less, and the consumer market has developed such that the penetration of mobile telephones exceeds 50% of the population in many countries.

The mobile communications industry has grown to the point where GSM manufacturers, such as Ericsson, Nokia and Motorola, and global operators, such as Vodafone, are now among the top companies in financial market capitalisation.

The speed and extent of this development is undoubtedly due in large part to the creation of international standards. Had we continued by further developing the

differing national first generation standards, the mobile industry could not have come so far, so quickly.

The challenge for third generation standards is to take this further — to create a truly single, world-wide standard. However, the standardisation environment has changed since the early work on GSM and it has been necessary to modify the approach. In particular, there are several key differences which have influenced the way in which 3G standards are being created:

- GSM had been created by ETSI (European Telecommunications Standards Institute) as a European regional standard, and to create a world standard needs the involvement of other standards bodies, for example from the Far East and North America,
- the need to work on a world scale has introduced a wider variety of political and cultural influences on the standards work, where conflicting agendas can put the goal of a single standard at risk,
- substantial investments have now been made in second generation systems and infrastructure — whereas in the transition from first to second generation it had been possible to start with a clean sheet of paper, for third generation there is a strong commercial drive to reuse existing infrastructure and create an evolutionary approach, in order to capitalise on past investments,
- the extent of roaming capabilities with GSM is significant across the globe, and different networks will proceed at different rates towards third generation, but users of 3G will not accept a reduction in roaming capability and this requires intelligent handling of roaming between 3G and 2G — this situation will also lead to more complex combined 2G and 3G handsets,

- the technology scope of 3G has broadened considerably to embrace data and Internet aspects — while GSM is a largely self-contained standard, for 3G it is necessary to draw on component standards from other bodies, such as the Internet Engineering Task Force (IETF) IP protocols, and this requires co-ordination and collaboration across different standards forums, where quite different standardisation processes are used.

These and other aspects led, in December 1998, to the creation of a new partnership project known as 3GPP (3rd Generation Partnership Project), involving several regional standards bodies working together.

2. Why standards are important

The development of standards benefits users and all sectors of the mobile industry — suppliers, operators and regulators. Examples of these are given in Table 1.

On the counter side, it is important that standards do not stifle innovation, and that product and service differentiation can still be achieved.

In practice, such is the importance of standardisation to the mobile industry, that the creation of standards is a key part of the development process. New terminals and network systems simply cannot be launched without standards in place. One measure of the importance could be the scale of effort on 3G standardisation, where tens of thousands of engineers are already engaged in the standards process. At any time of any day, you could be reasonably certain that there is a mobile standards committee in session somewhere in the world.

3. The 3G standard

The 3G standard is being created against the general background of user expectations and industry imperatives. In theory, a single standard could perhaps be created with a single standards body, including all interested parties. In practice, there are different interests and starting points, in particular the desire to evolve from various second generation start points. Figure 1 shows the estimated market share (customer numbers, world-wide) by technology type. While the GSM technology dominates this chart, there are some important other starting points for evolution to 3G, including the TDMA (DAMPS) system, used widely in North America, PDC used in Japan and the CDMAone standard used in North America and the Far East. To take account of these interests, within the ITU the concept of a family of standards, known as IMT2000, was developed.

In fact a total of five different air interface standards are included in this IMT2000 family, these being:

Table 1 Benefits of standardisation.

Economies of scale	Operators benefit from lower cost infrastructure. User benefit from low cost terminals. Suppliers benefit from large and stable market.
Competitive procurement	Open standards enable interworking of network elements from different suppliers, avoiding long-term lock-in to a single supplier.
Service portability	Users can change to different terminal equipment or move between service provider and network operators while retaining a similar service.
Roaming	Services can be made available outside the user's home network with the goal of having exactly the same look and feel.
Regulatory	Regulators can specify standards for spectrum use, giving a controlled, yet open and competitive basis for licensing. Operators and suppliers can access new markets without being disadvantaged by local standards requirements.
Simplicity of service	Services and terminals operate in a similar fashion, making it easier for users (e.g. use of + symbol for international calls).
Service interworking	Standards can be used to ensure that services work well across different networks.
Applications and services environment	Network and terminal standards enable the development of 3rd party applications, and allow the development of 3rd party value added services.
Spectrum efficiency	Standards enable radio technologies to work together, or in close proximity within the radio spectrum, without undue interference.
Radio technology harmonisation	Standards are needed to ensure that different technologies can work in harmony in the same or similar coverage area without undue interference.

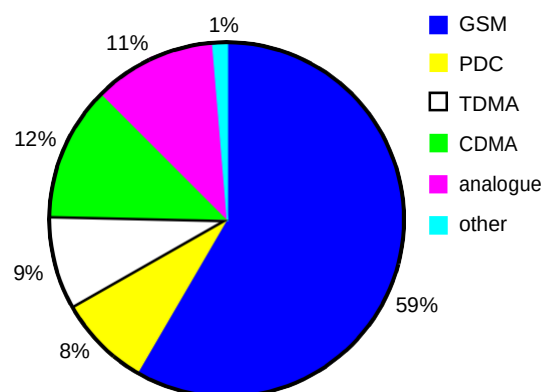


Fig 1 Estimate of market share by technology type.

- CDMA-DS (direct sequence) — specified by 3GPP, also known as UTRA, FDD mode,

- CDMA-MC (multi-carrier) — specified by 3GPP2, also known as cdma2000,
- CDMA-TDD (time division duplex) — specified by 3GPP, being a combination of the UTRA TDD mode together with the Chinese TD-SCDMA,
- TDMA single carrier — specified by 3GPP, also known as EDGE,
- FDMA/TDMA — specified by ETSI and based on the existing DECT standard.

In addition, there are two different core network standards, one based on evolution from GSM and the other based on evolution from the North American IS41 standard.

While this may seem like a perplexing range of options, there has been some effort to harmonise the different specifications, such that there is some alignment of the key technical parameters within the three CDMA modes, and there are developments to enable each air interface to be used with either of the core network standards. With this set of specifications, each major interest group can find an appropriate evolution path (see Table 2).

Table 2 Evolution options for different interest groups.

2G investment	Example operator*	Evolution options
GSM	BT Wireless	UTRA FDD and/or UTRA TDD with evolved GSM core. EDGE with GSM core.
DAMPS	ATT Wireless	EDGE with evolved GSM or IS41 core.
CDMAone	Sprint PCS	cdma2000, with IS41 core.
PDC	NTT DoCoMo	UTRA FDD with GSM evolved core.

*Note — the 'example operator' column shows examples of operators with the respective 2G investment and does not imply any declared intent to follow any particular evolution path.

From an operator perspective, while this approach gives a reasonable upgrade path to 3G, the variety of standards does present some problems. For global roaming, it may be necessary to support several standards, in order to allow access to service in those parts of the world where the home standard has not been implemented. This will require the use of multi-standard terminals, which currently represent a technology challenge, and are likely to have a cost premium. In addition, it will be necessary to develop cross-standard network interfaces and commercial arrangements. Despite this, the 3G standards landscape is a considerable improvement on the existing 2G multi-standard environment.

From a supplier perspective, the stabilisation of a standards family provides some good opportunities to enter into markets which have been difficult to access. For example, European suppliers have not been able to

penetrate into the Japanese market due to the unique standard in use in Japan, while Japanese suppliers have not capitalised on the opportunity to supply to the world GSM market, due to focus on their home market. However, the range of standards and standards bodies does present a significant resourcing challenge, for even the biggest suppliers. This is exacerbated by the fact that all standards options are developing in parallel.

For regulators and governments, the openness of a 3G standards set helps in removing artificial trade barriers, and gives an opportunity to attract competitive overseas bidders to enter into the 3G licensing processes.

4. 3G standards developments — who is doing what?

4.1 3GPP

The GSM community, including ETSI and ANSI-T1 in the USA, along with several Far Eastern standards bodies (ARIB and TTC from Japan, TTA from Korea and CWTS from China), has been brought together by 3GPP [1]. The broad objective of 3GPP is the development of a 3rd generation standard based on a direct sequence wide-band CDMA or time division duplex radio interface, coupled into an evolved core network based on GSM Release 98. This makes a significant advance on GSM by providing much higher data rates, but retains the GSM core network, allowing 2G/3G seamless roaming. Several initiatives which were already in place for GSM are also extended significantly, for example the SIM application tool-kit and the mobile execution environment (MExE), both of which allow a highly customisable terminal environment.

4.2 3GPP2

3GPP2 [2] is another global initiative with support from TR.45 in the USA, ARIB and TTC from Japan, and TTA from Korea. It defines the cdma2000 standard which builds on the 2G CDMAone standard. Although data rates are increased roughly in line with the 3GPP standards, the core network is, however, still based on the IS41 core network, making roaming between cdma2000 and 3GPP systems difficult.

4.3 ITU

The ITU [3] continues to have a role to play in the development of mobile standards. For some time, the ITU has had a programme of development work under the 'IMT 2000' banner. When the 3GPP and 3GPP2 bodies emerged as strong developers of 3G standards, the ITU agreed to provide an umbrella framework so that these two standards bodies could be recognised by the ITU as developing the detailed specifications, along with ETSI for the enhanced DECT specification. Work inside the ITU and in groups of ITU members has resulted in significant harmonisation

efforts which have brought 3GPP and 3GPP2 radio aspects much closer together.

4.4 3G.IP

3G.IP was born in May 1999 out of a desire to bring mobile services firmly into the 'Internet age'. Its primary goal was to put the success of 2G mobile systems, particularly those based on the GSM core network, together with the rapid growth of the Internet and the increasing interest in telephony and other real-time services over the Internet. It started modestly, with the objective to make rapid progress by bringing together like-minded companies (3G systems manufacturers and operators) who could develop the core principles for transporting IP-based multimedia services over a 3GPP system based on EDGE or UTRA.

3G.IP was very successful in establishing an agenda towards 'all-IP' and helping 3GPP to develop the first draft architecture, the first step towards a complete IP multimedia system. Once documents with proposals started to find their way into 3GPP, however, it became clear that 3G.IP could not make the desired progress without becoming much more open and allowing other companies to participate. So 3G.IP started to admit other companies towards the end of 1999, becoming completely open early in the year 2000. 3G.IP has no subscription charges and the only prerequisite for joining is the signing of an agreement which may be downloaded from its Web site [4].

4.5 IETF

The IETF [5] is focused on the development of protocols which run over an IP stack. As mobile standards migrate more and more towards IP-based services it becomes more important that the IP service standards take mobile into consideration. There is currently much interest in the IETF in further development of IETF protocols relating to mobile, including call-control protocols such as SIP, mobility services such as mobile IP, and transport efficiency aspects such as IP header compression. The IETF does not consider system aspects and therefore a close dialogue between the mobile standards community and the IETF is required to produce the right standards which help the system to work effectively.

4.6 WAP Forum

In 1997 several different manufacturers started to develop proprietary methods for converting Internet content into a more compact format for transmission over expensive and bandwidth-limited mobile data channels. It was during a session in a subgroup of ETSI SMG, responsible for the GSM standards at that time, that some of these manufacturers presented their ideas to the standards community. The ETSI standards community was interested, but

disappointed that these ideas were not brought into ETSI, as it was obvious that operators could not support multiple different protocols according to the handsets being used at the time by their subscribers. So these manufacturers were given a clear message that they must work together or their ideas would not take off. The WAP Forum [6] was born later that year, with the objective of defining a standard 'micro-browser' to run on mobile handsets, and a suite of protocols which allow that micro-browser to interact with a network server. WAP micro-browsers can be implemented on a variety of 2G handsets, including GSM, CDMAone and US TDMA handsets. During the year 2000, WAP telephones have started to appear on the market and the WAP Forum is moving on to providing a richer environment for delivering Internet content to mobiles.

4.7 Mobile Wireless Internet Forum (MWIF)

While 3G.IP focused on the delivery of an IP multimedia system which builds on 3GPP Release 99, MWIF [7] started early in the year 2000 to study how the existing Internet paradigm could be made mobile. MWIF members come from 3G operators and manufacturers, including mainstream Internet systems suppliers. MWIF also includes the ISP community. MWIF is now producing a proposal for a functional architecture which will be fed into 3GPP and 3GPP2 later this year. The MWIF approach is to define a solution which is independent of access technology and is, in general, much more radical than has been discussed in 3GPP to date, hinting at changing as many as possible of the protocols from today's telecommunications protocols to IP-based protocols.

5. The move to IP architecture and standards impact

Over the past couple of years there has been increasing interest in moving to generalised IP-based architectures and protocols and avoiding expensive specialist protocols and architectures for different implementations of the same service for mobile, fixed, tetherless, etc. In the 3G standards world, one of the most significant impacts is the use of 'voice over IP' technology within the mobile networks. 3G.IP developed an initial architecture which put together the IP call server approach used by both H.323 and SIP with the mobile architecture developed for 3GPP. Instead of carrying voice traffic through expensive MSCs, IP links are established to call servers using the basic IP bearer capability of the mobile network. The call server can then perform largely the same job as in the 'fixed' ISP-based networks, instructing a gateway to set up a call using 'voice over IP' or over the PSTN, and then instructing the mobile to establish another IP bearer channel with higher bandwidth to the gateway for transport of voice traffic.

For 3GPP, however, it is not as simple a process as this. There are a number of aspects which need detailed consideration inside the 3GPP standards process:

- the security and authentication mechanisms have to be examined to ensure that fraud and eavesdropping are avoided, while maintaining the ability to invoke lawful interception,
- the IP bearer channels for both signalling and voice traffic need to be of high enough quality to ensure that calls proceed without failure and that voice quality is equivalent to the circuit-switched world,
- the service or feature interaction between the call control model and additional services provided by operators, such as prepay, VPN, number translation, etc, needs to be handled to offer the same look and feel as the circuit-switched world,
- when roaming, all interactions must be handled smoothly so that the user does not perceive any difference between roaming on circuit-switched networks and roaming on IP-based networks.

The overall architecture for 3GPP has now been defined, and the additional functions required in the 3GPP core network have been termed the 'IP multimedia sub-system'.

Having addressed these considerations, there are the specific protocols to be considered. 3G.IP made an early decision to press for the use of the IETF session initiation protocol (SIP) as a standardised protocol to be used between the user equipment and the call server. This decision was also adopted by 3GPP. In principle, this means that the IETF standard SIP can just be slotted into place, but, in practice, there will need to be changes made to SIP to accommodate the needs of a mobile network. 3GPP has decided that it will encourage the development of these extensions within the IETF rather than making a 3GPP-specific version of SIP. Since the IETF will concern itself only with the protocol aspects, it is necessary for 3GPP to develop the overall system framework and develop the necessary additional function descriptions before the IETF can work out the details of the required extensions.

Overall, this means that the mobile standards landscape is moving from a position where all mobile standards for a particular system are developed in one standards committee structure to one where different standards structures must co-operate to develop the complete solution. The IP architecture is a particular challenge because the companies involved have to bring together small low-power mobile devices having hard-coded implementations with fast-moving IP standards which expect the latest code to be downloadable on to the end-user device.

6. Conclusions and future outlook on mobile standards

There can be little doubt that the pace of change in mobile is accelerating. Can the standards process keep up and continue to deliver the benefits of standardisation without delaying the introduction of new products and services? The future success of standardisation will be dependent on the ability to position standards in order to protect investments while giving freedom to innovate with new developments.

There is an increased speed of change and an expectation of ever shorter development lead times. However, this needs to be counterbalanced by the very high investment costs in introducing new network technologies, e.g. in the UK alone, the 3G licence cost to BT Wireless of £4bn, plus an expected network investment of a further £2bn, mitigates against a high rate of change. Putting together the world-wide costs of 3G and taking into account all of the different competing operators across all regions will result in a cost running to many hundreds of billions of pounds.

The key is to provide basic standards which provide a sound and stable platform, protecting the fundamental investments, while enabling a change of functionality and capabilities quickly and at low incremental costs. Some of the current developments will help us move to this paradigm:

- creation of linked standards families, giving evolution options and choices for implementation, e.g. the reuse of the GPRS core network in the 3GPP standards suite enables service and investment continuity during the transition to 3G — for this to work well, a long-term vision is required, such that the basic architecture decisions support future evolution,
- the move to IP-based architectures, where services applications can be developed quickly and supported on a simple, universal protocol structure — the creation of application programming interfaces (APIs) at both the network and the terminal is also a key enabler for this,
- the emergence of techniques such as software radio, where terminals and infrastructure can be re-configured by downloading or software upgrade to a new standard.

Another factor relating to the rate of change is the way in which standards are developed. This is now a resource-intensive (but vital) part of the development process. Already, standards are created in cyberspace, with electronic meetings, e-document development and e-voting processes. Even so, the lead time for significant standards developments, such as CAMEL, GPRS or 3G is still of the

order of 3—5 years. Even relatively small enhancements can take a year to standardise and a further year before deployment. So, one challenge for the industry is to streamline and automate the standards process, with increased use of development tools.

Standards can no longer be developed by small isolated committees. To produce high-quality mobile standards resulting in high-quality global mobile systems with full IP multimedia capability requires development within a number of different global standards organisations. The management and co-ordination of input into all the various forums is a big challenge for all companies in the industry, and, in particular, ensuring that deals struck between companies in one forum are upheld in a different forum will be very testing for all concerned. It is only the major standards players who will be in a position to drive results across all communities and create the right global mobile standards to create and enhance value for their shareholders.

Can standards keep up, and be created fast enough to meet commercial needs? Well, it is the commercial needs which drive the speed of standardisation, rather than vice-versa. The difference perhaps is that standards are driven by the overall industry commercial needs, often being a compromise, and perhaps delaying those who would benefit from a very high standards churn rate.

Overall, the outlook for mobile standards is highly positive — they are an intrinsic and essential component of network and terminal developments, and can clearly be seen to have played a major part in the success and growth of the mobile industry world-wide.

References

- 1 3GPP Web site — <http://www.3gpp.org>
- 2 3GPP2 Web site — <http://www.3gpp2.org>

- 3 ITU Web site — <http://www.itu.int/>
- 4 3G.IP Web site — <http://www.3gip.org>
- 5 IETF Web site — <http://www.ietf.org>
- 6 WAP Forum Web site — <http://www.wapforum.org>
- 7 MWIF Web site — <http://www.mwif.org>



Fred Harrison works in BT Wireless, where he is responsible for directing work on 3rd generation mobile standards. In 1998/99 he took a leading role in establishing the new third generation partnership project standards body (3GPP). He has also been active in the creation of the 3G.IP Focus Group.

He started his career with BT in 1974 as a sponsored student. He studied Electronic Engineering at Southampton University, graduating in 1978. He worked on optical fibre and microwave radio developments until 1990 when he moved to Cellnet, where he was responsible for the overall design and planning of Cellnet's radio network. He then spent two years in BT Group Technology prior to the formation of BT Wireless.



Kevin Holley graduated from Bristol University in 1985 with a BSc in Physics. He joined BT Laboratories that year and he began working on off-air analysis of analogue cellular signalling. His involvement in the global system for mobile communications (GSM) standards work began in 1988 with a study of the reliability of the proposed signalling mechanism. Later in 1988 he began work on the short message service (SMS). In 1989 he was seconded to Cellnet to work on GSM technology development. He returned to BT at Adastral Park in 1992, but has continued his involvement in GSM standardisation and development right up to the present day third generation (3GPP) standards where he is mostly focused on the terminal aspects.

Appendix F



The Mobile
Broadband
Standard


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Questions about 3GPP Membership

Who can become an Individual Member of 3GPP and how much does it cost?
 Who may participate in 3GPP meetings?
 Who shall fill in the 3GPP Individual Member Application form?
 What shall I do if a 3GPP company or official contact details change?
 What are the different membership categories?
 Who may become an observer?
 Who may become a Guest Member and do guests have to pay any fees?
 Who can apply for market representative Partnership?
 Can an ETSI Observer become an Individual Member of 3GPP?
 Can an ETSI Applicant apply for 3GPP Membership?
 Can an ETSI Member apply for 3GPP Guest status?

Questions about 3GPP email exploder lists

Are there discussion archives for the 3GPP exploder lists?
 How do I subscribe to the 3GPP exploder lists?

Questions about Legal Matters

What is the 3GPP IPR Policy?
 What is the 3GPP policy on licensing?
 Who owns the Technical Specifications and the Technical Reports approved by 3GPP?
 Are meeting contributions to ETSI TC SMG publically available?
 Is permission needed to use the 3GPP logo in marketing collaterals or on a web site?
 Can I use computer code included with a 3GPP TS to implement a product?

Questions about 3GPP Specifications

How do I create the next Release version of a TS or TR?
 Where can the rules, protocols or software needed to develop applications for UMTS be found?
 What is the correlation between Stage 1, Stage 2 and Stage 3?
 Are the 3GPP specifications produced only in word?
 Which group works with specifications covering the use of the GSM codec (either in C or Java based)?
 Where can I find documents produced by the GSM MoU Group / GSM Association?
 Where would I find a document (e.g. UMTS 30.03 version 3.1.0) which does not appear on the status list?
 Where are all the Change Requests (CRs) located?
 Where are all the current ETSI SMG specs located?
 Which group works on Physical Layer aspects of UMTS/LTE?
 Where can I find the list of Abstract syntax notation (ASN.1) object identifiers?
 Where can I find the 3GPP Confidentiality and Integrity algorithms?
 What is a Release - how does specification version numbering work?
 Where can I find information on the current status of 3GPP specifications?
 What is the system for numbering specifications?
 What is the meaning of the text at the foot of the TS/TR cover page?

Questions about Technical Specification Group/Working Group

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Who can become an Individual Member of 3GPP and how much does it cost?

