UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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

Petitioners

v.

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

Patent Owner

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Case Nos. IPR2025-00037

U.S. Patent 10,616,932

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Ex. 1013 – 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 Nokia of America Corporation ("Nokia"), Ericsson Inc. ("Ericsson"), AT&T Services, Inc. ("AT&T"), Cellco Partnership d/b/a Verizon Wireless ("Verizon"), and T-Mobile USA, Inc. ("T-Mobile"), (to whom I will refer to as Petitioners) for this *inter partes* review proceeding (which I may refer to at times as an "IPR").

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. In the preparation of this expert report 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, as well as all of the Appendices attached hereto.

4. In forming the opinions expressed within this expert report, I have considered:

- The appendices listed above; and

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- My own academic background, knowledge, and professional experiences in the field of wireless communications.

5. Although I have attempted to organize the information presented in this report into helpful sections and/or divisions, my opinions are supported by the information in the report in its entirety.

II. QUALIFICATIONS

6. My complete qualifications and professional experience are described in my *curriculum vitae*, a copy of which is attached as **Appendix 1.** The following is a summary of my relevant qualifications and professional experience.

7. I earned my Bachelor of Electronic Engineering degree with Honors from Polytechnic of Central London in 1989. In 2006, I earned my MSC in Computer Science with Distinction from the University of Kent.

8. 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

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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, and proposing changes as necessary to ensure input documents and the resulting specifications were in line with said requirements.

9. 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 Global System for Mobile Communications (GSM)/ General Packet Radio Service (GPRS), Universal Mobile Telecommunications System (UMTS), the IP Multimedia subsystem (IMS), and Long-Term Evolution (LTE)/ Evolved Packet System (EPS) systems. Initially, I participated in ETSI Special Mobile Group (SMG) committees SMG1, SMG2, SMG4, SMG5, and SMG9, and relevant UMTS related sub-committees working on the air interface radio access network protocols, service, and terminal aspects of UMTS and GSM/GPRS until 1999. In particular, I was a participant in the ETSI SMG2 meetings leading up to selection of Wideband Code Division Multiple Access (WCDMA) as the radio access technology for the Frequency Division Duplex (FDD) mode of UMTS.

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10. Beginning in 1998, I worked as a Principal Standards Engineer on the 3rd Generation Partnership Project (3GPP) on UMTS. I attended the inaugural 3GPP Technical Specification Group (TSG) meetings held in December 1998, and I began attending Working Group (WG) meetings in 1999. Specifically, I was a regular participant in Radio Access Network (RAN) WG1, Services & System Aspects (SA) WG1, Terminals (T) WG2, but I also attended TSG RAN and T plenary meetings and sometimes other Working Groups and covering similar technical aspects as in my previous work in ETSI. As an example, RAN WG2 was, and is, a Working Group responsible for the specification of layer 2 and layer 3 Radio Resource, protocols for the UE. 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 all contributions and review those of interest to Samsung, and where necessary, prepare additional input to the meeting based on said review.

11. Beginning in 2000, I acted as project manager and then as system engineering manager 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,

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contributions on Samsung's development projects, ensuring that Samsung's development team was kept informed about the latest developments as layers 2 and 3 of the UMTS standard were stabilized.

12. 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).

13. 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 3GPP 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, mainly focusing on IP Multimedia Subsystem (IMS) including voice over IMS but also looking at wider Evolved Packet System (EPS) related issues. From 2008 until 2011, I regularly attended and participated in SA WG1 meetings. I also attended SA plenary meetings from 2008 until I left

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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.

14. From 2005 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.

15. 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. In this position I gained further perspective on the organisation, management, and activities of ETSI and its Technical Committees and Partnership Projects including 3GPP.

16. Since leaving Samsung in January 2013, I have formed my own consulting company which is a member of ETSI, and as part of various projects

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undertaken, I have continued to regularly access the ETSI and 3GPP document servers, and to keep abreast of ETSI and 3GPP document handling and publication practices.

17. Through my extensive work in ETSI and on 3GPP standardization issues over the years, I have become very familiar with ETSI and 3GPP practices for when and how the technical standards (including revisions thereto) and other standards-related contributions are made publicly available, including in the 1999–2012 timeframe when I was attending or monitoring various 3GPP Working Groups, including RAN WG1 and RAN WG2, and since 2013 in support of my work as an independent standardisation consultant.

18. For purposes of my analysis in this declaration, I have been informed that a person of ordinary skill in the art ("POSITA") would have been a person with a working knowledge of 3GPP technology standards. That person would have had at least a Bachelor of Science degree in electrical engineering, computer engineering, or similar discipline and had at least two years of experience with communication networks governed by 3GPP technology standards.