Individual Members are by definition members of the Organizational Partners of 3GPP. This means that members of standardization bodies such as ETSI, ARIB, TTA, TTC, ATIS and CCSA have a right to take part in 3GPP. If your company becomes an ETSI member, please be informed that for participation in 3GPP you need to pay 3 units of contribution as a minimum except SMEs, Users, Universities, Public Research Bodies who should pay 2 units (instead of 1).

ETSI Members' and associate members' fees are calculated by class. The class is derived from the member company's annual ECRT band (Electronics Communications Related Turnover) – see ECRT definition. Each class corresponds to a number of units. This number determines the contribution payable.

Example: If your organization declares an annual ECRT of up to 135€ million, you would need to pay 2 Units of Contribution (corresponding to 9380€ per year) plus an additional UoC for participation in 3GPP of 3380€ (see fees table). Members joining ETSI during the 2nd half of the year benefit from a 50% rebate on the membership fee of the current year. In this case, you would pay 12760€ minus 50% = 6380€ for yyyy.

Who may participate in 3GPP meetings?

To attend a 3GPP meeting, you must be a 3GPP Individual Member (i.e., you must be a Member of one of the Organizational Partners involved in the project; ARIB, CCSA, ETSI, ATIS, TTA, TTC or TSDSI). A non-member company should seek membership with one of the above partners to be eligible to contribute and participate at 3GPP Meetings.

Who shall fill in the 3GPP Individual Member Application form?

The person legally responsible for the requesting company shall fill in the form.

What shall I do if a 3GPP company or official contact details change?

All changes of correspondence should be notified to ETSI Membership and 3GPPMembership.
In case of change of official contact an ETSI Online (EOL) account will be created for the new contact.
Please note that as official contact person you can view and modify your personal and organization's contact details via the "Manage my membership" web interface.

What are the different membership categories?

The different membership categories of 3GPP are described in Article 4 of the 3GPP Working Procedures.

Who may become an observer?

The status of Observer may be granted by the Organizational Partners to an entity which has the qualifications to become a future Partner (see also 3GPP Working Procedures Article 10)

Who may become a 3GPP Guest Member and do guests have to pay any fees?

The 3GPP Guest status is for potential Individual Members who may be granted permission to participate in 3GPP for a maximum period of 6 months. Guest status is granted on a case-by-case basis by the Organizational Partners (see also 3GPP Working Procedures Article 10). If you like to apply for a Guest status, please complete the on-line 3GPP Application form.

No membership fees are requested for Guest applications. The Guest status is a one time only membership which is used to enable a company to decide whether or not they wish to become a full member (by joining one of the Partners).

Who can apply for market representative Partnership?

Organisation who have the ability to offer market advice to 3GPP and to bring into 3GPP a consensus view of market requirements (e.g., services, features and functionality) falling within the 3GPP scope (see also 3GPP Working Procedures, Article 7).

Can an ETSI Observer become an Individual Member of 3GPP?

An ETSI Observer cannot become an Individual Member of 3GPP. An ETSI Observer may "observe" all activities, but their participation is limited to the ETSI General Assembly only. Therefore, ETSI Observers have no participation rights in 3GPP. ETSI Observers have access to ETSI documentation and of course to 3GPP documentation since that is openly published on the web.

3GPP does have it's own category called "Observer" but that is entirely different and is used for potential Partners.

Can an ETSI Applicant apply for 3GPP Membership?

YES, an ETSI Applicant means that your request to become an ETSI Member will be addressed (and normally approved) at the next General Assembly and that the company has specified they want to participate in 3GPP activities. See also above regarding 3GPP fees.

Can an ETSI Member apply for 3GPP Guest status?

Yes, any ETSI Member can apply for a 3GPP Guest status by filling in the on-line 3GPP Application form.

Are there discussion archives for the 3GPP exploder lists?

Yes! To see the complete list please have a look here: Home page of listserv and scroll down until you find the list you are interested in. For example, the archives for the main RAN email list.

How do I subscribe to the 3GPP exploder lists?

All 3GPP email exploder lists can be found at list.3gpp.org. In order to subscribe to any of the lists, scroll down until you find the list you are interested in, then click on the link and on the right side of the page you will find Subscribe or Unsubscribe. Click on the link and follow the simple instructions. Delegates who already have an ETSI username and password should use the list management application on the ETSI site.

What is the 3GPP IPR Policy?

The 3GPP Organizational Partners have agreed that their IPR policies should be respected and that their respective members should be encouraged to declare "their willingness to grant licenses on fair, reasonable terms and conditions and on non discriminatory basis" (Article 3.1 of the Third Generation Partnership Project). For more information, look here >>>

The above-mentioned principles are further reflected in Article 55 of the 3GPP Working Procedures which request that each Individual Members should declare "at the earliest opportunity, any IPR which they believe to be essential, or potentially essential, to any work ongoing within 3GPP".

What is the 3GPP policy on licensing?

Some aspects of 3GPP systems are covered by essential Intellectual Property Rights (IPR) - that is, patented technologies without which equipment cannot be implemented. The IPR vests in - i.e. the patents are held by - individual companies, and not by 3GPP itself or any of its Organizational Partners (OPs). All Individual Members of 3GPP abide by the IPR policies of the OP to which they belong; all such policies are broadly similar see also "What is the 3GPP IPR Policy", and require IPR holders to make licences available to all third parties, whether or not they are 3GPP Individual Members, under fair, reasonable and non-discriminatory (FRAND) terms.

Neither 3GPP nor its component OPs offer an IPR search service. It is the responsibility of each manufacturer / system implementor to seek and obtain its own licenses from the individual IPR holders. For more information, and a guide to the IPRs declared to each 3GPP OP, look here>>>

Who owns the Technical Specifications and the Technical Reports approved by 3GPP?

According to the Article 3.2.2 of the Third Generation Partnership Project Agreement, the 3GPP Organizational Partners jointly own copyright on the Technical Specifications and the Technical Reports approved by 3GPP.

Are meeting contributions to ETSI TC SMG publically available?

ETSI TC SMG meeting documents can be found on the ETSI docbox file server. Access is limited to bona fide representatives of ETSI member organizations. These, together with early versions of the GSM specifications, have been gathered together into a set of DVDs "A Technical History of GSM" available to ETSI members via the ETSI WEB store.

The GSM standardization work was transferred from CEPT to ETSI in 1991. TC SMG was closed at meeting #32 and TC MSG created to continue the work. Like almost all ETSI Technical Committees, participation in TC SMG and its working groups was open to all ETSI member organizations. That is, any bona fide representative of an ETSI member was free to participate. Exceptionally, other individuals could participate by express invitation of the Chair. Each meeting report contains a list of participants with their corporate affiliations.

Until the late 1990s, all meeting documents were circulated in paper form. Electronic files started to take over from paper in around 1997. Meeting documents ("TDocs") were distributed by post (later, by fax) in batches prior to the meeting, to those persons registered as regular participants in SMG or the appropriate working group, and many more documents were produced during the course of the meeting itself. Although a provision existed (and still exists) in the context of the IPR Policy for contributors to place restrictions on the distribution of TDocs via a formal notification at the time the document was provided, this was seldom if ever invoked. In the absence of such a condition, all TDocs were free of any restriction on subsequent distribution. Thus no restriction has ever been placed on how meeting participants dispose of the documents subsequent to their distribution before, during, or after the meeting. There were no non-disclosure agreements.

ETSI maintains a paper archive of the SMG TDocs, and bona fide representatives of current ETSI members can, by appointment, make an accompanied search of the archives. This facility extends to members which may not have been members at the time the document was originally produced.

TC-approved versions of ETSI "deliverables" (see ETSI Directives for formal definition of this term) would have been transferred by the support officer of the committee to the secretariat team responsible for publishing ETSI deliverables. That team would have made cosmetic (non-technical) modifications to the draft deliverables before issuing them. Depending on the type of "deliverable", those documents would have been issued via National Standards Organizations (NSOs) either for immediate publication, or first via either a one-step or two-step national public enquiry and vote process prior to final publication by ETSI. In ETSI parlance, "publication" of a deliverable is the final step in the development cycle of a technical standard, and has a precise meaning. That meaning is not "making publically available", since draft deliverables released for public enquiry or for vote are "publically available" but not yet "published".

If the confidentiality conditions described above had been imposed on a TDoc by its authors, if the text of that TDoc was in due course incorporated into an ETSI "deliverable", then those conditions are regarded as annulled from the date on which the deliverable is published.

Collections of TDocs / meeting reports have from time to time been made available to ETSI members in CD or DVD form, look here >>>

Is permission needed to use the 3GPP logo in marketing collaterals or on a web site?

ETSI (European Telecommunications Standards Institute) is the sole owner of the following acronyms:

ETSI,
DECT,
UMTS,
3GPP and
TIPHON,

as well as the ETSI, TIPHON, 3GPP and LTE logos. ETSI Members are authorized to use these Trade Marks in accordance with Collective Letter 1943. Authorization is needed to use the above mentioned acronyms and logos.

For further information contact the ETSI Legal Team or see <http://www.3gpp.org/about-3gpp/legal-matters/logo-use>.

Can I use computer code included with a 3GPP TS to implement a product?

Yes, but read this clause carefully. Some 3GPP Technical Specifications include computer code such as ASN.1 or XML (protocols), ANSI-C language (codecs), ...; and some include test vectors (codecs) for verifying implementations. These are published to allow users of these TSs to implement real-world products. No permission is required from 3GPP or its Organizational Partners (OPs) to use this code in the design of products - e.g. to compile the C to implement a codec in machine code.

Nevertheless, there may be essential IPR involved with such a design, and implementers are obliged to seek licences from IPR owners to use that technology. See also [What is the 3GPP policy on licensing?](#)

Moreover, the copyright of all 3GPP TSs and TRs vests jointly by all the 3GPP OPs. Other than for in-house copies for the purpose of further development of the 3GPP standard or for product design purposes, etc. you may not reproduce any part of a 3GPP TS or TR without seeking permission from 3GPP (e.g. from the ETSI Legal Team): use the procedure described on the legal area of this site. This means that you must not provide verbatim copies of source code (or lightly modified copies) without seeking permission from 3GPP.

Finally, you are reminded that 3GPP TSs and TRs have no legal status, and you should not design products directly to them. See the advice notice on the cover page of every 3GPP TS and TR. Instead, use the technically identical publication of one of the OPs.

How do I create the next Release version of a TS or TR?

There are three ways of upgrading a Release X spec to Release X+1:

1. Write a CR to the latest Release X version to incorporate technical changes to satisfy a Release X+1 work item, and on the cover sheet showing the WI code for that work item and the Release code for Release X+1. If the CR is approved at TSG level, this will automatically create the first instance of the next Release of the spec.
2. Make a specific request to the TSG to upgrade the latest version of the spec from Release X to Release X+1. This might be needed if the functionalities of the two Releases diverge, though backwards-incompatibility is to be avoided if possible.
3. Do nothing. If a spec has survived unchanged throughout the period during which Release X+1 was developed, when Release X+1 is frozen, all such specs will automatically be upgraded from Release X to Release X+1 without technical change.

Where can the rules, protocols or software needed to develop applications for UMTS be found?

A good place to start is on the 3GPP website, and particularly the specifications list.

What is the correlation between Stage 1, Stage 2 and Stage 3?

A three-stage methodology as defined in ITU T Recommendation I.130 is applied in 3GPP according to TR 21.900 clause 4.1:

- Stage 1 is an overall service description from the user's standpoint.
- Stage 2 is an overall description of the organization of the network functions to map service requirements into network capabilities.
- Stage 3 is the definition of switching and signalling capabilities needed to support services defined in stage 1.

Are the 3GPP specifications produced only in word?

The 3GPP specs are published as ETSI deliverables, and these are available in PDF form <http://www.etsi.org/standards-search>. But you can download a free Word viewer (i.e. read only) from the Microsoft web site. PDF is inherently secure (more so than html, in fact), and because WordViewer is very simple (it can not handle macros, for example), it is pretty safe too. ETSI has no plans at present to publish specifications in plain text or in html.

Which group works with specifications covering the use of the GSM codec (either in C or Java based)?

The SMG STC SMG11 and 3GPP SA4 specifications, available from <http://www.3gpp.org>, respectively deal with this. It gives you a list of specifications via the status list (look for the GSM specs in the MS-Access database at : http://www.3gpp.org/ftp/Information/Databases/Spec_Status/)

and you can then download the specs you need. If you do not have an ETSI EOL account, you can download the ETSI equivalent standards from <http://www.etsi.org/standards-search>.

Where can I find documents produced by the GSM MoU Group / GSM Association?

These documents are not available via 3GPP or its Organizational Partners. You must address this question to the GSM Association.

Where would I find a document (e.g. UMTS 30.03 version 3.1.0) which does not appear on the 3GPP Status List?

Look at <http://www.3gpp.org/DynaReport/3003U.htm>. It is a document stemming from the initial TC-SMG studies on UMTS, not a product of 3GPP. It was, in fact, published as an ETSI deliverable, TR 101 112, and this may be downloaded via <http://www.etsi.org/standards-search>.

Where are all the Change Requests (CRs) located?

The CR database can be downloaded under: http://www.3gpp.org/ftp/Information/Databases/Change_Request/

Or you select the specification under:
<http://www.3gpp.org/specifications/79-specification-numbering>

The information is classed by series so it is very easy to locate the particular specification which interests you. After selecting a series and a specification you will find a line "Change Requests for this spec: click here." which provides a web list of the CRs for this specification.

If, for example, you are looking for CRs on GSM 08.18 then you would use this link:
<http://www.3gpp.org/ftp/Specs/html-info/0818-CRs.htm>

<http://www.3gpp.org/DynaReport/0818><http://www.3gpp.org/ftp/Specs/html-info/0818-CRs.htm>
-CRs.htm

Where are all the current ETSI SMG specs located?

All the ETSI SMG specs are located here [archives for the GSM documentation](#). An ETSI On-Line account is needed to access these documents. You can apply for an ETSI online account.

In general, the cross-referencing between GSM and ETSI deliverables, and between 3GPP and ETSI deliverables may be found at <http://webapp.etsi.org/key/queryform.asp>

Which group works on Physical Layer aspects of UMTS/LTE?

The radio aspects are standardised in TSG-RAN. The technical work is done in the 5 Working Groups of RAN (WG1 radio layer 1, WG2 radio layer 2/3, WG3 interfaces, WG4 RF measurements, WG5 Mobile Terminal Conformance Testing).

So Physical Layer aspects are addressed by TSG RAN WG1. Their UMTS specifications are numbered 25.2xx and their LTE specifications are numbered 36.2xx.

The temporary documents (meeting documents etc.) of WG1 are stored on ftp://ftp.3gpp.org/TSG_RAN/WG1_RL1.

Where can I find the list of Abstract syntax notation (ASN.1) object identifiers?

The expandable list of object identifiers is available here >>>. To see the formal definition of the object identifiers, see the document cited on the right. The tree is not necessarily complete; further extensions may be included in the referenced document. For more information look here >>>.

Where can I find the 3GPP Confidentiality and Integrity algorithms?

The 3GPP Confidentiality and Integrity algorithms F8 & F9 (KASUMI) have been developed through the collaborative efforts of the 3GPP Organizational Partners. For more information and in order to download the algorithms look here >>>.

What is a Release - how does specification version numbering work?

To meet new market requirements, 3GPP specifications are continually being enhanced with new features. In order to provide developers with a stable platform for implementation while at the same time allowing the addition of new features, the 3GPP uses a system of parallel "releases". For more information look here >>>.

Where can I find information on the current status of 3GPP specifications?

New versions of many 3GPP specifications are made available shortly after the 3GPP TSG plenary meetings which take place four times a year (March, June, September and December). In order to identify what the current version is or and how to find information about older versions of specifications look here >>>.

What is the system for numbering specifications?

All 3G and GSM specifications have a 3GPP specification number consisting of 4 or 5 digits. (e.g., 09.02 or 29.002). For a more complete description and examples look here >>>.

Who are the TSG/WG Officials and Support team and where can I find their contact details?

Each TSG/WG has a Chair, up to two Vice-Chair (three Vice-Chair in the case of TSGs and a secretary who is a member of the support team. From the 3GPP structural organization page, click on the TSG or WG of interest to reach its home page. From there, click on the "officials" entry in the table.

Where can I find the Terms of Reference for my TSG/WG?

The current Terms of Reference for each TSG/WG appear on the web pages of each TSG/WG.

May I become an Official?

The TSG Chair and Vice Chair are elected by the Technical Specification Group from amongst the Individual Member representatives. Each TSG can elect a maximum of two Vice Chair. Once elected, these candidates are proposed to the PCG for appointment.

The Working Group Chair and Vice Chair are elected by the Working Group from amongst the Individual Member representatives. Each Working Group can elect a maximum of two Vice Chair.

A candidate for TSG or Working Group election shall provide a letter of support from their Organization and nominations may be made up to the point when an election takes place.

The TSG Chair and Vice-Chairs shall be appointed by the PCG on the proposal of the TSG.

The Chair and the Vice-Chairs shall be appointed for a two year term of office. The Chair and Vice-Chairs may be appointed for one further consecutive term. If, at the end of a Chair or Vice Chairs second term, no other candidates are available, the Chair or Vice Chairs may be appointed for a further term.

Chair and Vice Chairs should not be from the same region, Organizational Partner, or from the same group of companies, unless no other candidate is available.

Successive Chairs should not be from the same Organizational Partner, the same region or from the same group of companies, unless no other candidate is available

How do I register for a meeting?

To register to any 3GPP TSG/WG meeting, please go to the Meetings tab on the 3GPP Ultimate portal (3GU) at <https://portal.3gpp.org/>, log in with your EOL credentials, and click "Not registered" in the Registration column of the meeting in question. When registration is complete, you will receive a confirmation email. Keep this email, it contains important information, without which you will not be able to confirm your presence!

Once you are at the meeting you have to "Check-in" to confirm your presence at the meeting itself. To check in, open the registration confirmation email and click on the check-in URL. This will take you to a page on the local meeting server (not the Internet). After you have checked in, your token will be sent to the main 3GPP server, and the web-based participants list will now show "yes" in the Participated column. Obviously you must be physically present at the meeting venue to be able to reach the local server.

Who can submit a change proposal on any 3GPP specifications to 3GPP?

Any bona fide representative of any 3GPP Individual Member (see list via the first sentence at <http://www.3gpp.org/membership>) can present a technical contribution - for example, a Change Request - to any 3GPP TSG or WG meeting.

If a change proposal is submitted how long does it take for it to get approved?

The usual procedure is that the responsible Working Group will examine a CR and agree it (or revise it until such time as it be agreeable - or not!). Having been agreed at WG level, it is packaged with related CRs and sent to the TSG plenary, where it will be discussed if necessary and then - if appropriate - formally approved. Within a matter a few weeks at most, a new version of the Specification is produced, which includes the contents of the TSG-approved CR.

TSGs meet every three months, and WGs meet at least once between each TSG meeting (sometimes two or occasionally even more times). Thus from inception of a CR to its approval is normally a matter of a few weeks, depending on the point in the meeting schedule of the WG and TSG concerned.

How to get a user name and password for "Reserve a Document Number"?

You need to request an EOL account via: <http://webapp.etsi.org/createaccount/form.asp> (username and password will then be sent to you by separate email).

How do I obtain a document number for my contribution?

Delegates wishing to make contributions must first obtain a document number either from the secretary or automatically via an on-line application "Automatic Document Numbering (ADN)" which is used by some groups.

You need a user name and password to "Reserve a Document Number" (see above).

Where can I download documents for an upcoming meeting?

Each TSG/WG has a specific area allocated on the 3GPP ftp server. For example TSG SA look here ftp://ftp.3gpp.org/tsg_sa/TSG_SA/. It is advisable for delegates attending a meeting to download the documents available prior to the meeting from the ftp server and onto their personal computers.

Where can I find a temporary document template?

The document template is made available by each TSG/WG in the meeting respective folder on the ftp server (see above).

What is my role when my TSG/WGs has to approve a deliverable?

Approval of Technical Specifications and Technical reports by a TSG shall normally be by consensus. Where consensus cannot be achieved in the TSG a vote may be taken.

When Technical Specifications and Technical Reports become sufficiently stable, they shall be put under change control of the relevant TSG. The further elaboration of these Technical Specifications and Technical Reports shall be achieved by Change Requests (CRs) to be approved by the TSG.

What are the different types of deliverables?

3GPP shall prepare, approve and maintain documents known as Technical Specifications and Technical Reports. Such documents shall be drawn up by the TSGs and shall, following approval at that level, be submitted to the participating Organizational Partners to be submitted to their respective standardization processes.

Can I write an 3GPP Document myself?

Why not?! If you wish to propose a deliverable then bring it to the attention of your Chair and the other members of the TSG/WG in order to discuss the subject.

Each proposed new Work Item shall be supported by at least four Individual Members, and their names shall be recorded in the Work Item definition prepared for the TSG approval. One or more persons shall be named as Rapporteur for the proposed Work Item, and the Rapporteur shall act as the prime contact point on technical matters and for information on progress throughout the drafting phases. The supporting Individual Members are expected to contribute to and progress the new work item throughout the drafting phases.

In addition to the above, TSGs shall approve new Work Items, giving all essential parameters. The proposal shall be

entered into the 3GPP work programme, clearly marked as a new entry, for which a unique reference identity shall be allocated.

Do I and my company have to support my TSG/WGs Work Items?

Neither you or your company is obliged to support the work items of your TSG/WG, however it is normal that if you and your company are supporting members of a Work Item that you be in agreement with their work and will normally support the production of the related deliverable.

Do I need a password and user name to access the 3GPP Web site ?

No password is needed to access any information on the 3GPP Web site, all information is openly published.

Can you give me information about which companies manufacture particular types of equipment. Or about what services are available on particular networks?

No. The 3GPP Support Team must remain neutral and must not show bias to any of its Individual Members. Such information may be available from the Global Mobile Suppliers Association (www.gsacom.com) where you will find a statistics area which could be of help.

How can I determine when a meeting contribution document (TDoc) became publicly available?

TDoc numbers start to be allocated some weeks before a 3GPP meeting; the authors then create them and they or the group's secretary uploads them to the public file server as soon as possible. Some may have been distributed to the group's members in draft form for review, using the email exploder, in advance of the final version becoming available, and for some groups, it is normal to distribute even the final TDoc via the exploder, from where the secretary picks it up and copies it to the public server.

Most Groups have a deadline for their meetings by which TDocs should have been uploaded. Contributions uploaded after this point are considered to be "late" and will be addressed during the meeting only at the Chair's discretion, depending on the time available. Typically, at the start of a meeting, most TDocs for which numbers have been reserved are available. However, during the meeting, it is normal for further TDoc numbers to be reserved and uploaded. Typically, the final number of TDocs can be double the number reserved at the start of the meeting. Such TDocs are not subject to the "late" rules described above because they are generally produced as a result of discussions during the meeting itself.

TDoc numbers are allocated sequentially, from lowest to highest.

This distribution on the group's email exploder is important, because once that happens, the document is effectively in the public domain, since membership of the exploder is open to all and is (almost) unpoliced.

As noted above, during the meeting, further TDocs are created, mostly revisions of ones available before the meeting, but usually some brand new ones too – for example, outgoing liaison statements. These are uploaded to the *meeting* server, but may or may not be uploaded to the *public* server during the meeting. (Since 2014, for most meetings, meeting server contents have been mirrored to a folder on the public server, but these copies are deleted after the end of the meeting.)

Soon after the end of the meeting – at worst within a few days – the TDocs created during the meeting are uploaded by the secretary to the public server. Occasionally, some matters from the meeting cannot be resolved until maybe one week later, and these might result in some very late TDocs which are produced well after the end of the meeting, and thus uploaded onto the public server correspondingly late.

When the secretary copies from the meeting server (or from their own PC) to the public server, they may opt to only copy the missing files (i.e. the new ones), which is the best approach; or they may decide to overwrite everything and thus do a complete refresh of the files on the public server, which will now get an upload date/time-stamp of the new upload. This latter approach is now deprecated but has sometimes happened; you can detect this most easily when a meeting shows the same date/time-stamp for all or nearly all TDoc files, and this date/time-stamp is after the end of the meeting.

In cases such as this, one has to descend to greater subterfuge to narrow down the likely "public availability" moment. The zip file for a TDoc typically contains a Word file which has its own date/time-stamp, which puts an absolute limit on the earliest moment that the TDoc could have become available [in that form](#).

Searching the group's email exploder archive (<http://list.etsi.org/scripts/wa.exe?INDEX>) on or about the suspected production date gleaned from the file date/time-stamp may well reveal the message in which the TDoc was *first* distributed, or perhaps the message by which the group's secretary announced that it was available on the server. Note however that this technique does not reveal any earlier versions of the TDoc which might have been circulated, either as draft versions of the identified TDoc or as other Tdocs which were ultimately revised into the actual TDoc of interest. In order to identify this latter case, it is necessary to refer to the official secretary's report of the meeting, where the train of revisions will be evident.

Some final considerations:

Some FTP tools will retain the original timestamp of a file when copying it to (or from) a server, whilst others will use the current time for the new copy.

The observed timestamp of a file depends on the time zone and the daylight saving time setting in force. Thus the apparent upload time of a given file may vary when viewed in summer compared to when viewed in winter.

Is it possible to determine the date and time of publication of a particular version of a 3GPP Spec?

During the drafting phase (versions lower than 3.0.0), 3GPP TSs and TRs ("Specs") are under the control of their authors ("rapporteurs") and are handled like normal meeting contributions (see above). Revised versions incorporating text agreed by the responsible working group are often made available by the rapporteur via the group's email exploder shortly after the end of the meeting at which such text was discussed. Consultation of the exploder archives can reveal this. Alternatively, a revised draft may be sent directly to the 3GPP Support Team, and it will be uploaded to the public file server (specs archive directory) shortly afterwards. Again, the time stamp of the Zip file can be relied upon to indicate when the upload occurred.

After formal approval by the TSG (versions 3.0.0 or greater), Specs are edited only by the Support Team. The first approved version is based upon the draft version formally approved by the TSG, and thereafter versions are generated whenever Change Requests are approved by the TSG. These versions are made available shortly after the TSG meeting at which such approval occurred. The date (year and month) shown at the top of the Spec's cover page indicates either the date of (the last day of) the meeting, or the month in which the new version was prepared. However a more precise indication of the date of availability can be obtained from the Spec's web page (via the table at <http://www.3gpp.org/specifications/>) where a precise date is shown in the "available" column.

More information on the procedures relating to Spec handing can be found in 3GPP TR 21.900.

Note that, in accordance with the statement at the foot of the cover page of all 3GPP Specs, 3GPP does not "publish" its Specs per se. Formal publication is the responsibility of the individual Standards Development Organizations which comprise the Organizational Partners of 3GPP. For further information, see <http://www.3gpp.org/specifications/63-official-publications>.

What formalities do I have to go through to get type approval for terminal equipment in Europe? Is there a single point of contact? What standards does my equipment need to conform to in order that I can place it on the market?

The legal requirements for the marketing of electrical products in Europe are governed by various EU Directives, depending on the nature of the equipment. Conformity with any of these Directives can be demonstrated by the use of Harmonized Standards, whose title has been cited in the Official Journal of the European Union. The lists of relevant standards can be found on the Commission web site which can be accessed via <http://www.newapproach.org/Directives/DirectiveList.asp>.

General electrical equipment is covered by the EMC Directive & Low Voltage Directives, see http://ec.europa.eu/enterprise/sectors/electrical/documents/index_en.htm.

The harmonized standards are listed at http://ec.europa.eu/enterprise/policies/european-standards/harmonised-standards/index_en.htm

More general information on procedures to declare conformity and how equipment should be marked are contained on the web sites related to the two Directives.

Radio Equipment and Telecommunications Terminal Equipment is covered by the Radio and Telecommunications Terminal Equipment Directive, see http://ec.europa.eu/enterprise/policies/european-standards/harmonised-standards/rtte/index_en.htm, which also includes a link to the one-stop procedure for "placing on the market" (http://ec.europa.eu/enterprise/sectors/rtte/documents/guidance/one-stop-procedure_en.htm).

Further information on EU harmonized standards relevant to telecommunications can be found on the ETSI site at <http://www.etsi.org/standards/looking-for-an-etsi-standard/list-of-harmonized-standards>, and the published standards themselves can be downloaded via <http://pda.etsi.org/pda/queryform.asp>.

Where can I find a list of technical terms and abbreviations used in 3GPP documents?

Individual terms are defined in each 3GPP Technical Specification and Technical Report. A compendium of terms and abbreviations can be found in 3GPP TR 21.905. ETSI maintains a list of all terms and abbreviations defined in its publications in "TEDDI".

What is the difference between a SIM and a USIM? What is a UICC?

The Universal Integrated Circuit Card (UICC) is the removable card bearing a silicon chip which holds 3GPP system subscriber information. The UICC is a general purpose card having both non-volatile memory and a general-purpose processor. Thus while it is used, in a 3GPP terminal, to hold (U)SIM information / applications, it is can also be used for other purposes, possibly unrelated to telecommunications. A common use of UICCs is in the well-known credit card format, and there is no reason why a single card could not hold (U)SIM functionality in addition to electronic purse / credit card functionality, or indeed any other application / data.

The Subscriber Identity Module (SIM) is the collection of functions which personalize a 3GPP terminal. The SIM contains static information about the services subscribed to, the phone number, the identity of the home network, a list of preferred roaming networks, and so on. The SIM also contains storage capacity for the subscriber's contacts' phone numbers. The term "SIM" is often misused for "UICC". The SIM concept was created during the early development of the GSM standards, and second-generation (based on GERAN) terminals up to and including Release 4 use SIM functionality.

For third generation systems (based on UTRAN), more complex functionality was called for, and the SIM evolved into the USIM or Universal Subscriber Identity Module. Release 99 3rd generations onwards use USIMs rather than SIMs.

For further information on the 3GPP Release system, see the [Release page](#).

I have transferred a video file from my phone to my PC. Where can I find a player for 3gp files?

The 3gp file format is defined in 3GPP TS 26.244 and in 3GPP TS 26.412. However, 3GPP has not defined a specific decoder. Your phone manufacturer may have supplied a player (check the CD-ROM which came with your phone) or look on its web site. Alternatively, search the Internet: a number of commercial players exist, and trial versions of some may be downloaded without charge.

Where can I find the specification of the SIM Lock feature?

In clause 8 of 3GPP TS 22.022.

What is the meaning of the text at the foot of the TS/TR cover page?

The present document has been developed within the 3rd Generation Partnership Project (3GPP TM) and may be further elaborated for the purposes of 3GPP.
The present document has not been subject to any approval process by the 3GPP Organizational Partners and shall not be implemented.
This Specification is provided for future development work within 3GPP only. The Organizational Partners accept no liability for any use of this Specification.
Specifications and Reports for implementation of the 3GPP TM system should be obtained via the 3GPP Organizational Partners' Publications Offices.

3GPP is not a legally incorporated body, and its technical work is conducted under the auspices of its Organizational Partners, each of which transposes relevant 3GPP specifications as its own publications. Thus the "raw" 3GPP TSs and TRs have no legal status per se. Under an agreement with the ITU at the time 3GPP was created, the ITU would not publish the output of 3GPP but would make reference to the publications of the participating Organizational Partners from its Recommendations; this state of affairs accounts for the text found on the cover of each 3GPP TS and TR. More information can be found [here](#).

Revision history:

- 2020-02-21: Minor improvements to the answer to FAQ "How can I determine when a meeting contribution document (TDoc) became publicly available?" (JMM)
- 2018-01-04: Clarifications to the answer to faq M12. (JMM)
- 2016-11-16: Correction of minor typo. (JMM)

ABOUT RELEASES	FULL MEETING CALENDAR	BROWSE KEYWORDS & TECH.
Release 18 Release 17 Release 16 Release 15 Release 14 Release 13 Release 12 Release 11 Release 10 Release 9 Release 8 Release 7 Release 6 Release 5 Release 4 Release 1999	Face to face meetings have been suspended for the time being. The calendar of replacement e-meetings is online at https://portal.3gpp.org/	5G NR (Rel-15) Common API Framework (CAPIF) Carrier Aggregation Explained Coordinated Vulnerability Disclosure (CVD) Control and User Plane Separation of EPC nodes (CUPS) DSS - Dynamic spectrum sharing HSPA LTE-Advanced LTE UAS - UAV V2X ...more keywords
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Appendix G



Project Management

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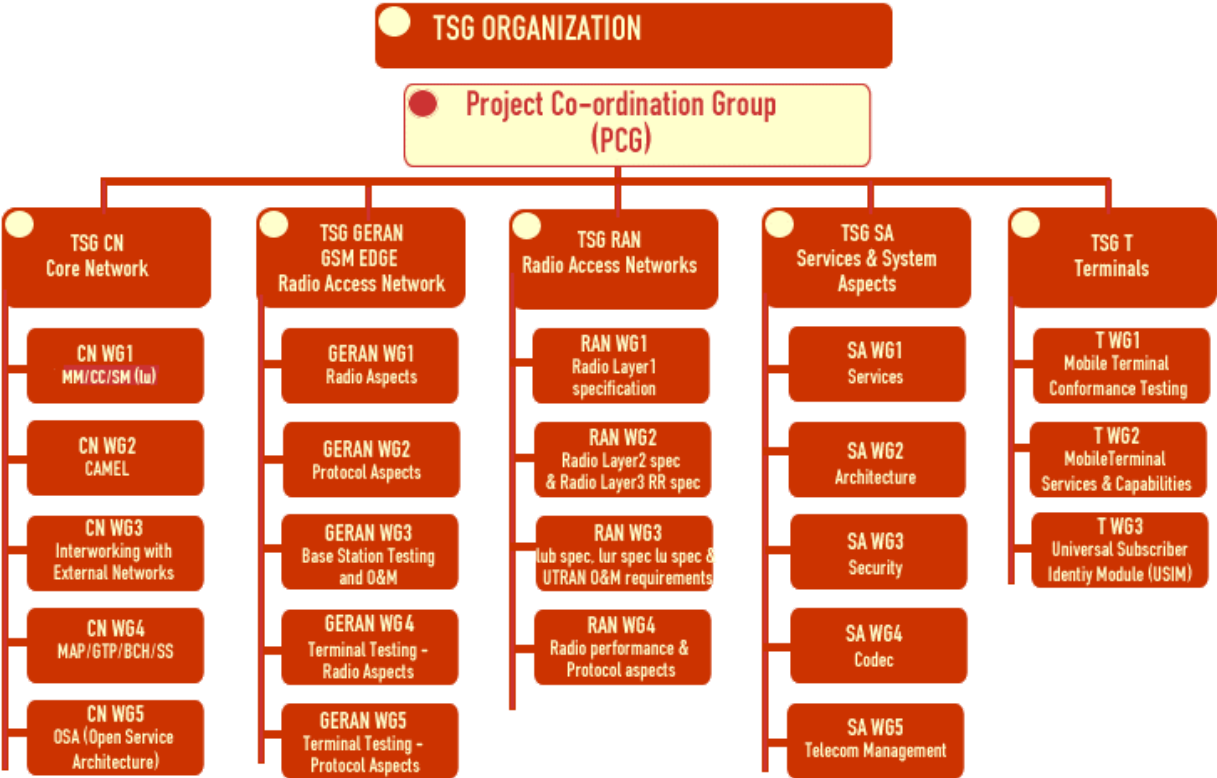
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Appendix H

WILEY

WCDMA FOR UMTS

Radio Access For Third Generation
Mobile Communications

Revised Edition



REVISED
AND
UPDATED
Spring 2001

Edited by Harri Holma
and Antti Toskala

WCDMA FOR UMTS

Radio Access For Third Generation
Mobile Communications

Revised edition

Edited by
Harri Holma and Antti Toskala
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in which at least two trees are planted for each one used for paper production.

4.5.3 cdma2000

The cdma2000 air interface proposal to ITU is the result of work in TR45.5 on the evolution of IS-95 towards the third generation. The cdma2000 proposal is based partly on IS-95 principles with respect to synchronous network operation, common pilot channels, and so on, but it is a wideband version with three times the bandwidth of IS-95. The ITU proposal contains further bandwidth options as well as the multi-carrier option for downlink. The cdma2000 proposal has a high degree of commonality with the Global CDMA 1 ITU proposal from TTA, Korea.

The cdma2000 multi-carrier option is covered in more detail in Chapter 13, as being currently standardised by 3GPP2.

4.5.4 TR46.1

The WIMS W-CDMA was not based on work derived from an existing second generation technology but was a new third generation technology proposal with no direct link to any second generation standardisation. It was based on the constant processing gain principle with a high number of multicodes in use, thus showing some fundamental differences but also a level of commonality with WCDMA technology in other forums.

4.5.5 WP-CDMA

WP-CDMA (Wideband Packet CDMA) resulted from the convergence between W-CDMA N/A of TTP1 and WIMS W-CDMA of TR46.1 in the US. The main features of the WIMS W-CDMA proposal were merged with the principles of W-CDMA N/A. The merged proposal was submitted to the ITU-R IMT-2000 process towards the end of 1998, and to the 3GPP process at the beginning of 1999. Its most characteristic feature, compared with the other WCDMA-based proposals, was a common packet mode channel operation for the uplink direction, but there were also a few smaller differences.

4.6 Creation of 3GPP

As similar technologies were being standardised in several regions around the world, it became evident that achieving identical specifications to ensure equipment compatibility globally would be very difficult with work going on in parallel. Also, having to discuss similar issues in several places was naturally a waste of resources for the participating companies. Therefore initiatives were made to create a single forum for WCDMA standardisation for a common WCDMA specification.

The standardisation organisations involved in the creation of the 3rd Generation Partnership Project (3GPP) [9] were ARIB (Japan), ETSI (Europe), TTA (Korea), TTC (Japan) and TTP1 (USA) as shown in Figure 4.2. The partners agreed on joint efforts for the standardisation of UTRA, now standing for Universal Terrestrial Radio Access, as distinct from UTRA (UMTS Terrestrial Radio Access) from ETSI, also submitted to 3GPP. Companies such as manufacturers and operators are members of 3GPP through the respective standardisation organisation to which they belong.

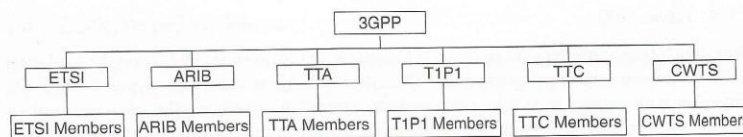


Figure 4.2. 3GPP organisational partners

Later during 1999, CWTS (the China Wireless Telecommunication Standard Group) also joined 3GPP and contributed technology from TD/SCDMA, a TDD-based CDMA third generation technology already submitted to ITU-R earlier.

3GPP also includes market representation partners: GSM Association, UMTS Forum, Global Mobile Suppliers Association, IPv6 Forum and Universal Wireless Communications Consortium (UWCC). In [9] there are up-to-date links to all participating organisations.

The work was initiated formally at the end of 1998 and the detailed technical work was started in early 1999, with the aim of having the first version of the common specification, called Release-99, ready by the end of 1999.

Within 3GPP, four different technical specification groups (TSG) were set up as follows:

- Radio Access Network TSG
- Core Network TSG
- Service and System Aspects TSG
- Terminals TSG

Within these groups the one most relevant to the WCDMA technology is the Radio Access Network TSG (RAN TSG), which has been divided into four different working groups as illustrated in Figure 4.3.

The RAN TSG will produce Release-99 of the UTRA air interface specification. The work done within the 3GPP RAN TSG working groups has been the basis of the technical description of the UTRA air interface covered in this book. Without such a global initiative, this book would have been forced to focus on a single regional specification, though with many similarities to those of other regions. Thus the references throughout this book are to the specification volumes from 3GPP.

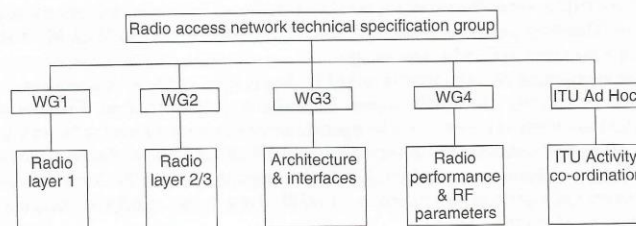


Figure 4.3. 3GPP RAN TSG working groups

During the first half of 1999 the inputs from the various participating organisations were merged in a single standard, leaving the rest of the year to finalise the detailed parameters for the first full release, Release-99, of UTRA from 3GPP. The member organisations have undertaken individually to produce standard publications based on the 3GPP specification. Thus, for example, the Release-99 UMTS specifications from ETSI are identical to the Release-99 specifications produced by 3GPP. The latest specifications can be obtained from 3GPP [9].

During 2000, further work on GSM evolution was moved from ETSI and other forums to 3GPP, including work on GPRS and EDGE. A new TSG, TSG GERAN was set up for this purpose.

4.7 Creation of 3GPP2

Work done in TR45.5 and TTA was merged to form 3GPP2, focused on the development of cdma2000 Direct-Sequence (DS) and Multi-Carrier (MC) mode for the cdma2000 third generation component. This activity has been running in parallel with the 3GPP project, with participation from ARIB, TTC and CWTS as member organisations. Recently the main concentration has been on the MC mode work, due to decisions resulting from the global harmonisation efforts.

4.8 Harmonisation Phase

During the spring of 1999 several operators and manufacturers held series of meetings to seek further harmonisation and convergence between the CDMA-based third generation solutions, WCDMA and cdma2000. For the 3GPP framework the ETSI, ARIB, TTA and T1P1 concepts had already been merged to a single specification, while cdma2000 was still on its own in TR45.5. As a result of several meetings and telephone conferences, the manufacturers and operators agreed to adopt a harmonised global third generation CDMA standard consisting of three modes: Multi-Carrier (MC), Direct Spread (DS) and Time Division Duplex (TDD). The MC mode was based on the cdma2000 multi-carrier option, the DS mode on WCDMA (UTRA FDD), and the TDD mode on UTRA TDD. The agreement was to phase in a modular approach in which both core networks could be used with all air interface alternatives, as described in Figure 1.4 in Chapter 1.

The main technical impacts of these harmonisation activities were the change of UTRA FDD and TDD mode chip rate from 4.096 Mcps to 3.84 Mcps and the inclusion of a common pilot for UTRA FDD. The work in 3GPP2 focused on the MC mode, and the DS mode from cdma2000 was abandoned. The result is that globally there is only one Direct Spread (DS) wideband CDMA standard, WCDMA.

4.9 IMT2000 Process in ITU

In the ITU, recommendations have been developed for third generation mobile communications systems, the ITU terminology being called IMT-2000 [10], formerly FPLMTS. In the ITU-R, ITU-R TG8/1 has worked on the radio-dependent aspects, while the radio-independent aspects have been covered in ITU-T SG11.

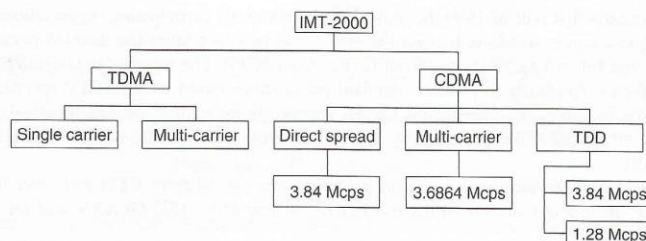


Figure 4.4. ITU-R IMT-2000 grouping

In the radio aspects, ITU-R TG8/1 received a number of different proposals during the IMT-2000 candidate submission process. In the second phase of the process, evaluation results were received from the proponent organisations as well as from the other evaluation groups that studied the technologies. During the first half of 1999 recommendation IMT-RKEY was created which describes the IMT-2000 multimode concept.

The ITU-R IMT-2000 process was finalised at the end of 1999, when the detailed specification (IMT-RSCP) was created and the radio interface specifications were approved by ITU-R [11]. The detailed implementation of IMT-2000 will continue in the regional standards bodies. The ITU-R process has been an important external motivation and timing source for IMT-2000 activities in regional standards bodies. The requirements set by ITU for an IMT-2000 technology have been reflected in the requirements in the regional standards bodies, for example in ETSI UMTS 21.01 [5], in order for the ETSI submission to fulfil the IMT-2000 requirements. The ITU-R interaction between regional standardisation bodies in the IMT-2000 process is reflected in Figure 4.5.

The ITU-R IMT-2000 grouping, with TDMA- and CDMA-based groups, is illustrated in Figure 4.4. The UTRA FDD (WCDMA) and cdma2000 are part of the CDMA interface, as CDMA Direct Spread and CDMA Multi-Carrier respectively. UWC-136 and DECT are part of the TDMA-based interface in the concept, as TDMA Single Carrier and TDMA Multi-Carrier respectively. The TDD part in CDMA consists of UTRA TDD from 3GPP and TD-SCDMA from CWTS. For the FDD part in the CDMA interface, harmonisation has been completed, and the harmonisation process is expected to continue for the CDMA TDD mode within 3GPP during 2000 and 2001.

4.10 Beyond 3GPP Release-99

Upon completion of the Release-99 specifications, work will concentrate on specifying new features as well as making the necessary corrections to Release-99. Typically such corrections arise as implementation proceeds and test systems are updated to include the latest changes in the specifications. As experience in various forums has shown, a major step forward in system capabilities with many new features requires a phasing-in period for the specifications. Fortunately, the main functions have been verified in the various test systems in operation since 1995, but only the actual implementation will reveal any errors and inconsistencies in the fine detail of the specifications.

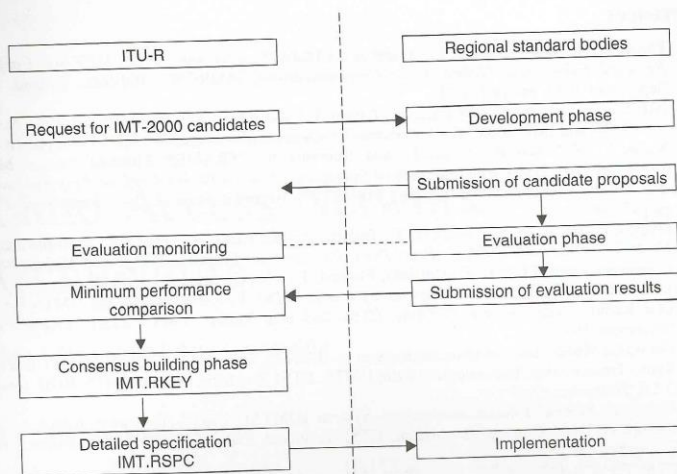


Figure 4.5. Relationship of ITU-R to the regional standards bodies

In 3GPP the next version of the specifications was originally considered as Release 2000, but since that the Release naming was adjusted so that next release is called Release 4 due to the 03/2001. Release 4 will contain only minor adjustment with respect to the Release'99. Bigger items are foreseen for inclusions in Release 5, including reaching for the data rates even up to the 10 Mbps in the downlink direction. Release 5 is due for the end of 2001. Release'99 specifications have a version number starting with 3 while Release 4 and 5 specifications have version number starting logically with 4 and 5 respectively.

During coming years, part of the process is to specify the extensions for connecting UTRA FDD to IS-41 based core networks. Work will be carried out on cdma2000 to allow connection to GSM-based core networks. This development will offer operators some degree of flexibility in selecting their third generation technology, assuming they are not aiming to launch such a service immediately, since Release-99 does not yet contain these options.

On the TDD side, further alignment is expected between the TDD mode in UTRA and the TDD mode from CWTS (China). This process is expected to continue after Release-99 is completed in 3GPP. 3GPP Release-4 is also planned to cover the lower chip rate (1.28 Mcps) TDD.

Other interesting developments are expected in the area of using IP based technology in UTRA. First step is going to be the IP based transport option in Release 4 and further releases are likely to see IP technology shaping the internal architecture of the UTRA Network (UTRAN). Also some of the protocols developed by the Internet Engineering Task Force (IETF) [12], such as robust IP header compression suitable for cellular transmission, are foreseen to be adopted as part the UTRA Rel'4 specifications.

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Appendix I

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| [T](#) | [T1](#) | [T2](#) | [T3](#) |

TSG SA WG3 (Security)

Overview:

TSG SA WG3 Security is responsible for the security of the 3GPP system, performing analyses of potential security threats to the system, considering the new threats introduced by the IP based services and systems and setting the security requirements for the overall 3GPP system. SA WG3 aims at providing at least the same level of security and confidentiality as the 2nd Generation digital systems (e.g. GSM) and to improve upon this wherever feasible. SA WG3 continuously analyse the security implications of new services being developed.

Useful links and information			
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2006-01-09:Election information and obituary removed
2005-05-17: Election information added
2005-01-10: link to meetings page changed
2004-10-07

Appendix J

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Dr.	Blom Roif	+46 10 7131707	Ericsson LA ETSI	3GPPMEM Ericsson LA ETSI	3GPPMEM	15/03/2007 23:00 F2F	Present	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Mr.	Blommaert Marc	+32 14 722 192	Nokia Networks Oy	Nokia Networks Oy	3GPPMEM	27/02/2007 23:00 F2F	Present	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Dr.	Bosch Peter	1.91E+10	Nokia ATIS	3GPPMEM Nokia ATIS	3GPPMEM	27/03/2007 22:00 F2F	Present	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Mr.	Brusilovsky Alec	+1 610 878 1851	Alcatel-Luc ETSI	3GPPMEM Alcatel-Luc ETSI	3GPPMEM	27/03/2007 22:00 F2F	Present	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Mr.	Castagno Mauro	+39 0112285203	TELECOM I ETSI	3GPPMEM TELECOM I ETSI	3GPPMEM	15/03/2007 23:00 F2F	Present	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Mr.	Chen Jing	+86 2168644808-2462	HuaWei Te CCSA	3GPPMEM HuaWei Technologies Co., Ltd	3GPPMEM	22/03/2007 23:00 F2F	Unknown	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Mr.	Chikazawa Takeshi	+81 467 41 2290	Mitsubishi TTC	3GPPMEM Mitsubishi ARIB	3GPPMEM	22/03/2007 23:00 F2F	Present	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Mr.	Christoffer Per	+46 8 975203	TeliaSonera ETSI	3GPPMEM TeliaSonera ETSI	3GPPMEM	26/02/2007 23:00 F2F	Unknown	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Mr.	Ciotti Frank	+1 512-427-7231	Motorola S ETSI	3GPPMEM Motorola S ETSI	3GPPMEM	20/03/2007 23:00 F2F	Present	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Mr.	Ding Yu	+86 10 58832102	CATT CCSA	3GPPMEM CATT CCSA	3GPPMEM	15/03/2007 23:00 F2F	Unknown	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Dr.	Escott Adrian	+44 1252 363209	Qualcomm ETSI	3GPPMEM Qualcomm ETSI	3GPPMEM	27/03/2007 22:00 F2F	Present	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Mr.	Gusenburger Reiner	+49 681 9330 561	BNetzA ETSI	3GPPINVT BNetzA ETSI	3GPPINVT	27/03/2007 22:00 F2F	Unknown	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Mr.	He Dony	-2.9E+07	Huawei Tei ETSI	3GPPMEM Huawei Tei ETSI	3GPPMEM	27/02/2007 23:00 F2F	Present	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Dr.	Horn Guenther	+49 89 5159 28258	Nokia Netv ETSI	3GPPMEM Nokia Netv ETSI	3GPPMEM	25/02/2007 23:00 F2F	Present	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Mr.	Howard Peter	+44 1635 676206	VODAFONE ETSI	3GPPMEM VODAFONE ETSI	3GPPMEM	11/03/2007 23:00 F2F	Present	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Mr.	Karmaneni Sergey	+7 812 329 92 19	LG Electrol ETSI	3GPPMEM LG Electrol ETSI	3GPPMEM	20/03/2007 23:00 F2F	Present	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Ms.	Koskinen Tiina	3.59E+11	Nokia Corp ETSI	3GPPMEM Nokia Corp ETSI	3GPPMEM	08/03/2007 23:00 F2F	Present	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Mr.	Lehtovirta Vesa	3.58E+11	Ericsson LA ETSI	3GPPMEM Ericsson In ATIS	3GPPMEM	01/03/2007 23:00 F2F	Present	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Miss	Mach Natacha	3.33E+10	Orange SA	Orange SA	3GPPMEM	26/02/2007 23:00 F2F	Present	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Dr.	Meyer Ulrike	+49 89 636 41496	Nokia Netv ETSI	3GPPMEM Nokia Netv ETSI	3GPPMEM	27/03/2007 22:00 F2F	Present	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Dr.	Niemi Valtteri		Nokia Corp ETSI	3GPPMEM Nokia Corp ETSI	3GPPMEM	19/02/2007 23:00 F2F	Present	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Mr.	Norrman Karl	+46 8 4044502	Nanjing Eri CCSA	3GPPMEM Ericsson Ja ARIB	3GPPMEM	15/03/2007 23:00 F2F	Present	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Mrs.	Pauliac Mireille	+33 4 42365441	Gemalto N ETSI	3GPPMEM Gemalto N ETSI	3GPPMEM	15/03/2007 23:00 F2F	Present	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Mr.	Prouff Emmanuel	3.36E+10	OBERTHUR ETSI	3GPPMEM OBERTHUR ETSI	3GPPMEM	22/03/2007 23:00 F2F	Unknown	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Mr.	Rajadurai Rajavelsarr	+91 80 4181 9999	SAMSUNG ARIB	3GPPMEM SAMSUNG ARIB	3GPPMEM	15/03/2007 23:00 F2F	Present	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Mr.	Sahlin Bengt		Ericsson LA ETSI	3GPPMEM Ericsson LA ETSI	3GPPMEM	15/03/2007 23:00 F2F	Present	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Ms.	Wifvesson Monica		Ericsson LA ETSI	3GPPMEM Nanjing Eri CCSA	3GPPMEM	15/03/2007 23:00 F2F	Present	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Mr.	Wilhelm Berthold	+49 681 9330 562	BMW ETSI	3GPPMEM BMW ETSI	3GPPMEM	14/03/2007 23:00 F2F	Present	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Miss	Yang Yanmei	+86 755 654 0223	HuaWei Te CCSA	3GPPMEM HuaWei Te CCSA	3GPPMEM	22/03/2007 23:00 F2F	Present	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Mr.	Zhang Daijiang	+86 65392828	Nokia Japan Co, Ltd	Nokia Japan Co, Ltd	3GPPMEM	15/03/2007 23:00 F2F	Present	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO
Dr.	Zugenmaier Alf	+49 89 1265 3753	NTT DOCO ARIB	3GPPMEM NTT DOCO ARIB	3GPPMEM	29/03/2007 22:00 F2F	Present	3GPPSA3-A	28/03/2007 09:00	29/03/2007 17:00 (GMT+02.C	Sophia-Ant	31/12/1969 23:00	MMP init	NO

Appendix K

Subscription Settings

[Subscriber's Corner](#)
[Server Archives](#)

[Help](#)
[Log off](#)

Join or Leave the 3GPP_TSG_SA_WG3 List

This screen allows you to join or leave the 3GPP_TSG_SA_WG3 list. To confirm your identity and prevent third parties from subscribing you to a list against your will, an e-mail message with a confirmation code will be sent to the address you specify in the form. Simply wait for this message to arrive, then follow the instructions to confirm the operation.

Alternatively, you can [login with your LISTSERV password](#) (if you have one) and update your subscription interactively, without e-mail confirmation.

Your E-Mail Address:

Your Name:

Join 3GPP_TSG_SA_WG3

Leave 3GPP_TSG_SA_WG3

Leave all the Lists

Subscription Type:

- ☒ Regular [NODIGEST]
☐ Digest (traditional) [NOMIME DIGEST]
☐ Digest (MIME format) [NOHTML MIME DIGEST]
☐ Digest (HTML format) [HTML DIGEST]
☐ Index (traditional) [NOHTML INDEX]
☐ Index (HTML format) [HTML INDEX]

Mail Header Style:

- ☒ Normal LISTSERV-style header [FULLHDR]
☐ LISTSERV-style, with list name in subject [SUBJECTHDR]
☐ LISTSERV-style, short [SHORTHDR]
☐ "Dual" (second header in mail body) [DUALHDR]
☐ sendmail-style [IETFHDR]

Acknowledgements:

- ☐ No acknowledgements [NOACK NOREPRO]
☐ Short message confirming receipt [ACK NOREPRO]
☐ Receive copy of own postings [NOACK REPRO]
☒ [Special or obsolete setting]

Miscellaneous:

- ☐ Mail delivery disabled temporarily [NOMAIL]
☐ Address concealed from REVIEW listing [CONCEAL]

Join 3GPP_TSG_SA_WG3

Leave 3GPP_TSG_SA_WG3

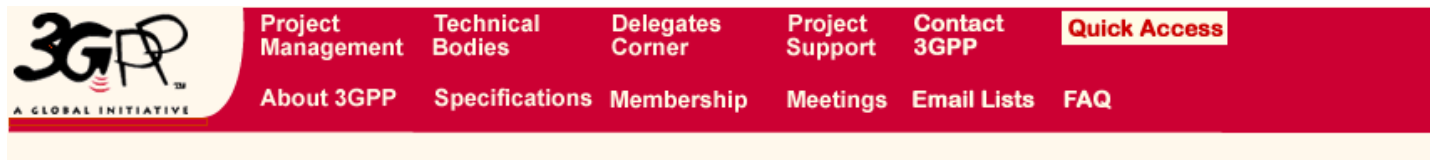
Leave all the Lists

LIST.ETSI.ORG



Appendix L

The Wayback Machine - <https://web.archive.org/web/20070403172634/http://www.3gpp.org:80/>



☒ only search 3GPP site



Shaping the future of mobile communication standards

News & info

- **2007-04-03:** [GERAN#34 - updated election information](#)
- **2007-04-02:** [Voting list for SA1#36](#)
- **2007-04-02:** [Elections for Vice Chairman of SA1 to be held in April](#)
- **2007-04-02:** [Updated voting list for GERAN#34](#)
- **2007-04-02:** [Updated voting list for GERAN WG1#34](#)
- **2007-03-27:** [GERAN WG1#34 - updated election information](#)
- **2007-03-13:** [Results of SA#35 election](#)
- **2007-03-07:** [Results of CT#35 election](#)
- **2007-03-07:** [Results of RAN#35 election](#)
- **2007-03-01:** [Elections for Chairman of GERAN WG2 to be held in May](#)
- **2007-02-19:** [Elections for officials of CT5 to be held in May](#)
- **2007-02-19:** [Voting list for CT5#39](#)
- **2007-01-05:** In response to requests received as part of the [satisfaction survey](#), an improved, quick-loading, view of the Work Plan is [available here](#). Clicking on a Feature (or Study Item) now gives progress details for all component work items.
- **2007-01-02:** First-ever 3G & Mobile Broadband User Experience Interoperability Event (23rd - 26th January, 2007, Sophia Antipolis, ETSI Headquarters)
A usable and accessible 3G and mobile broadband environment is of high priority to all stakeholders, in order to enable better usability of our information and communication infrastructures, enabling the creation of a true Information Society. Participation in this user-experience-focused event, co-sponsored by the European Commission, EFTA, ETSI and its Members, is [free of charge](#). - [more >>](#) - **Important:** registration deadline is 2007-01-08.
- **2007-01-02:** TSG / WG meeting (TDoc) contribution lists available in HTML. For example, on the [meeting list for WG CT4](#) (available via [that WG's home page](#) which is itself reached by clicking on that WG's box on the [3GPP TSG organization page](#)), click on the asterisk to the right of the TDoc number range against meeting C4-31 to see the [list of contributions to that meeting](#). Each TDoc is hyperlinked to its file in the meeting directory. **Note:** TDoc list pages are not yet available for all meetings; we are updating these as fast as possible, so please be patient, and do not report broken links!

▪ TSG#35 Highlights ▪ 2006-11-28: Results of 3GPP Satisfaction survey 2006 ▪ 2006-11-17: You look younger than ever – 20 years of GSM: A seminar to commemorate the decisions taken in February 1987 in Madeira ▪ 2006-11-10: Google search engine added on the main page ▪ 2006-05-02: 300 delegates attend 3GPP Beijing workshop ; click here for workshop presentations ▪ 2006-04-24: Revised 3GPP Working Procedures as approved by PCG#16 ▪ 2006-04-24: PCG#16 welcomes MobileIGNITE as eighth 3GPP Market Representation Partner ▪ 2006-04-21: list of Features by Release, with descriptions ▪ 3GPP-endorsed conferences ▪ UTRA-UTRAN Long Term Evolution and System Architecture Evolution What does the future hold for 3GPP technologies? ▪ Downloadable iCalendar files for each future meetings. See the last column of (for example) the TSG SA WG1 meetings page: click on ICS to have the meeting registered as an appointment in your personal calendar (eg MS Outlook). <i>(Each TSG and WG has a dedicated web page, accessible from the 3GPP structure page. To see meetings information, use the link top right of the table on the TSG/WG page.)</i> ▪ 3GPP IETF Dependencies and Priorities ▪ What is UMTS? (overview of the content of Releases 99 to 5)
Click here for access to the 3GPP ftp site

Last update:
2007-04-02

[Legal notice](#)

Appendix M

3GPP representatives can obtain information about the IETF document and web-site structures by contacting the relevant IETF contact points (the Area Directors indicated at the IETF web-site <http://www.ietf.org/>).

5. Communication

Whenever possible, informal communication at working level is encouraged.

The vast majority of the technical discussions and decision making in both IETF and 3GPP is done over mailing lists. Both 3GPP and IETF web sites contain information concerning the associated mailing lists.

It is recommended that interested individuals subscribe to and participate in these lists.

When deemed necessary, formal communication between 3GPP and IETF is also permitted. Relevant IETF Area Directors and 3GPP technical leadership are encouraged and authorized to facilitate such communications when needed.

6. Rapporteurs/coordinators

6.1 IETF coordination support in 3GPP

An IETF rapporteur function is established in 3GPP TSG-SA.

The individual(s) appointed to undertake the responsibility of this function should be the initial contact point in 3GPP for matters pertaining to the 3GPP-IETF cooperation. Of course, the chairman of TSG-SA can always be contacted.

The 3GPP-IETF rapporteur function, therefore, is expected to work with the concerned working groups and TSGs and support the interaction between 3GPP and IETF.

6.2 3GPP Liaison in IETF

The preferred way for organizations to work with IETF is through the working groups. However, IETF has a limited number of liaison relationships with other organizations when conditions warrant the appointment of a specific person.

The appointment, by the IAB, of a specific person to function as a "3GPP liaison" is proposed.

The role of the 3GPP Liaison is to act as an initial contact point in IETF for administrative aspects of this collaboration that cannot easily be handled in other ways (e.g., at a technical level by interactions with IETF Working Groups or Area Directors). It is agreed that the role does not carry the expectation of attendance at 3GPP meetings or participation in 3GPP administrative processes and anticipated that all liaison efforts assigned to this individual will

Appendix N

The Wayback Machine - <https://web.archive.org/web/20070402233302/http://list.3gpp.org:80/>

Server Archives

List Archives at LIST.ETSI.ORG

From this page you can browse the online archives of the following mailing lists:

Subscriber's Corner Server Archives

List Management List Moderation Server Management

Help Log off

Archive Search

3GPP-REVIEW

3gpp-review : gsmtrans replacement (*11 subscribers*)

3GPP_3GPP2_SCM

3gpp_3gpp2_scm : 3gpp-3gpp2 spatial channel modelling (*30 subscribers*)

3GPP_FFG

3gpp_ffg : 3gpp list (*16 subscribers*)

3GPP_GUP

3gpp_gup : evolution of 3gpp (*21 subscribers*)

3GPP_ORGANIZATION

3gpp_organization: 3gpp discussion group (*52 subscribers*)

3GPP_TSG_CN

3GPP_TSG_CN: THIS LIST HAS NOW BEEN CLOSED 18.03.05 (*0 subscribers*)

3GPP_TSG_CN_AH_ITUT

3GPP_TSG_CN_AH_ITUT: THIS LIST HAS NOW BEEN CLOSED (*0 subscribers*)

3GPP_TSG_CN_WG1

3GPP_TSG_CN_wg1: THIS LIST HAS NOW BEEN CLOSED 18.03.05 (*0 subscribers*)

3GPP_TSG_CN_WG2

3GPP_TSG_CN_wg2: THIS LIST HAS BEEN CLOSED 18.03.05 (*0 subscribers*)

3GPP_TSG_CN_WG3

3GPP_TSG_CN_wg3: THIS LIST HAS NOW BEEN CLOSED (*0 subscribers*)

3GPP_TSG_CN_WG4

3GPP_TSG_CN_WG4: THIS LIST HAS NOW BEEN CLOSED 18.03.05 (*0 subscribers*)

3GPP_TSG_CN_WG5

3GPP_TSG_CN_WG5: THIS LIST HAS NOW BEEN CLOSED (*0 subscribers*)

3GPP_TSG_CN_WG5_JOINTAPIWORK

3gpp_tsg_cn_wg5_jointapiwork : THIS LIST HAS NOW BEEN CLOSED 18.03.05 (*0 subscribers*)

3GPP_TSG_CT

3GPP_TSG_CT - Core Network and Terminals (*264 subscribers*)

3GPP_TSG_CT_WG1

3GPP_TSG_CT_WG1 - Core Network and Terminals WG 1 (*854 subscribers*)

3GPP_TSG_CT_WG1_MMS_SMS_CBS_AT

3GPP_TSG_CT_WG1_MMS_SMS_CBS_AT:Commands (*127 subscribers*)

3GPP_TSG_CT_WG2

3GPP_TSG_CT_WG2 - Core Network and Terminals WG 2 (*51 subscribers*)

3GPP_TSG_CT_WG3

3GPP_TSG_CT_WG3 - Core Network and Terminals WG 3 (*308 subscribers*)

3GPP_TSG_CT_WG4

3GPP_TSG_CT_WG4 - Core Network and Terminals WG 4 (*382 subscribers*)

3GPP_TSG_CT_WG5

3GPP_TSG_CT_WG5 - Core Network and Terminals WG 5 (*220 subscribers*)

3GPP_TSG_CT_WG6

3GPP_TSG_CT_WG6 - Core Network and Terminals WG 6 (*210 subscribers*)

3GPP_TSG_CT_WG6_API_TEST

3GPP_TSG_CT_WG6_API_TEST: Mailing List (*39 subscribers*)

3GPP_TSG_GERAN

3gpp_tsg_geran : list for etsi tsg geran mailing (*295 subscribers*)

3GPP_TSG_GERAN_FUTURERAN

3gpp_tsg_geran_futureran : list for etsi tsg geran futureran mailing (*54 subscribers*)

3GPP_TSG_GERAN_TDOC

3gpp_tsg_geran_tdoc : list for etsi tsg geran temporary documents (*252 subscribers*)

3GPP_TSG_GERAN_WG1

3gpp_tsg_geran_wg1 : list for etsi tsg geran wg1 mailing (*201 subscribers*)

3GPP_TSG_GERAN_WG2

3gpp_tsg_geran_wg2 : list for etsi tsg geran wg2 mailing (*207 subscribers*)

3GPP_TSG_GERAN_WG3

3gpp_tsg_geran_wg3 : list for etsi tsg geran wg3 mailing (*223 subscribers*)

3GPP_TSG_GERAN_WG4

3gpp_tsg_geran_wg4 : THIS LIST HAS BEEN CLOSED (*0 subscribers*)

3GPP_TSG_GERAN_WG4_EDGE

3gpp_tsg_geran_wg4_edge : THIS LIST HAS BEEN CLOSED (*7 subscribers*)

3GPP_TSG_GERAN_WG4_GPRS

3gpp_tsg_geran_wg4_gprs : THIS LIST HAS BEEN CLOSED (6 subscribers)
3GPP TSG GERAN WG4 PCS1900
3gpp_tsg_geran_wg4_pcs1900 : THIS LIST HAS BEEN CLOSED (3 subscribers)
3GPP TSG GERAN WG4 TTCN
3gpp_tsg_geran_wg4_ttcn : THIS LIST HAS BEEN CLOSED (2 subscribers)
3GPP TSG GERAN WG5
3gpp_tsg_geran_wg5 : THIS LIST HAS BEEN CLOSED (0 subscribers)
3GPP TSG LEADERS
3gpp_tsg_leaders: tsg leaders group (81 subscribers)
3GPP TSG RAN
3gpp_tsg_ran: tsg radio access network group (649 subscribers)
3GPP TSG RAN3-SA5-RET
3GPP TSG RAN3-SA5-RET : Common RAN3/SA5 Work Item discussion for Remote List closed (0 subscribers)
3GPP TSG RAN ADHOC
3gpp_tsg_ran_adhoc: tsg ran ad hoc meetings (48 subscribers)
3GPP TSG RAN AHG1
3gpp_tsg_ran_ahg1: tsg ran ad-hoc group on itu co-ordination (52 subscribers)
3GPP TSG RAN WG1
3gpp_tsg_ran_wg1: tsg ran working group 1 (1,129 subscribers)
3GPP TSG RAN WG1 EUL AH
3GPP TSG RAN WG1 EUL AH (79 subscribers)
3GPP TSG RAN WG1 WCDMA MIMO
3GPP TSG RAN WG1 WCDMA MIMO (145 subscribers)
3GPP TSG RAN WG2
No title defined (1,034 subscribers)
3GPP TSG RAN WG2 MBMS RRC
3GPP TSG RAN WG2 MBMS RRC List (94 subscribers)
3GPP TSG RAN WG2 ROHC
3GPP TSG RAN WG2 ROHC : 3GPP_TSG_RAN_WG2_ROHC List (63 subscribers)
3GPP TSG RAN WG3
3gpp_tsg_ran_wg3: tsg ran working group 3 (752 subscribers)
3GPP TSG RAN WG4
3gpp_tsg_ran_wg4: tsg ran working group 4 (603 subscribers)
3GPP TSG RAN WG4 BANDS
3GPP TSG RAN WG4 Bands : New UMTS frequency bands (110 subscribers)
3GPP TSG RAN WG4 CELL RESELECTION
3GPP TSG RAN WG4 Cell Reselection : List Closed (0 subscribers)
3GPP TSG RAN WG4 CPC
3gpp_tsg_ran_wg4_CPC: tsg ran working group 4 CPC (71 subscribers)
3GPP TSG RAN WG4 DIVERSITY OFF
3gpp_tsg_ran_wg4_DIVERSITY_OFF: tsg ran working group 4 Diversity off (68 subscribers)
3GPP TSG RAN WG4 EDCH
3GPP TSG RAN WG4 EDCH : Enhanced Uplink Performance Requirements (123 subscribers)
3GPP TSG RAN WG4 HSDPA
3GPP TSG RAN WG4 HSDPA : HSDPA PERFORMANCE REQUIREMENTS (175 subscribers)
3GPP TSG RAN WG4 LTE
3GPP TSG RAN WG4 Long Term Evolution (118 subscribers)
3GPP TSG RAN WG4 MBMS
3GPP TSG RAN WG4 MBMS : List closed (0 subscribers)
3GPP TSG RAN WG4 POWERCONTROL
3GPP TSG RAN WG4 PowerControl : List closed (0 subscribers)
3GPP TSG RAN WG4 TEM
3gpp_tsg_ran_wg4_tem : THIS LIST HAS NOW BEEN CLOSED (18 subscribers)
3GPP TSG RAN WG4 UE ANTENNA
3GPP TSG RAN WG4 UE Antenna: UE Antenna Performance (170 subscribers)
3GPP TSG RAN WG4 UE TXPOW
UE Max Output Power back off : List closed (1 subscriber)
3GPP TSG RAN WG5
3GPP TSG RAN WG5 : Testing (483 subscribers)
3GPP TSG RAN WG5 IMSCC
3GPP TSG RAN WG5 IMS Call Control mailing (112 subscribers)
3GPP TSG RAN WG5 RF
3GPP TSG RAN WG5 RF : Radio Frequency (160 subscribers)
3GPP TSG RAN WG5 SIG

3GPP_TSG_RAN_WG5_SIG: Signalling (387 subscribers)
3GPP_TSG_RAN_WGS_LONG_TERM_EVOLUTION
 3GPP_TSG_RAN_WGS_LONG_TERM_EVOLUTION: UTRA/UTRAN Long Term Evolution (377 subscribers)
3GPP_TSG_RAN_WGS_LTE_UE_TRANSCEIVER
 3gpp_tsg_ran_wgs_lte_ue_transceiver (112 subscribers)
3GPP_TSG_SA
 3gpp_tsg_sa: tsg system aspects group (413 subscribers)
3GPP_TSG_SA_WG1
 3gpp_tsg_sa_wg1: tsg sa services (533 subscribers)
3GPP_TSG_SA_WG1_AIPN
 3GPP_TSG_SA_WG1_AIPN List (55 subscribers)
3GPP_TSG_SA_WG1_GLOBALTEXT
 3gpp_tsg_sa_wg1_globaltext: THIS LIST HAS BEEN CLOSED (0 subscribers)
3GPP_TSG_SA_WG1_VOCABULARY
 THIS LIST HAS BEEN CLOSED (80 subscribers)
3GPP_TSG_SA_WG1_WLAN
 THIS LIST HAS BEEN CLOSED (13 subscribers)
3GPP_TSG_SA_WG2
 3gpp_tsg_sa_wg2: tsg sa architecture (1,097 subscribers)
3GPP_TSG_SA_WG2_VCC
 SA WG2 Voice Call Continuity discussion list: THIS LIST HAS BEEN CLOSED (0 subscribers)
3GPP_TSG_SA_WG3
 3gpp_tsg_sa_wg3: tsg sa security (301 subscribers)
3GPP_TSG_SA_WG3_LI
 3gpp_tsg_sa_wg3_li: (tsg sa wg3 lawful interception group) (139 subscribers)
3GPP_TSG_SA_WG4
 3gpp_tsg_sa_wg4: tsg sa codec (313 subscribers)
3GPP_TSG_SA_WG5
 3gpp_tsg_sa_wg_5: tsg sa5 telecoms management (308 subscribers)
3GPP_TSG_SA_WG5_SWGA
 3GPP_TSG_SA_WG5_SWGA : Harmonization (197 subscribers)
3GPP_TSG_SA_WG5_SWGB
 3GPP_TSG_SA_WG5_SWGB : Charging (233 subscribers)
3GPP_TSG_SA_WG5_SWGC
 3GPP_TSG_SA_WG5_SWGC : OAM&P Interface Definition (202 subscribers)
3GPP_TSG_SA_WG5_SWGD
 3GPP_TSG_SA_WG5_SWGD : OAM&P Data Definition (188 subscribers)
3GPP_TSG_T
 3gpp_tsg_t: tsg terminals group: THIS LIST HAS NOW BEEN CLOSED (0 subscribers)
3GPP_TSG_T_WG1
 3gpp_tsg_t_wg1: THIS LIST HAS NOW BEEN CLOSED - 18.03.05 (0 subscribers)
3GPP_TSG_T_WG1_RF
 3gpp_tsg_t_wg1_rf: THIS LIST HAS NOW BEEN CLOSED - 18.03.05 (0 subscribers)
3GPP_TSG_T_WG1_SIG
 3gpp_tsg_t_wg1_sig: THIS LIST HAS NOW BEEN CLOSED - 18.03.05 (0 subscribers)
3GPP_TSG_T_WG2
 3gpp_tsg_t_wg2: THIS LIST HAS NOW BEEN CLOSED 18.03.05 (0 subscribers)
3GPP_TSG_T_WG2_SWG1
 3gpp_tsg_t_wg2_swg1 : execution environment LIST HAS BEEN CLOSED 12/07/2004 (48 subscribers)
3GPP_TSG_T_WG2_SWG2
 3gpp_tsg_t_wg2_swg2 : terminal interfaces LIST HAS BEEN CLOSED 12/07/2004 (113 subscribers)
3GPP_TSG_T_WG2_SWG3
 3gpp_tsg_t_wg2_swg3 : messaging LIST HAS BEEN CLOSED 12/07/2004 (275 subscribers)
3GPP_TSG_T_WG3
 Smart Card Application Aspects: THIS LIST HAS NOW BEEN CLOSED 18.03.05 (136 subscribers)
3GPP_TSG_T_WG3_API
 T3 API Sub-Working-Group discussion: THIS LIST HAS NOW BEEN CLOSED 18.03.05 (0 subscribers)
3GPP_TSG_T_WG3_TEST
 T3 testing related discussion: THIS LIST HAS NOW BEEN CLOSED 18.03.05 (127 subscribers)

3GPP_TSG_T_WG3_UI

T3 USAT interpreter discussion: THIS LIST HAS NOW BEEN CLOSED 18.03.05 (0 subscribers)

3GPP_TSG_T_WG3_USAT

T3 USIM application toolkit discussion: THIS LIST HAS NOW BEEN CLOSED (0 subscribers)

3GPP_UE_POSITIONING

3GPP_UE_Positioning: 3GPP UE Positioning Reporting (41 subscribers)

3GPP_WORKSHOP_LTE_GSM_HANDOVERS

3GPP_WS (156 subscribers)

3GPP_WP_GROUP

3GPP_WP_GROUP: 3GPP Working Procedures Group list (25 subscribers)

ADMIN_GROUP

admin_group : admin_group list (80 subscribers)

AMETIS

AMETIS : Ametis (0 subscribers)

AT

at: tc access & terminals - the etsi "home" for terminal matters (74 subscribers)

AT-A

at-a: tc at working group for conventional analogue technologies (56 subscribers)

AT-D

at-d: tc at working group for digital technologies (59 subscribers)

AT-I

at-i: installation and cabling matters list (24 subscribers)

AT-N

at-n: at-n list (50 subscribers)

ATMOBILE

ATmobile STF 304 (7 subscribers)

ATTM

ATTM: Access, Terminals, Transmission and Multiplexing (125 subscribers)

AT_ANNOUNCE

at_announce: at_announce list (40 subscribers)

AT_A_ANNOUNCE

at_analogue_announce list (31 subscribers)

AT_D_ANNOUNCE

at_digital_announce list (46 subscribers)

AT_N_ANNOUNCE

at_n_announce: at_ngnathome announce list (21 subscribers)

BOARD_3GFF

board_3gff: 3gpp funding formula board ad hoc group (2 subscribers)

BOARD_IMS

Board_IMS 3GPP-TISPAN synergies (group now closed) (45 subscribers)

BOARD_IMS-TEST

Board ad hoc group on IMS Testbed (53 subscribers)

BOARD_NGG

BOARD_NGG: ETSI Board NGN Globalization Group (32 subscribers)

BOARD_OP_ADHOC

Board_op_adhoc: ETSI Board list for input to 3GPP OP ad hoc (94 subscribers)

BOARD_RFID

BOARD_RFID ETSI Board RFID (29 subscribers)

BRAN

bran: broadband radio access networks mailing list (196 subscribers)

BRAN_5GHZ_HARM_STD

BRAN_5GHZ_HARM_STD : LIST CLOSED (65 subscribers)

BRAN_ANNOUNCE

broadband radio access networks announcement list (49 subscribers)

BRAN_HA

bran_ha: bran hiperaccess standards area mailing list (43 subscribers)

BRAN_HA_DLC_DG

bran_ha_dlc_dg: LIST CLOSED (1 subscriber)

BRAN_HL

bran_hiperlan2 standardization area (46 subscribers)

BRAN_HM

bran_hm: etsi bran hiperman (fwa below 11 ghz) (57 subscribers)

BRAN_RCWG

BRAN_RCWG : BRAN harmonized standards and related work (66 subscribers)

BROADCAST

jtc broadcast official mailing list (68 subscribers)

BROADCAST_ANNOUNCE

broadcast announcement list (26 subscribers)
BROADCAST_M331
 BROADCAST_M331: Response to EC/EFTA (40 subscribers)
CENELEC_ETSI_JWG EMC
 No title defined (65 subscribers)
CEPT_ETSI
 ETSI liaison officers to CEPT ECC (20 subscribers)
CLC-ETSI-JWG-PLTCOEX
 clc-etsi-jwg-pltcoex:cenelec etsi joint working group (33 subscribers)
DANET-TOOL
 Danet-tool (1 subscriber)
DECT
 Dect : DECT mailing list (57 subscribers)
DECT_A
 dect_a : THIS LIST HAS BEEN CLOSED (14 subscribers)
DECT_ANNOUNCE
 announce list for etsi dect (15 subscribers)
DECT_INTEREST_GROUP
 DECT_Interest_Group : DECT interest group (57 subscribers)
DECT_NEWGENERATION
 DECT_NewGeneration : DECT_NewGeneration List (67 subscribers)
DECT_T
 dect_t : THIS LIST HAS BEEN CLOSED (13 subscribers)
DELIVERABLE-NOTIFICATIONS
 deliverable-notifications : deliverable notifications (86 subscribers)
DISTRIBUTIONS_INDEPT_DISTRIBUTORS
 Distributions_Indept_Distributors: Distributions Indept Distributors list (8 subscribers)
ECALL
 eCall related issues (29 subscribers)
EDS-NEWS
 eds-news: etsi documentation service news (135 subscribers)
EE
 environmental engineering technical committee membership and mailing list (40 subscribers)
EE1
 ee1 : THIS LIST HAS BEEN CLOSED (15 subscribers)
EE1_ANNOUNCE
 EE1 ANNOUNCE : THIS LIST HAS BEEN CLOSED (10 subscribers)
EE1_MAINTENANCE
 EE1_MAINTENANCE : EE1 document maintenance mailing list (11 subscribers)
EE2
 ee2 : (power supply) membership and mailing list (29 subscribers)
EE2_ANNOUNCE
 No title defined (14 subscribers)
EE_ANNOUNCE
 environmental engineering announce list (15 subscribers)
EE_ECO-ENVIRONMENTAL_PRODUCT_STANDARDS_GROUP
 EE EEPs: Eco-environmental Product Standards (25 subscribers)
EF3
 EF3 : EF3 list (32 subscribers)
EHEALTH
 ETSI Project eHEALTH (16 subscribers)
EHEALTH_STARTER_GROUP
 ehealth_starter_group: eHealth Starter Group (23 subscribers)
EL-SIGN
 el-sign: electronic signatures - List has been closed (285 subscribers)
EMERGING ICT
 Open discussion on ICT Emerging Technologies (6 subscribers)
EMTEL
 emtel : Emtel (120 subscribers)
EPDECT
 epdect : THIS LIST HAS BEEN CLOSED (119 subscribers)
ERM
 erm : emc and radio spectrum matters distribution (213 subscribers)
ERMCC
 ermcc: erm co-ordination committee (28 subscribers)
ERM_ACEA
 No title defined (20 subscribers)
ERM_ANNOUNCE

erm_announce : emc and radio spectrum matters distribution (48 subscribers)
ERM EMC
 ERM EMC : erm wg on electromagnetic compatibility (106 subscribers)
ERM EMC ANNOUNCE
 erm_em_announce: erm_em_announce list (25 subscribers)
ERM ITU-R WP8A
 erm_itu-r_wp8a : preparation for itu-r wp8a (17 subscribers)
ERM ITU-R WP8A P
 erm_itu-r_wp8a_p : itu-r wp8a participants (17 subscribers)
ERM JOINT TG34 TG28
 ERM_Joint_TG34_TG28: ERM TG34 TG28 work on RFID and SRD (72 subscribers)
ERM LIAISON
 erm_liaison : external liaison statements from tc erm (19 subscribers)
ERM RM
 erm_rm : radio matters (129 subscribers)
ERM RM ANNOUNCE
 erm_rm : radio matters (67 subscribers)
ERM TG04
 erm_tg04 : automotive emc (25 subscribers)
ERM TG11
 erm_tg11 : radio lans (37 subscribers)
ERM TG14
 erm_tg14 : radio interfaces under article 4.2 of the r&tte directive (3 subscribers)
ERM TG17
 erm_tg17 : standards for broadcast and ancillary communications equipment (31 subscribers)
ERM TG17 WG1 2 4
 erm_tg17_wg1_2_4 : erm_tg17 working groups exploder list (26 subscribers)
ERM TG17 WG3
 erm_tg17_wg3 : working group 3 on radio microphones (32 subscribers)
ERM TG17 WG5
 erm_tg17_wg5 : active tv reception (24 subscribers)
ERM TG21
 erm_tg21 : co-ordination of etsi inputs to rast#10 (2 subscribers)
ERM TG23
 erm_tg23 : standards for a close-field peer-to-peer symmetrical data communication system (15 subscribers)
ERM TG25
 erm_tg25 : aeronautical (41 subscribers)
ERM TG25 VDL MODE2
 No title defined (21 subscribers)
ERM TG25 VDL MODE4
 No title defined (18 subscribers)
ERM TG26
 erm_tg26 : maritime (32 subscribers)
ERM TG27
 erm_tg27 : radio site engineering (41 subscribers)
ERM TG28
 erm_tg28 : generic srd's (62 subscribers)
ERM TG30
 erm_tg30 : wireless medical services (38 subscribers)
ERM TG31A
 erm_tg31a : ultra wide band for short range devices (72 subscribers)
ERM TG31B
 erm_tg31b : ultra wide band automotive radar (35 subscribers)
ERM TG31C
 erm_tg31c: ultra wide band sensors (37 subscribers)
ERM TG32
 erm_tg32 : pmr List closed (0 subscribers)
ERM TG33
 erm_tg33 : measurement methods and their uncertainties List closed (0 subscribers)
ERM TG34
 erm_tg34 : rf identification devices (99 subscribers)
ERM TG35
 ERM_TG35 : Co-ordination of ETSI inputs to GSRC#1 (20 subscribers)
ERM TG37
 ERM_TG37 : Intelligent Transport Systems (67 subscribers)
ERM TG37 DSRC

ERM_TG37_DSRC : technical discussion on DSRC testing and updating (15 subscribers)

ERM_TG39
ERM_TG39 : Code Division Multiple Access (CDMA) (15 subscribers)

ERM_TG40
Broadband Disaster Relief (11 subscribers)

ERM_TGDMR
ERM_TGDMR : Digital Mobile Radio (55 subscribers)

ERM_TGTLPR
erm_tglpr : Tank Level Probing Radar (18 subscribers)

ERM_WP
ERM_WP: Improvement of ERM working procedures discussion list (2 subscribers)

ESI
esi : etsi tc esi (electronic signatures and infrastructures) (78 subscribers)

ESI_ALGO
ESI_ALGO : TC ESI discussion list for maintenance of the ALGO paper (27 subscribers)

ESI_ANNOUNCE
esi_announce : etsi tc electronic signatures (14 subscribers)

ETSAG
etsag : THIS LIST HAS BEEN CLOSED (16 subscribers)

ETSI-MEDIA-LIST
etsi-media-list : etsi media mailing list for press releases (164 subscribers)

ETSI-NEWS
etsi-news: technical news, general news and press announcements from etsi (585 subscribers)

FOE
foe: ga ad hoc group on Financing of ETSI (0 subscribers)

GRID
GRID: Open discussion on ETSI GRID Standardization (132 subscribers)

GSC
GSC: (195 subscribers)

GSC-GRSC
GSC-GRSC : (125 subscribers)

GSC-GTSC
GSC-GTSC : (164 subscribers)

GSC-HOD
GSC-HoD: (36 subscribers)

GSC-IPR
gsc-ipr: gsc intellectual property rights (32 subscribers)

GSC-USER
gsc-user : gsc user group (35 subscribers)

GSM_ONBOARD_PLANES
GSM_onboard_planes: GSM_onboard_planes (60 subscribers)

HF
hf : etsi tc human factors (hf) (50 subscribers)

HF_ANNOUNCE
hf announcement list (11 subscribers)

HF_MOBILE
No title defined (9 subscribers)

HF_MULTICULTURAL_COMMUNICATION
HF_MULTICULTURAL_COMMUNICATION:
HF_MULTICULTURAL_COMMUNICATION STF 287 list (14 subscribers)

HF_SETUP
HF_SETUP: HF_SETUP STF 285 list (8 subscribers)

HF_TELECAREUX
Telecare User Experience (6 subscribers)

HF_UG
HF_UG: HF_UG STF 285 list (9 subscribers)

HF_USER_PROFILE_MANAGEMENT
HF_User_Profile_Management : STF 265 list (41 subscribers)

HIPERMAN_WIMAX_TESTING
HiperMAN_WiMAX_testing : HiperMAN WiMAX testing related mailing list (107 subscribers)

HLRG
HLRG: GA ad hoc High Level Review Group (71 subscribers)

ICANN-MATTERS
icann-matters : icann-matters list (87 subscribers)

IMPACT

impact : impact list (62 subscribers)
IPR
 ipr: ga ad hoc group on ipr policy implementation (227 subscribers)
JEEC
 No title defined (19 subscribers)
LI
 li : etsi tc li (lawful interception) (139 subscribers)
LI ANNOUNCE
 li_announce : etsi tc lawful interception announce list (61 subscribers)
MESA ORGANIZATION
 mesa_organization: main distribution list for all mesa related information (151 subscribers)
MESA_SC
 mesa_sc: mesa steering committee (119 subscribers)
MESA_SSG_SA
 mesa_ssg_sa: mesa ssg services and applications (134 subscribers)
MESA_TSG_SYS
 mesa_tsg_sys: mesa tsg system (157 subscribers)
MSG
 msg : mobile standards group (109 subscribers)
MTS-GEN
 MTS_GEN (48 subscribers)
MTS-IPT
 MTS-IPT: MTS-IPT (28 subscribers)
MTS-IPT-H248
 MTS-IPT-H248 : MTS-IPT-H248 (11 subscribers)
MTS-IPT-H323
 MTS-IPT-H323 : MTS-IPT-H323 (9 subscribers)
MTS-IPT-IPV6
 MTS-IPT-IPV6 : MTS-IPT-IPV6 (11 subscribers)
MTS-IPT-SIGTRAN
 MTS-IPT-SIGTRAN :MTS-IPT-SIGTRAN (9 subscribers)
MTS-IPT-SIP
 MTS-IPT-SIP : MTS-IPT-SIP (27 subscribers)
MTS ANNOUNCE
 mts announcement list (11 subscribers)
NGN_IMS
 NGN_IMS: Joint 3GPP-TISPAN open list (339 subscribers)
NSO-CONTACTS
 nso-contacts :nso voting contacts (62 subscribers)
NSO_INFO
 nso_info : distribution list for nso information (80 subscribers)
OCG
 ocg: list of ocg members (ep and tc chairmen) (133 subscribers)
OCG_ECNS
 OCG_ECNS: OCG ad hoc group on Electronic Communications Networks & Services (37 subscribers)
OCG_EMTEL
 ocg_emtel : ocg ad-hoc group on emergency telecommunications (1 subscriber)
OCG_IOP
 OCG ad hoc group on Interoperability (15 subscribers)
OCG_RTTEd
 ocg_rttd : steering committee on harmonised standards (77 subscribers)
OCG_SECURITY
 ocg_security: ocg ad hoc group on security issues (39 subscribers)
PLT
 plt : etsi project powerline telecommunications (78 subscribers)
PLT ANNOUNCE
 etsi project powerline telecommunications announcement list (37 subscribers)
PLT_INHOUSE
 PLT_InHouse@list.etsi.org : In-House PLT (28 subscribers)
PLT_WI_DISCUSSION
 PLT_WI_DISCUSSION@list.etsi.org: Workitem 19 Layer 1 and 2 of a comprehensive PLC System (32 subscribers)
PLUGTESTS-EBXML
 Plugtests-ebxml: Discussion list on ebxml Interoperability matters (2 subscribers)
PLUGTESTS-ENUM
 PLUGTESTS-ENUM : Discussion list on enum matters (12 subscribers)
PLUGTESTS-GRID

PLUGTESTS-GRID: Discussion list on GRID COMPUTING Interoperability matters
(122 subscribers)

PLUGTESTS-IPSEC
Plugtests-IPSec : Discussion list on IPSec Interoperability matters (2 subscribers)

PLUGTESTS-IPV6
Plugtests-IPv6 : Discussion list on IPv6 Interoperability matters (1 subscriber)

PLUGTESTS-IPV6-PEERING
PLUGTESTS-IPV6-PEERING: Discussion list on Remote IPv6 peering (0 subscribers)

PLUGTESTS-J2ME
Plugtests-J2ME : Discussion list on J2ME Interoperability matters (2 subscribers)

PLUGTESTS-LI
plugtests-li : discussion list on li interoperability matters (2 subscribers)

PLUGTESTS-MIP6
PLUGTESTS-MIP6 : PLUGTESTS-MIP6 (0 subscribers)

PLUGTESTS-NGN
Plugtests-NGN : Discussion list on NGN-VoIP Interoperability matters (6 subscribers)

PLUGTESTS-OSAPARLAY
Plugtests-OSAParlay : Discussion list on OSA / Parlay Interoperability matters (3 subscribers)

PLUGTESTS-POWERLINE
PLUGTESTS-POWERLINE: DISCUSSION LIST ON POWERLINE
INTEROPERABILITY MATTERS (9 subscribers)

PLUGTESTS-R-IPV6
Plugtests-R-IPv6 : Discussion list on Remote IPv6 Interoperability matters (1 subscriber)

PLUGTESTS-R-IPV6-COORDINATORS
PLUGTESTS-R-IPV6-COORDINATORS : Discussion list for Remote IPv6 coordinators
(0 subscribers)

PLUGTESTS-SECURITY
PLUGTESTS-SECURITY: Discussion list on security Interoperability matters (2 subscribers)

PLUGTESTS-SIGTRAN
Plugtests-Sigtran: Discussion list on SIGTRAN (13 subscribers)

PLUGTESTS-SMS
Plugtests-SMS : Discussion list on Wireline SMS Interoperability matters (7 subscribers)

PLUGTESTS-XADES
plugtests-xades : discussion list on xades (23 subscribers)

PLUGTESTS_PARLAYX
PLUGTESTS_PARLAYX (37 subscribers)

PUBLICINTERNETACCESS
PublicInternetAccess List (0 subscribers)

RCCBRIEFING
RCC Briefing List (47 subscribers)

RT
RT Railway Telecommunications (29 subscribers)

RT_DMO
RT_DMO : RT Direct Mode Operation (16 subscribers)

S1_ANSI-41
s1_ansi-41: THIS LIST HAS NOW BEEN CLOSED (0 subscribers)

S1_CAMEL
s1_camel : THIS LIST HAS NOW BEEN CLOSED (0 subscribers)

S1_CHARGING
s1_charging : THIS LIST HAS NOW BEEN CLOSED (0 subscribers)

S1_DISCUSS
s1_discuss : THIS LIST HAS NOW BEEN CLOSED (0 subscribers)

S1_HANDOVER
s1_handover : THIS LIST HAS NOW BEEN CLOSED (0 subscribers)

S1_IP
s1_ip : THIS LIST HAS NOW BEEN CLOSED (0 subscribers)

S1_LCS
s1_lcs : THIS LIST HAS NOW BEEN CLOSED (20 subscribers)

S1_MM
smg1 : list for s1_mm : THIS LIST HAS NOW BEEN CLOSED (0 subscribers)

S1_MULTICALL
s1_multicall : THIS LIST HAS NOW BEEN CLOSED (0 subscribers)

S1_PRESENCE
s1_presence: THIS LIST HAS NOW BEEN CLOSED (0 subscribers)

S1_QOS

s1_qos : THIS LIST HAS NOW BEEN CLOSED (0 subscribers)
S1_SMS
s1_sms : THIS LIST HAS NOW BEEN CLOSED (0 subscribers)
S1_VHE
s1_vhe : THIS LIST HAS NOW BEEN CLOSED (0 subscribers)
SA1_OSA
sa1_osa : THIS LIST HAS NOW BEEN CLOSED (0 subscribers)
SAFETY
safety : etsi tc for telecommunications equipment safety (48 subscribers)
SAFETY-JWG-TC108
SAFETY-JWG-TC108 list (23 subscribers)
SAFETY-JWG-TC108 ANNOUNCE
SAFETY-JWG-TC108 ANNOUNCE list (8 subscribers)
SAFETY ANNOUNCE
safety announcement list (17 subscribers)
SCP ANNOUNCE
ETSI Project Smart Card Platform - THIS LIST HAS NOW BEEN CLOSED (0 subscribers)
SCP_PLENARY
ETSI Project Smart Card Platform - Plenary discussion (323 subscribers)
SCP_REQUIREMENTS
SCP_REQUIREMENTS : REQUIREMENTS WORKING GROUP (192 subscribers)
SCP_TECHNICAL
SCP_TECHNICAL : Technical Working Group (262 subscribers)
SCP_WG1
THIS LIST HAS BEEN CLOSED (15 subscribers)
SCP_WG2
THIS LIST HAS BEEN CLOSED (14 subscribers)
SCP_WG3
THIS LIST HAS BEEN CLOSED (18 subscribers)
SDHA
SDHA : LI Rapporteurs list for DTR/LI-00020 Closed (51 subscribers)
SDR-CR
SDR-CR : Software defined radio-cognitive radio list (40 subscribers)
SES
ses : etsi tc satellite earth stations and systems (ses) (46 subscribers)
SES_AES
ses_aes : [List closed] etsi tc ses wg on aeronautical satellite earth stations (2 subscribers)
SES ANNOUNCE
: etsi tc satellite earth stations and systems announcement list (17 subscribers)
SES_BSM
ses_bsm : ses_bsm (broadband satellite multimedia) (45 subscribers)
SES_BSM_C2P
BSM C2P work items (20 subscribers)
SES_ECAS
SES_ECAS:European Commission Activity support (5 subscribers)
SES_ECSS
SES WG on European Co-operation for Space Standardisation (1 subscriber)
SES_GMR
ses_gmr : etsi tc ses geo_mobile_radio (gmr) interface working group (12 subscribers)
SES_GMR ANNOUNCE
ses gmr announce list (4 subscribers)
SES_HARM
listname : SES_HARM (13 subscribers)
SES_MAR_ESV
ses_mar_esv : SES working group on Maritime Earth Stations on Board Vessels (16 subscribers)
SES_SATEC
SES_SatEC: Satellite Emergency Communications (22 subscribers)
SES_SDR
ses_sdr : ses_sdr satellite digital radio (31 subscribers)
SES_SUMTS
ses_sumts : working group on s-umts (28 subscribers)
SES_SUMTS ANNOUNCE
ses s-umts announce list (16 subscribers)
SG_GNGN
Global NGN stakeholders group on future services and capabilities for NGN (45 subscribers)

SG_UCI

SG_UCI : UCI stakeholders group on UCI matters (29 subscribers)

SOSINTEROP

SOSinterop: SOS Interoperability workshop series (159 subscribers)

SRS-ANNOUNCE

srs-announce : srs-announce list (0 subscribers)

SRS-TEST-ANNOUNCE

srs-test-announce : srs-test-announce list (0 subscribers)

STF217

stf217 : mail discussion and distribution list for stf217 Closed (0 subscribers)

STF260

STF260: STF 260 steering group on NGN OSS activity Closed (0 subscribers)

STF268

STF268: STF 268 stakeholders group closed (44 subscribers)

STF280

STF280: STF 280 AND STF 281 STAKEHOLDERS GROUP Closed (31 subscribers)

STF283-SC

STF283-SC (18 subscribers)

STF293SG

STF293SG : STF 293 steering group closed (9 subscribers)

STF297

STF297: STF 297 stakeholders group on CTS closed (14 subscribers)

STF315

STF315 : Stakeholders group (SG) (23 subscribers)

STF321

STF321 Stakeholders Group (SG) (21 subscribers)

STQ

stq : for anyone interested in the work of etsi stq (87 subscribers)

STQ_AURORA

stq_aurora : etsi stq aurora project for distributed speech recognition (20 subscribers)

STQ_MOBILE

stq_mobile : QoS aspects of mobile telephony (68 subscribers)

TBINFO

tbinfo : tbinfo list has been closed 09/03/2005 (0 subscribers)

TC106X-4

tc106x-4 : safety joint working group tc 106x wg4 (30 subscribers)

TC106X-7

tc106x-7 : safety joint working group tc 106x wg7 (24 subscribers)

TESTCOM_2003_AC

TESTCOM_2003_AC : Aréa Coordinators (0 subscribers)

TESTCOM_2003_SC

TESTCOM_2003_SC : Steering Committee (0 subscribers)

TESTCOM_2003_TPC

TESTCOM_2003_TPC: TPC Technical Program Committee (0 subscribers)

TESTLIST

TESTLIST : List for ListServ tests (1 subscriber)

TEST_DB

list for testing dbms feature (1 subscriber)

TETRA

TETRA : Technical Committee TETRA (56 subscribers)

TETRAMAN

TETRAMAN : restricted to the ETSI Project TETRA Management Committee (12 subscribers)

TETRAWG1

No title defined (46 subscribers)

TETRAWG1_ANNOUNCE

tetrawg1 announce list (16 subscribers)

TETRAWG3

No title defined (52 subscribers)

TETRAWG31

TETRAWG31 : General Issues (19 subscribers)

TETRAWG32

TETRAWG32 : Air interface lowest layers, mainly physical layer (20 subscribers)

TETRAWG33

TETRAWG33 : Air interface protocols (22 subscribers)

TETRAWG34

TETRAWG34 : ISI (16 subscribers)

TETRAWG35

TETRAWG35 : Interworking with other telecommunication networks (19 subscribers)

TETRAWG36

TETRAWG36 : Supplementary Services (20 subscribers)

TETRAWG37

TETRAWG37 - SIM (18 subscribers)

TETRAWG38

TETRAWG38 : PEI (19 subscribers)

TETRAWG3_ANNOUNCE

tetra wg3announce list (15 subscribers)

TETRAWG4

No title defined (45 subscribers)

TETRAWG4_ANNOUNCE

tetra wg4 announce list (20 subscribers)

TETRAWG5

No title defined (24 subscribers)

TETRAWG5_ANNOUNCE

tetrawg5_announce : tetrawg5_announce list (13 subscribers)

TETRAWG6

No title defined (44 subscribers)

TETRAWG6_ANNOUNCE

tetra wg6 announce (17 subscribers)

TETRAWG8

No title defined (47 subscribers)

TETRAWG8_ANNOUNCE

tetra wg8 announce list (17 subscribers)

TETRA_ANNOUNCE

etsi project tetra announcement list (15 subscribers)

TFES

tfes : tfes list (41 subscribers)

TISPAN_EMTEL

TISPAN_EMTEL: TISPAN project EMTEL on Emergency communications (77 subscribers)

TISPAN_F-MMS

TISPAN_F-MMS: TISPAN project F-MMS (66 subscribers)

TISPAN_FORUM

TISPAN_FORUM: TISPAN open list (156 subscribers)

TISPAN_GEN

TISPAN_GEN: technical committee list (490 subscribers)

TISPAN_NGN

TISPAN_NGN: technical committee list dealing with NGN Project matters (485 subscribers)

TISPAN_STF328_SG

TISPAN_STF328_SG: IMS NNI Interop (21 subscribers)

TISPAN_WG1

TISPAN_WG1: Services (399 subscribers)

TISPAN_WG2

TISPAN_WG2: Architecture (345 subscribers)

TISPAN_WG3

TISPAN_WG3: Protocols (404 subscribers)

TISPAN_WG4

TISPAN_WG4: Numbering and Routeing (227 subscribers)

TISPAN_WG5

TISPAN_WG5: NGN Home Networking (40 subscribers)

TISPAN_WG5_OLD

TISPAN_WG5_OLD: NGN Home Networking OLD (0 subscribers)

TISPAN_WG6

TISPAN_WG6: Testing (106 subscribers)

TISPAN_WG7

TISPAN_WG7: Security (279 subscribers)

TISPAN_WG8

TISPAN_WG8: Network Management (248 subscribers)

TM

TM : TM Approval by Correspondence list (59 subscribers)

TM1-ATM

tm1-atm : wp3 atm equipment (10 subscribers)

TM1-GEN

tm1-gen : tm1 plenary meetings management (16 subscribers)

TM1-SDH

tm1-sdh : sdh equipment (11 subscribers)

TM1-TEST

tm1-test : wp3-conformance testing (7 subscribers)
TM1-WP1
tm1-wp1 : optical fibres and components (11 subscribers)
TM1-WP2
tm1-wp2 : core networks architecture (9 subscribers)
TM1-WP3
tm1-wp3 : transport equipment, systems and interfaces (14 subscribers)
TM1-WP4
tm1-wp4 : timing and synchronization (6 subscribers)
TM1_ANNOUNCE
tm1 announce list (6 subscribers)
TM4
tm4 : digital radio relay systems (86 subscribers)
TM4-WP1
tm4-wp1 : tm4-wp1 list closed (45 subscribers)
TM4-WP2
tm4-wp2 : tm4-wp2 list closed (44 subscribers)
TM4-WP4
tm4-wp4 : tm4-wp4 list closed (38 subscribers)
TM4_ANNOUNCE
tm4 announce list (27 subscribers)
TM6_ALL
tm6_all : access networks (architecture, unis, xdsl isdn) (108 subscribers)
TM6_ANA
tm6_ana : tm6 access network architecture wp (17 subscribers)
TM6_ANNOUNCE
tm6 announce list (46 subscribers)
TMSIX_OPS
TM6 operators group (29 subscribers)
TM_ANNOUNCE
No title defined (22 subscribers)
TPLAN
Test Purpose Language (7 subscribers)
TTCN3
active_ttcn3 : mts stf133 ttcn version 3 - active members only (357 subscribers)
TTCN3CR
TTCN3CR : TTCN3 Change Request (8 subscribers)
TTCN3_DOC
TTCN3-DOC (13 subscribers)
USER-INFO
No title defined (32 subscribers)
USER_ANNOUNCE
announcement list for the user group (12 subscribers)
WIG
wig : wireless lan interworking group LIST CLOSED (2 subscribers)

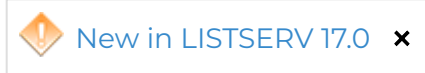
Note that confidential or sensitive lists may be unlisted. If you know the exact name of the list you are looking for but could not find it on this page, try the [unlisted archive form](#) instead.

Appendix O



3GPP_TSG_SA_WG3 Archives

February 2007



3GPP_TSG_SA_WG3@LIST.ETSI.ORG



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Subject: [Invitation to Joint TISPAN WG7/SA3 ad hoc on IMS and SA3 ad hoc on SAE/LTE](#)



From: Michael Clayton <Michael.Clayton@ETSI.ORG>

Reply To: Michael Clayton <Michael.Clayton@ETSI.ORG>

Date: Mon, 19 Feb 2007 14:57:37 +0100

Content-Type: multipart/mixed

Parts/Attachments: [text/plain](#) (761 bytes) , [text/html](#) (2364 bytes) , [3GPPSA3Joint IMS and Ad Hoc on LTESAE.zip](#) (32 kB)

Dear All,

At last, here is the invitation to the joint TISPAN WG7/SA3 ad hoc on IMS and SA3 ad hoc on SAE/LTE.

It is a combined invitation, but there are two registration pages on the WEB. The link for the joint WG7/SA3 meeting is <http://webapp.etsi.org/MeetingCalendar/MeetingDetails.asp?mid=26462> and the link for the SAE/LTE meeting is <http://webapp.etsi.org/MeetingCalendar/MeetingDetails.asp?mid=26418>. Document allocation will be on the latter for both meetings since I cannot open to independent instances of ADN.

So you can reserve documents at http://webapp.etsi.org/rmeetingDocuments/CreateDoc.asp?MTG_Id=26418. If there are any CRs then please apply to me for CR numbers. This does not apply for P-CRs.

Best regards,

ATOM

RSS1

RSS2

Appendix P



3GPP_TSG_SA_WG3 Archives

March 2007



New in LISTSERV 17.0 x

3GPP_TSG_SA_WG3@LIST.ETSI.ORG



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Topic: [[<< First](#)] [[< Prev](#)] [[Next >](#)] [[Last >>](#)]

Author: [[<< First](#)] [[< Prev](#)] [[Next >](#)] [[Last >>](#)]

Subject: [Draft agenda for SAE-LTE security ad hoc meeting](#)
From: Valtteri Niemi <valtteri.niemi@NOKIA.COM>
Reply To: valtteri.niemi@NOKIA.COM
Date: Mon, 26 Mar 2007 12:20:57 +0300
Content-Type: multipart/mixed
Parts/Attachments: [text/plain](#) (449 bytes) , [text/html](#) (1174 bytes) , [S3-070zyx_agenda_of_SAE_ad_hoc.zip](#) (5 kB)



Dear SA3,

Due to some confusion between Michael and me, document S3-070271 that was meant to contain the draft agenda for the SAE/LTE security ad hoc meeting 28-29th March, actually contains a copy of the 27th March joint IMS meeting agenda.

Attached, please find the correct document (= draft agenda for the SAE/LTE security ad hoc meeting).

Sorry about the inconvenience,

Best regards,
Valtteri Niemi
SA3 chairman

[ATOM](#)[RSS1](#)[RSS2](#)

Appendix Q



3GPP_TSG_RAN@LIST.ETSI.ORG

Options:

Subject	From	Date ▾
		
ITU Ad Hoc invitation & agenda	Magnani Nicola	Tue, 29 Dec 1998 21:28:11 +0100
ITU Ad Hoc Group	Magnani Nicola	Mon, 28 Dec 1998 08:30:07 +0100
RDR:Inv. to UMTS-L1 & 3GPP TSG RAN WG1/WG4	Toskala Antti (NTC/Espoo)	Wed, 23 Dec 1998 17:32:34 +0100
Inv. to UMTS-L1 & 3GPP TSG RAN WG1/WG4	Toskala Antti (NTC/Espoo)	Wed, 23 Dec 1998 10:59:00 +0200
Inv. to first 3GPP TSG RAN WG2 and next SMG2UMTS-L23 EG meeting	Mikko J. Rinne	Tue, 22 Dec 1998 19:17:48 +0200

ATOM

RSS1

RSS2

Appendix R

The Wayback Machine - <https://web.archive.org/web/20070418135818/http://www.3gpp.org:80/tb/home.htm>



Project Management

About 3GPP

Technical Bodies

Specifications

Delegates Corner

Membership

Project Support

Meetings

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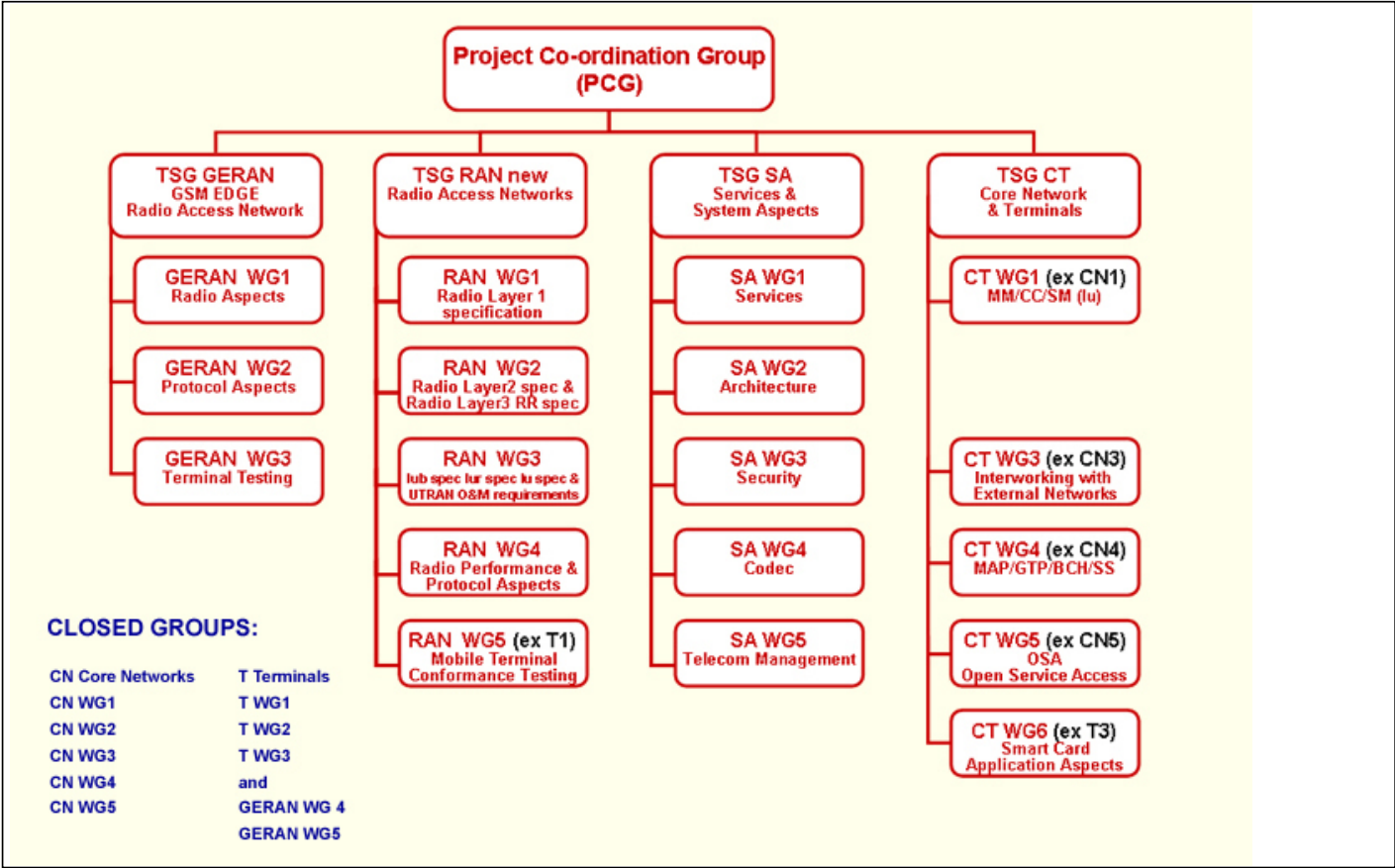
FAQ

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TSG ORGANIZATION

Click on any TSG or WG in the chart to go to that Group's home page to find information on its elected officials, its meeting schedule, the Work Items and Specifications for which it is responsible, etc.



[Powerpoint™ version of the chart above](#)

[MCC Task Forces](#)

last updated:
2006-07-21: Guidance note added above chart, link to Powerpoint version moved to below chart
2005-06-22: New org chart removing closed working groups from main body of chart
2005-03-14: Complete update
2005-01-31: New TSG structure.

Appendix S

The Wayback Machine - <https://web.archive.org/web/20070403172845/http://www.3gpp.org:80/ftp/>

www.3gpp.org - /ftp/

[\[To Parent Directory\]](#).

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14 September 2006	16:15	<dir> Invitation
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12 March 2007	14:32	<dir> Op
24 November 2006	19:51	<dir> PCG
07 March 2007	15:25	<dir> Specs
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08 February 2007	11:04	<dir> workshop

Appendix T

The Wayback Machine - https://web.archive.org/web/20070429085738/http://www.3gpp.org:80/ftp/tsg_sa/...

www.3gpp.org - /ftp/tsg_sa/WG3_Security/

[\[To Parent Directory.\]](#)

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30 March 2007	00:05	<dir> Work Items

Appendix U

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/ftp/tsg_sa/WG3_Security/TSGS3_46b_LTESAE_adHoc_SophiaAntipolis/

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30 March 2007	00:03	<dir> Report

Appendix V

Source: Chairman of 3GPP TSG-SA WG3
Title: Draft agenda for the SAE ad hoc meeting
Document for: Approval
Agenda Item: 2

- 1 Opening of the meeting (Wednesday 28th March at 9:00 am)**
- 2 Agreement of the agenda**
- 3 Assignment of input documents**
- 4 Report of SAE/LTE issues from SA#35**
- 5 Incoming LS's sent to SA3 about SAE/LTE**
- 6 Technical contributions**
- 7 Planning of the specification phase**
- 8 Any other business**
- 9 Close (Thursday 29th March 16:00 pm at latest)**

Appendix W

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/ftp/tsg_sa/WG3_Security/TSGS3_46b_LTESAE_adHoc_SophiaAntipolis/Agenda/

[\[To Parent Directory\]](#)

26 March 2007	11:00	5864	S3-070241.zip
26 March 2007	11:00	5167	S3-070275.zip

Appendix X

Source: MCC

Title: Draft Report for the SA3 SAE/LTE ad hoc 28-29th March 2007

Document for: Information

Agenda Item: 4.5

Version: 1.0

1	Opening of the meeting	2
2	Agreement of the agenda.....	2
3	Assignment of input documents	2
4	Report of SAE/LTE issues from SA#35	2
5	Incoming LS's sent to SA3 about SAE/LTE	2
6	Technical contributions	3
6.1	TR 33.821 changes due to PDCP termination point move	3
6.2	Key Management and Control	4
6.3	eNB Security requirements.....	7
6.4	Other:	7
7	Planning of the specification phase	8
8	Any other business	8
9	Close.....	8

1 Opening of the meeting

2 Agreement of the agenda

The agenda was provided in TD S3-070275. It was approved without comment. TD S3-070271 contained an earlier version, but this was erroneous and was withdrawn.

S3-070271: Draft agenda for the SA3 SAE ad hoc meeting (Chairman of 3GPP TSG-SA WG3) – replaced by 275

3 Assignment of input documents

4 Report of SAE/LTE issues from SA#35

S3-070282: Report from SA#35 plenary (Chairman). A brief report was given on SAE/LTE in SA #35. The only contribution that proposed to overrule SA3's decision to exclude SIM access to LTE was actually withdrawn during the meeting. Therefore, our LS (S3-070155) was simply noted.

Also in the SAE/LTE area, some attention was devoted to the security issues around terminating user plane security in eNodeB. As you remember, we listed several countermeasures in our LS to SA2 (S3-070153). It was agreed that we should include requirements on implementation security in the normative part of our SAE/LTE specifications. How and where to document detailed guidelines about what technologies could be used (and how) to meet these requirements, was left for further discussions. RAN requested that we provide information to RAN3 about the notion of tamper-resistance during or for their meeting 7-11 May (Kobe, Japan). We should discuss in the ad hoc meeting (28-29 March) whether some SA3 people could participate their meeting and/or whether we can create an informative enough LS on the subject. The SAE/LTE work plan was provided in SP-070230, and we were reminded that we should aim at solving the critical RAN2/3 issues in our ad hoc meeting.

There was a RAN3 request at SA3 to provide more information and a request for someone to go to the next RAN3 to explain eNode B security. Mr Alec Brusilovsky (Alcatel-Lucent) agreed to do this. It was also agreed to send a liaison statement. This was provided in TD S3-070283. This would be to RAN2 and RAN3 (and answers the liaison statement in TD S3-070284). It was agreed to send this liaison statement.

5 Incoming LS's sent to SA3 about SAE/LTE

TD S3-070278: (R2-071105) LS on 'Verification of security principles' from RAN2 (cc SA2). As, SA2/RAN2/RAN3 have decided to move the PDCP and ciphering down to the eNB RAN2 would like to verify whether previous security agreements made between SA3 and RAN2 are still valid.

S3-070249: Proposed reply to 'LS Verification of security principles' (Ericsson). This document provided some proposed answers to the RAN2 questions in TD S3-070278.

It was commented on question 5 regarding the benefits of the solution; this is true but it should be clarified that these benefits only apply to some cases. Also, if it is applied to all conditions, then a delay would be introduced. Hence, the only advantage is that the RRC can be updated regularly, but this is unnecessary. There were a number of contributions to this issue later in the meeting in Key management.

However, the answers to questions 1 was approved. The meeting needed to come back to the answers to questions 2, 3, and 4, 5. It was noted that there was some agreement to the answer to question 3, but that there were some elements that needed further work. There are also some issues in question 2 that have not been addressed.

It was revised to TD S3-070280 (Karl). This would e. The version would be available 10th April and comments could be received until the 17th April. The commented version would be provided on 18th April and comments can be checked until the 20th April. The final version would be available on the 23rd April.

TD S3-070279: (S2-071046) LS on 'Location of PDCP in eNodeB' from SA2 (cc RAN2, RAN3). SA2 is asking SA3 to take the decision on location of PDCP and user plane ciphering functions in eNode B into account and to develop cost effective security features and/or specifications to mitigate the threats that SA 3 identify with the objective of achieving a security level as good as the current UMTS systems.

TD S3-070014: R3-062037: LS on 'possible security concerns of path switch control message in eNB-UPE user plane' from RAN3 (cc SA2). This was dealt with at SA#46 and resulted in an Email discussion initiated by Karl Norrman. RAN3 has been discussing about the alternative ways of re-directing data flows between Evolved Packet Core network and eNodeB in Active mode intra-LTE mobility, i.e. on Path Switching at handovers. One of the proposed alternatives is to signal the corresponding Path Switch Control message from eNodeB to CN via S1-U interface. In the meanwhile SA2 has agreed to conduct the Path Switching directly between eNodeB and UPE function of the EPC. RAN3 has turned to SA3 to evaluate the security of this approach. TD S3-070090 also provided more information.

At the time, it was commented that the response to RAN3 should await an answer from SA2 since it may not be necessary to do this. This was passed to the ad hoc where a response to RAN3 should be done on the first day. To do this, a discussion over email was expected. A proposed response was provided in TD S3-070281. The changes proposals were generally agreed, but it needed to be turned into an liaison statement from SA3. it was revised to TD S3-070285. It was agreed to send this liaison statement.

TD S3-070284 contained a liaison statement from RAN2 during the meeting. Following the decision to move the termination of the PDCP to eNode B, a discussion has started in RAN2 on whether the ciphering and deciphering should be done in PDCP or RLC sublayer. In addition the preferred choice of sublayer for ciphering has a connection to the security requirements of eNode B. This would be answered in TD S3-070283 (see section 4.0).

TD S3-070289 contained a liaison statement from SA2 during the meeting. SA2 is asking SA3 to investigate APN integrity and confidentiality, that means, whether it is acceptable from security point of view that the UE sends the PDN information before establishing the NAS signalling security. This was noted at this meeting. It will be dealt with at the next meeting in May.

6 Technical contributions

6.1 TR 33.821 changes due to PDCP termination point move

TD S3-070238: pCR to TR 33.821: Editorial changes due to PDCP relocation (Nokia, Siemens Networks). There isn't UPE in SAE now and the endpoint of user plane in EPC is SAE gateway. The corresponding changes should be reflected in this TR. A new section 7.6 is added to reflect the design of moving PDCP to eNodeB. Some former decisions in 6.2 were obsoleted and removed. It was agreed and will be put into the next version of 33.821.

TD S3-070235: pCR to TR 33.821: Update on Layered Security Approach (Nokia, Siemens Networks). This contribution updates section 4 in TR 33.821 to reflect the PDCP relocation into the eNB. There was an issue on section 4.4. The meeting decided to postpone until after discussion Path Switch Message. There was a minor change and with this it was agreed and will be put into the next version of 33.821.

TD S3-070251: Proposal for Modification to Baseline Key Hierarchy (Motorola). Contribution S3-070095 proposed a particular key hierarchy and nomenclature for various keys in the LTE keying structure. In meeting SA3-46, it was agreed to adopt this structure as a baseline for further discussion. The baseline hierarchy has been incorporated into the working document section 7.4.7.2. Since meeting SA3-46, it has been agreed by the SA and RAN groups that the user-plane encryption function should be performed at the eNodeB rather than the UPE. In the light of this decision, a modification to the baseline key hierarchy is needed. This contribution proposes such a modification.

There was a conflict with TD S3-070230. There was some support of the picture in TD S3-070251 rather than TD S3-070251 TD S3-070251 was agreed and will be put into the next version of 33.821..

TD S3-070230: pCR to TR 33.821: Updated hierarchy of user-related keys in SAE/LTE (Nokia, Siemens Networks). In S3-070095 a working assumption for a key hierarchy for SAE/LTE was proposed. This proposal was accepted during SA3#46 and included in the TR 33.821, Section 7.4.7. However, the proposal was built on the assumption that UP protection was terminated in UPE and that UPE was "above" eNB. This document makes a proposal to update the working assumption on the key hierarchy according to the fact that UP protection is now expected to terminate in eNB. Furthermore some minor editorial corrections are made. It was noted that the diagram from TD S3-070251 was preferred. Also an editor's note was added to indicate that some further work was required as to whether the same key to be used for user plan and RRC in eNodeB.

TD S3-070258: Discussion on key architecture (Huawei): Section 3.2, 3.4. In latest specification 33.821, a key architecture in LTE/SAE was present as basis for further study. This paper discussed several issues about this key architecture and proposed to do some modifications on it. There was some discussion on this and no decision could be made. It was postponed.

TD S3-070231: pCR to TR 33.821: Update on idle-to-active and active-to-idle transition (Nokia, Siemens Networks). In S3-070097 a working assumption for a key handling on idle-to-active and active-to-idle transitions within LTE was proposed. This proposal was accepted during SA3#46 and included in Section 7.4.9 of TR 33.821 V. 0.1.0. This was built on the assumption that UP protection was terminated in UPE and that UPE was “above” eNB. This document makes a proposal to update the working assumption on the key handling according to that fact that UP protection is now terminate in eNB. This document is based on a companion contribution on how to update section 7.4.7 of the TR on key hierarchy. It was agreed and will be put into the next version of 33.821.

TD S3-070232: pCR to TR 33.821: Update on active and idle mode mobility of user-related keys in SAE/LTE (Nokia, Siemens Networks). This is very similar to TD S3-070231 but to consistent rename the keys. It was agreed and will be put into the next version of 33.821.

TD S3-070236: pCR to TR 33.821: Update on UMTS AKA and Key Derivation for SAE/LTE (Nokia, Siemens Networks). The current TR 33.821 includes multiple alternatives for key derivation purposes. However, the key hierarchy (S3-070095) and serving network authentication (S3-060716) contributions agreed in the SA3#46 meeting as baseline rule out some of the alternatives presented. These need to be removed from the TR. On the other hand we need to continue to specify the key derivation parameters. Thus, in this contribution we propose modifications to the TR 33.821 section 7.4.3 “Key derivation”. We also need to update the section 7.4.1 “UMTS AKA” to reflect the key hierarchy baseline. Updates to this section are also provided in this contribution.

It was asked to not delete section 7.4.1, but instead to put that it was decided not to use this solution. Document TD S3-070095 contained the reasons why this was not chosen. With this, it was agreed and will be put into the next version of 33.821.

TD S3-070239: pCR to TR 33.821: Update on NDS/IP (Nokia, Siemens Networks). This contribution updates section 8 on Network Domain Security due to the decision to move User plane ciphering to the eNodeB i.e. we have taken into account the new SAE architecture i.e. MME and SAE GW (and no UPE). Beside that, some new threats are added and some changes are due to editorial improvements.

It was asked why was integrity protection needed in the uplink and not all the way. This was probably an error and some thought is required. Another question was why is integrity protection on the uplink is not sufficient. It was answered that an attacker could insert packets. This was possible before of course. It was suggested that the text for the uplink would not inserted, but an editor’s note instead. The note would indicate whether integrity protection is required on the uplink to avoid packet insertion attacks. With this, it was agreed; to be put into the TR 33.821.

6.2 Key Management and Control

TD S3-070258: Discussion on key architecture (Huawei): Section 3.3. This was presented in section 6.1, but paragraph 3.3 was left until this agenda item.

TD S3-070248: On Key/AV Separation and Security Domains (Ericsson). Key separation, making sure keys are made specific to a specific purpose is a well-known security measure. It has been discussed in 3GPP as a countermeasure to the A5/2 attack effects. It is also well known in IETF protocols such as Digest AKA v2 which can device “context specific” keys. EAP has so called channel bindings/service identities, [1]. However, besides the keys, the “security context” can contain other information and it could perhaps be desirable to make the entire context specific to its purpose. In S3-070096, there is a proposal to use the AMF field to “bind” AVs to a certain access technology (3G/LTE/...etc). The purpose of this contribution is to discuss some general problems in the area of binding of authentication data and some issues related to the approach of S3-070096.

TD S3-070274: Comments on TD S3-070248 “On Key/AV Separation and Security Domains” by Ericsson (Nokia, Siemens Networks). This was produced since the some of the elements of TD S3-070096 could have been misunderstood.

There was a great deal of discussion on this. In the end, it was asked what actually the concrete threat is in this circumstances. This threat may well be in the TR already, but this needs to be checked. In the end, after a long discussion, it was felt that the arguments in TD S3-070258 and TD S3-070248 were not strong enough to change the decision made at the last meeting and so the decision was maintained as per TD S3-070274.

TD S3-070258: Discussion on key architecture (Huawei): Section 3.1. This was dealt with again to finish off the last issue in section 3.1; i.e. to change ME to UE. This was already implemented by TD S3-070230.

TD S3-070265: pseudo-CR to 33.821: alternative solution to derive user-related keys in SAE/LTE (Gemalto, Oberthur). The establishment of user-related keys in SAE/LTE is described within 3GP TR 33.821. This document proposes an alternative solution to derive user-related keys in SAE/LTE with higher security level.

It was commented that this does not allow backwards compatibility. This requirement is described in 2.2 where it is exactly like GBA. It was commented that there was not a need for this for Rel-8. The comment on the last paragraph on the section on constraints, where it is indicated that this is like that of GBA, was questioned. If there is a separation between UMTS and LTE, then it is not sure that there is a major problem.

It was pointed out that the comparison to GBA from a threat point of view was not valid, since the legitimate owner of the UE could distribute the keys and this was why GBA-U was introduced. In the instance of LTE, this is not the case. The threats are different. The author indicated that the intention is not to make a decision on a solution, but to identify that the threats from the users side have not been investigated. This type of threat needs to be described and this was proposed in the pCR also in TD S3-070265. This may need to be updated in light of the comments at this meeting. It was decided to put in some editor's notes to indicate that this needs to be added at some time.

TD S3-070252: Requirements on LTE Keying Structure (Motorola). At meeting SA3-46, there was a proposal for several requirements that the keying structure be used for obtaining cryptographic keys for various operations. It was recommended in meeting SA3-46 that further discussion be conducted to study the requirements. Further, in meeting SA3-46, a key hierarchy and nomenclature for various keys proposed was adopted as a baseline. This contribution provides further clarification on the rationale and implications of the requirements proposed. The terminology is also updated to conform to the baseline key hierarchy in SA3-46.

It was commented that requirement 2 is the most restrictive one. The requirements are nice to have security principles, but without more information on the added complexity, they could not be added to the TR at this time.

TD S3-070253: A method to derive new keys at handover in LTE (Motorola). Contribution S3-070044 proposed a method for obtaining the key used for the security association of the UE with various network entities, with particular focus on the key used for the user-plane ciphering function, and handling the key generation when the termination point of the ciphering is relocated. In meeting SA3-46, it was decided to adopt the key hierarchy proposed in S3-070095 as a baseline. This contribution provides an update to S3-070044 to conform to the baseline key hierarchy. In the terminology of the key hierarchy, this contribution proposes to apply the method of S3-070044 to obtain the key K_{eNB} at the target eNodeB after a handover. Additional discussion on the rationale and implications of the proposed procedure is also provided.

There are two cases. A hard handover and not much time on handover. If key is cracked after handover, then there is nothing to fear. If it is cracked before the handover, then the eNB is at the mercy of the attacker. However, SA3 has always been a little cautious with anything to do with handover as it is so time critical. It was noted that if eNB-1 is cracked, then it is possible that the attacker could act as a man-in-the-middle for eNB-2 and poison the keys. Of course, the attacker could try and stop the user from a handing-over although this would not be possible if the user is moving.

It was noted that key derivation function is secure and cannot be inverted, then this solution is not needed. This is the assumption. This needs to go into the TR and a pCR is required for this at the next meeting.

TD S3-070234: Key refresh in SAE/LTE (Nokia, Siemens Networks). This document proposed that SA3 adopts the proposed key refresh procedures as working assumption to ensure key stream freshness within SAE/LTE.

This would mean that we would have to send Nonces in each measurement report and most of these would not be used. Of course, it is not known what the overhead on the air interface would be. The answer was this depends on which message is used for sending this. Not only measurement reports are used to send Nonces value, but since the measurement report is used in handover and so it is possible. The Nonce could be sent on any number of messages. This makes some sort of Nonce sense. The second question regarded a solution of deriving a key in a one-way function to get a new key. It was answered that the Nonce provides freshness, but this is not precluded.

TD S3-070272: Comments to "Key refresh in SAE/LTE" (Huawei). It was commented regarding the additional latency, which is true, but this needs to be done in anycase and does not impact on this solution. In TD S3-070272 it was suggested to use Start Value. It was also suggested that the decision on the solution should be done by RAN2.

There was no decision on this, but rather contributions were requested before the 2th May 16:00 CET.

TD S3-070273: Comments to contributions TD S3-070230 - TD S3-070240, TD S3-070257 (Ericsson) section 2.1

TD S3-070246: Key management for LTE and UTRAN (Ericsson). This contribution proposes some principles for key management in relation to LTE and UTRAN and LTE/UTRAN interworking and builds on an earlier contribution S3-060704, and recommendations accepted in section 7.4.4 of TR 33.821, and section 7.4.7 in TR 33.821.

There was some concern regarding the second proposal. There was no comment against the first proposal (first bullet) and so this was agreed and contributions were encouraged. The other proposals would need a new WI for Rel-8. It was noted.

TD S3-070240: Key change during LTE_ACTIVE (Nokia, Siemens Networks). Key change in active mode is not supported in UMTS and a consequence of this is that a new AKA key can only be taken into use after a change to IDLE mode. Hence a key stream might be reused for a terminal without mobility and a very long active session. The intent of this contribution is to solicit SA3 for a view whether we need key change in active mode of the keys KASME or KeNB, or alternatively whether it is sufficient to extend the sequence number range (SN) for the user plane encryption such that it will become very unlikely that the SN would wrap around. In the next clause we clarify the rationales about extending the SN, while clause 3 discusses solutions that do not need SN-range extension. In clause 5 we make a comparison. In this contribution we have focussed on the User Plane as the key stream reuse is expected to happen there more quickly as on the other security layers (RRC and NAS).

TD S3-070273: Comments to contributions TD S3-070230 - TD S3-070240, TD S3-070257 (Ericsson) section 2.1.1.

It is possible there is a need to change both the keys sent to the mobile and the K_{ASME} . The key is if there is the possibility to have sessions that last for several days. However, the real technical problem is largely independent of running the AKA. This could be run beforehand and load them in to the mobile in advance. The tricky bit is changing between the keys while maintaining the session. This is the point that needs some study. If necessary, perhaps there is a need to break the session for a short time (e.g. 100ms) to fulfil a security requirement. The idea is to make this key change soon after running AKA. This is the point that should be clarified to RAN.

There was also the issue of wrap-around and what happens if the cycle is completed. It is possible to add a few bits and make the period so long that it would never be reached. Still, if SA3 does not say anything then RAN will assume that the length of the timer would be the same as UMTS. The documents were noted.

TD S3-070257: Discussion of security algorithm negotiation in SAE/LTE networks (Huawei). This contribution was provided to analyze alternatives for how the security algorithms for RRC, UP and NAS protection could be agreed upon between UE and a serving network during network attachment and on idle to active transitions and give some proposed solutions based on the analysis. This document does not include algorithm selection for UP since the security algorithms UPE has been moved to eNB and it is assumed that there is no need to select UP algorithm separately.

TD S3-070259: Procedure of key update (Huawei). This contribution dealt with the idea of updating keys separately is mentioned in tdoc S3-070052. There were some concerns about complexity of solution of updating keys separately. This paper introduced a procedure of key updating in LTE/SAE. It could be seen from the procedure that key updating procedure could be combined with SMC procedure. The key updating procedure would not be complex as imagined.

TD S3-070233: pCR to TR 33.821: Update on security algorithm negotiation (Nokia, Siemens Networks). In S3-070100, it was described how the security algorithms for RRC, UP and NAS protection could be agreed upon between UE and a serving network during network attachment and on idle-to-active transitions. This pCR provided some changes to 33.821 to implement this process.

TD S3-070273: Comments to contributions TD S3-070230 - TD S3-070240, TD S3-070257 (Ericsson) section 2.3 (algo negotiation).

In TD S3-070257 it was proposed to add the analysis in section 2 into TR 33.821 and add the proposed solutions in section 3 in the LS to RAN2 and RAN3. It was commented that section 2 may need some clarification how NAS and RRC algorithm selection have to take place on all state transitions. The specific wording was not determined and so it was decided to add an editor's note to mention the difference. The meeting was pointed to TD S3-070233. It was revised to TD S3-070288. This was agreed but without the weakness in alternative 3. It was agreed and will be put into the next version of 33.821.

On TD S3-070259, it was suggested to adopt this pCR with some editors notes to clarify how to combine the key update procedure with security mode command is for further study. Also, and editor's note that the key names may need updating based on the consistency check of the whole TR. With this, it was agreed and will be put into the next version of 33.821.

TD S3-070237: pCR to TR 33.821: Update on KSI usage in SAE/LTE (Nokia, Siemens Networks). This pCR was to update the TR in line with earlier decisions. It would appear to conflict with pCRs in TD S3-070233 and TD S3-070259.

It was decided to combine TD S3-070259 and TD S3-070237. The consolidated pCR was provided in TD S3-070287. It was agreed and will be put into the next version of 33.821. The key name consistency check still needs to be done.S

6.3 eNB Security requirements

As background, it was noted that SA2#56b Rel-8 joint meeting with SA2, RAN2 and RAN3 made a decision to move User Plane ciphering into eNB (S2-071046), based on SA3's reply-LS on 'potential implementation of user plane encryption in LTE Base Station site (S3-070153).

TD S3-070256: eNB Security Requirements (Nokia, Siemens Networks). This contribution listed some high level security requirements for eNBs for mitigating these threats. SA3 should have a discussion on the eNB security requirements and agree on them during the SA3 May meeting (22 - 25 May 2007). There was some agreement for the requirements or, as one delegate put it, there is nothing that could be disagreed. The first sentence of section 2 was agreed; i.e.:

As a guideline, the security requirement for eNB shall not mention any specific implementation technology, in order not to prevent future evolutions of security technology.

There was a question as to whether the requirements are applicable to UMTS also. The answer is that some are not applicable since the user plane ciphering does not terminated the eNode B. Of course, it was not known if existing base stations could conform to the other requirements. It was endorsed and sent with the liaison statement in TD S3-070283.

TD S3-070264: Requirements on implementation of security functionality at the eNodeB (Alcatel-Lucent). SA#35 decided that SA3 would include requirements on implementation of the eNodeB security functionality in the normative part of SA3 SAE/LTE specifications. The purpose of this contribution is to start discussion in SA3 aimed on identifying these requirements. It was suggested that a layered approach to security is preferred and should be put into the liaison statement. It was answered that this is pretty fundamental issue since this could end up as a mess of security requirements. If there is a level of security, then level one may imply it is more important to level 2 or 3. This should be avoided. No agreement could be reached on the level approach to security.

TD S3-070263: Notion of the tamper-resistance (Alcatel-Lucent). The purpose of this contribution is to start discussion in SA3 aimed on defining the notion of tamper-resistance. There was a great deal of discussion. It was decided that a new document should be produced which will contain section 2 and the relevant references so that this could be put into the TR. There was still some concern regarding the use of the term cryptoprocessors. Some disclaimers should also be put in. A revision was provided in TD S3-070286. It was agreed to be added to the liaison statement in TD S3-070283.

6.4 Other:

TD S3-070247: Cleanup of the term 'xSIM' (Ericsson). This pCR proposed to "clean up" the document regarding the notation and replace the term "xSIM" with "USIM". At the same time the editor's note mentioning that it must be made explicit that R99 USIM is sufficient for access to LTE is removed, and requirement 3 in Sections 7.2.1.3 and 7.6.2 is augmented to make this fact explicit. In addition, it is proposed to correct the term "USIM cards" to say "USIM", as the USIM is not a card but an application on the UICC and a few references which are invalid are corrected in the affected sections.

There was a comment that the text that R99 USIM should be sufficient does not imply that later USIMs are not allowed. It was agreed and will be put into the next version of 33.821.

TD S3-070266: Mobility between 3GPP and non-3GPP networks (Samsung). This contribution proposed security mechanisms for mobility between 3GPP and non-3GPP networks to achieve low latency handovers. In the SAE system, AAA server and MME will be within a single operator domain, if the operator owns both 3GPP and non-3GPP networks and it is possible to exchange the security context between the different trusted access technology authentication entities to reduce handover latency. In case if the operator consider non-3GPP network as un-trusted network, then mechanism like pre-authentication to be considered to achieve low latency handovers.

It was not clear what security context really means. It was answered that the purpose of the document was to prompt AAA server since it can be in the same operator domain and to achieve low latency handover. It was postponed and improved for the next meeting.

TD S3-070260: DoS attack against the MME in SAE/LTE network (Huawei). In TR23.882, the P-TMSI and P-TMSI signature mechanism in UMTS has been re-used in SAE/LTE. But the P-TMSI Signature mechanism in UMTS may have the risk of DoS attack. This contribution analysed the potential DoS attack against the MME and proposed a solution. It was withdrawn prior to presentation.

7 Planning of the specification phase

TD S3-070261: Proposed LTE-SAE security workplan (Vodafone). It was noted and it was decided to make it a living document. The revision was provided in TD S3-070290

8 Any other business

There was no other business. However, it was noted that the update version of 33.821 version 0.2.0 was provided in TD S3-070291. It would be made available by 16th April.

9 Close

The chairmen thanked all the delegates for all the hard work. The meeting closed at 16:05.

Annex A: List of documents

Doc-2nd-Level	Title	Source	New doc	Result
S3-070014	LS on possible security concerns of path switch control message in eNB-UPE user plane	RAN3	90	See 90 for further discussion.
S3-070230	pCR to TR 33.821: Updated hierarchy of user-related keys in SAE/LTE	Nokia, Siemens Networks	None	Agreed; to be put into the TR 33.821 without figure and with ed note
S3-070231	pCR to TR 33.821: Update on idle-to-active and active-to-idle transition	Nokia, Siemens Networks	None	Agreed; to be put into the TR 33.821
S3-070232	pCR to TR 33.821: Update on active and idle mode mobility of user-related keys in SAE/LTE	Nokia, Siemens Networks	None	Agreed; to be put into the TR 33.821
S3-070233	pCR to TR 33.821: Update on security algorithm negotiation	Nokia, Siemens Networks	288	Agreed; to be put into the TR 33.821 without the weakness in alternative 3; Revised to 288
S3-070234	Key refresh in SAE/LTE	Nokia, Siemens Networks	None	Noted, no decision on this, but rather contributions were requested before the 2th May 16:00 CET
S3-070235	pCR to TR 33.821: Update on Layered Security Approach	Nokia, Siemens Networks	None	Agreed; to be put into the TR 33.821
S3-070236	pCR to TR 33.821: Update on UMTS AKA and Key Derivation for SAE/LTE	Nokia, Siemens Networks	None	Agreed; to be put into the TR 33.821 with modifications not to delete text in 7.4.1
S3-070237	pCR to TR 33.821: Update on KSI usage in SAE/LTE	Nokia, Siemens Networks	287	Revised to 287
S3-070238	pCR to TR 33.821: Editorial changes due to PDCP relocation	Nokia, Siemens Networks	None	Agreed; to be put into the TR 33.821.
S3-070239	pCR to TR 33.821: Update on NDS/IP	Nokia, Siemens Networks	None	Agreed; to be put into the TR 33.821 with editor's note on uplink integrity protection
S3-070240	Key change during LTE_ACTIVE	Nokia, Siemens Networks	None	Noted: some study to be done and RAN informed

S3-070246	Key management for LTE and UTRAN	Ericsson	None	Noted: proposal 1 agreed, rest for further study
S3-070247	Cleanup of the term 'xSIM'	Ericsson	None	Agreed; to be put into the TR 33.821
S3-070248	On Key/AV Separation and Security Domains	Ericsson	None	Arguments not strong enough to change decision of SA3 #46
S3-070249	Proposed reply to 'LS Verification of security principles'	Ericsson	280	Revised to 280
S3-070251	Proposal for Modification to Baseline Key Hierarchy	Motorola	None	Agreed; to be put into the TR 33.821.
S3-070252	Requirements on LTE Keying Structure	Motorola	None	Nice to have, but not added until a measure of added complexity is determined.
S3-070253	A method to derive new keys at handover in LTE	Motorola	None	Not accepted but a pCR is needed to define the assumption on which this is based
S3-070256	eNB Security Requirements	Nokia, Siemens Networks		Endorsed and sent with the liaison statement in TD S3-070283
S3-070257	Discussion of security algorithm negotiation in SAE/LTE networks	Huawei	None	Proposal accepted with editor's note; LS to be done in May
S3-070258	discussion on key architecture	Huawei	None	Arguments not strong enough to change decision of SA3 #46
S3-070259	procedure of key update	Huawei	287	Revised to 287
S3-070260	DoS attack against the MME in SAE/LTE networks	Huawei	None	Withdrawn prior to presentation
S3-070261	Proposed LTE-SAE security workplan	Vodafone	290	Noted; Revised to 290
S3-070263	Notion of the tamper-resistance	Alcatel-Lucent	286	Revised to 286
S3-070264	Requirements on implementation of security functionality at the eNodeB	Alcatel-Lucent	None	No agreement could be reached on the level approach to security
S3-070265	pseudo-CR to 33.821: alternative solution to derive user-related keys in SAE/LTE	Gemalto, Oberthur		Not accepted as is, but some editor's notes to be added to indicate that this needs to be added at some time
S3-070266	Mobility between 3GPP and non-3GPP networks	Samsung	None	Postponed and improved for the next meeting
S3-070271	Draft agenda for the SA3 SAE ad hoc meeting	Chairman of 3GPP TSG-SA WG3	275	Revised to 275
S3-070272	comments to Key refresh in SAE/LTE"	Huawei	None	Noted, no decision on this, but rather contributions were requested before the 2th May 16:00 CET
S3-070273	Comments to contributions S3-070230 - S3-070240, S3-070257	Ericsson	None	Noted
S3-070274	Comments on S3-070248 On Key/AV Separation and Security Domains" by Ericsson	Nokia, Siemens Networks	None	Decision of SA3 #46 maintained
S3-070275	Draft agenda for the SAE ad hoc meeting	Chairman of 3GPP TSG-SA WG3	None	Approved
S3-070278	LS Verification of security principles	RAN2	249	Response in 249
S3-070279	LS on Location of PDCP in eNode B	SA2	None	Noted
S3-070280	Proposed reply to 'LS Verification of security principles'	Ericsson	Email	Email from 17/04 until 23/04, see report
S3-070281	Proposed reply to LS on possible security concerns of path switch control message in eNB-UPE user plane	Ericsson	285	Revised to 285

S3-070283	LS to RAN3 on eNode B security	Alcatel Lucent	Out	Agreed to be sent
S3-070284	LS on security requirements on the eNode B	RAN2	283	Response in 283
S3-070285	Proposed reply to LS on possible security concerns of path switch control message in eNB-UPE user plane	Ericsson	Out	Agreed to be sent
S3-070286	Notion of the tamper-resistance	Alcatel-Lucent	None	Agreed
S3-070287	Procedure of key update and Update on KSI usage in SAE/LTE	Huawei, Siemens Networks	None	Agreed; to be put into the TR 33.821.
S3-070288	pCR to TR 33.821: Update on security algorithm negotiation	Nokia, Siemens Networks, Huawei	None	Agreed; to be put into the TR 33.821.
S3-070289	LS on Access Point Name Confidentiality	SA2		To be done in May meeting
S3-070290	Proposed LTE-SAE security workplan	Vodafone		-
S3-070291	TR 33.821 version 0.2.0 - Rational and Track of Decisions	Rapporteur		To be available
S3-070293	Draft Report for the SA3 SAE/LTE ad hoc 28-29th March 2007	MCC		-

Annex B: List of Delegates

Appendix Y

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/ftp/tsg_sa/WG3_Security/TSGS3_46b_LTESAE_adHoc_SophiaAntipolis/Rep

[\[To Parent Directory\]](#)

29 March 2007	15:16	24808	S3-070292 Report of joint WG7 SA3V1.zip
29 March 2007	15:16	32419	S3-070293 Report of SAEadhocV1.zip

Appendix Z



www.3gpp.org / [ftp](#) / [tsg_sa](#) / [WG3_Security](#) / [TSGS3_46b_LTESAE_adHoc_SophiaAntipolis](#) / **Docs**

sort by name/desc	sort by date/desc	sort by size/desc
 TDoc_List_Meeting_SA3-Ad Hoc on LTE	2016/05/31 23:31	
 13bTD421_eTVRA_pre-demonstration_presentation.zip	2007/03/26 9:46	340 KB
 13bTD433 WI7021_Status_of_work_on_media_security_in_TISPAN.zip	2007/03/26 9:46	217,7 KB
 DoclistIMS_SAE-LTE.csv	2007/03/26 9:59	13,1 KB
 DoclistIMS_SAE-LTE.txt	2007/03/26 9:59	24,5 KB
 DoclistIMS_SAE-LTE.zip	2014/11/07 12:56	7,2 KB
 ENB Security LS - S3-070283 v.2.zip	2007/03/29 12:16	43,2 KB
 Proposed LTESAE doc sequence 2803.doc	2007/03/28 7:11	28 KB
 Proposed LTESAE doc sequence 2803.zip	2014/11/07 12:56	4,9 KB
 S3-070014.zip	2007/03/28 7:43	9,5 KB
 S3-070220.zip	2007/03/13 8:51	51,6 KB
 S3-070221.zip	2007/03/16 11:14	264,8 KB
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 S3-070276.zip	2007/03/27 7:26	184,2 KB
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 S3-070278.zip	2007/03/28 7:34	11,5 KB
 S3-070279.zip	2007/03/28 7:34	28,1 KB
 S3-070281.zip	2007/03/28 8:15	12,8 KB
 S3-070283.zip	2007/03/29 12:39	41,9 KB
 S3-070284.zip	2007/03/28 14:50	10 KB
 S3-070285.zip	2007/03/29 11:04	9,8 KB
 S3-070286.zip	2007/03/29 14:30	18,9 KB
 S3-070287.zip	2007/03/29 14:30	19,8 KB
 S3-070288.zip	2007/04/10 9:31	114,3 KB
 S3-070289.zip	2007/03/29 14:30	5,8 KB
 TDoc_List_Meeting_SA3-Ad Hoc on LTE_SAE.xlsm	2017/06/05 8:04	31,8 KB
 TDoc_List_Meeting_SA3-Ad Hoc on LTE_SAE.xlsx	2017/10/13 9:12	28,1 KB
 TDoc_List_Meeting_SA3-TISPAN7-on IMS Securit.xlsm	2017/06/05 8:04	19,8 KB
 TDoc_List_Meeting_SA3-TISPAN7-on IMS Securit.xlsx	2017/10/13 9:12	16 KB

83 items.