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

19. Based on my years of experience working in various capacities in 3GPP and on 3GPP standards issues, I am familiar with the regular business practices of

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the 3rd Generation Partnership Project (3GPP) relating to technical documents including specifications, draft standards and proposals, and standards-related technical contributions, as well as the business practices through which 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 2** at 2, 3 ("[3GPP] Partnership Project Description"); **Appendix 3** at 1; **Appendix 4** at 5. At that time, various standards organisations agreed to cooperate to produce a "complete set of globally applicable Technical Specifications" that would then be transposed into standards by the relevant standardization bodies (also known as Organizational Partners). **Appendix 2** at 3, 5 ("[3GPP] Partnership Project Description"). 3GPP "attracted a very strong commitment from organisations and companies around the world, reflecting the truly global nature of the project." **Appendix 4** at 7.

21. 3GPP is a global initiative partnership made up of Organizational Partners, Market Representation Partners, and Individual Members. **Appendix 5** at

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7, 8; **Appendix 2** at 10. Today, 3GPP unites seven telecommunications standard development organisations ("Organizational Partners") from around the world: the Association of Radio Industries and Businesses (ARIB) and the Telecommunication Technology Committee (TTC) from Japan, the China Communications Standards Association (CCSA) from China, the Telecommunications Standards Development Society, India (TSDSI) from India, the Telecommunications Technology Association (TTA) from Korea, the European Telecommunications Standards Institute (ETSI), and the Alliance for Telecommunications Industry Solutions (ATIS) from the United States. These Organizational Partners are regional standards organisations that have the authority to define, publish, and set standards for their respective regions. **Appendix 2** at 12. 3GPP also includes "Market Representation Partners" that represent various industry perspectives and offer market advice. **Appendix 5** at 9 (3GPP Working Procedures, "Market Representation Partnership"); **Appendix 2** at 14; **Appendix 4** at 5. Additionally, 3GPP includes individual member companies ("Individual Members") that participate in 3GPP through their membership in a 3GPP Organizational Partner. **Appendix 5** at 9 (3GPP Working Procedures, "Individual Membership"); **Appendix 6** at 5 (textbook including a chart showing 3GPP structure at the time of publication); **Appendix 8** at 9, 10. As an example of how prominent 3GPP was (and remains) in the industry,

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there were 175 individual members in December 2000 and 196 by 2004. **Appendix 9**, **Appendix 7** at 8 (3GPP Project Coordination Group document showing 3GPP membership numbers to 2017). There were 835 individual members as of August 2024. **Appendix 10**.

22. As noted in paragraph 20, a primary goal of 3GPP is to provide an environment to produce Technical Specifications and Technical Reports that define and standardize technologies 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 such as work on codecs, security, and quality of service. The specifications also provide hooks for interworking with non-3GPP networks including, but not limited to, Wi-Fi networks. **Appendix 2** at 32–40; **Appendix 3** at 2.

23. Given the prominence of 3GPP in the wireless communication industry, beginning in 1999 and continuing through today, interested POSITAs were tracking the developments of the latest 3GPP specifications and reports to ensure timely development of products and services by their companies that were consistent with the standards being developed. In other words, it is my opinion that a POSITA would have to be familiar with 3GPP and with the specification-related documents

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produced as part of the 3GPP process in order to properly perform his or her job. Without access to and knowledge of the 3GPP documentation, including, for example, the substantive contents of 3GPP technical specifications, an engineer could not develop products that were interoperable with the worldwide 3G, 4G, and 5G standards. Because 3GPP documents were an important aspect of a POSITA's professional experience, textbooks and articles about cellular communications commonly directed readers to the 3GPP website for information regarding standards development. **Appendix 4** at 9 (directing readers to the 3GPP website at the conclusion of the chapter on the success of 3GPP in the standards development process). As a POSITA myself, I would regularly visit the 3GPP website for the latest developments in mobile communications standards setting and refer colleagues involved in the development of such devices to the 3GPP website as a valuable reference.

24. My personal experience at Samsung confirms 3GPP's prominence in the wireless industry. For example, engineers and managers at Samsung who were responsible for implementing 3GPP compliant modem software (and who were not attending 3GPP meetings or involved with development of the 3GPP standard in any direct way) would often enquire as to which version of a given 3GPP specification they should be developing. Further, between 2000 and 2004, part of my role at

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Samsung involved advising software engineers implementing the 3GPP standard on the correct interpretation of the specifications and ensuring that they were made aware of any changes and proposals made during the 3GPP standards development process that would impact their work. I also for a time maintained an internal company database that tracked 3GPP-approved changes to help the software engineers at Samsung implementing the 3GPP standard more readily stay informed as to changes that would impact their work. The database also included links to relevant 3GPP documents so that engineers could access the documents directly. In short, the technical output of 3GPP was, and continues to be, well known at 3GPP member companies, even by engineers who were not directly involved with designing the 3GPP system or contributing to the 3GPP standard process.

B. 3GPP's Policy of Making Documents Public

25. 3GPP's policy was to make 3GPP documents available to the public, including to interested POSITAs. The free availability of 3GPP documents to any interested member of the public was widely recognized in the industry. As an example of the prominence of 3GPP and its place in the wireless standards industry, I note that textbooks directed readers to the 3GPP website for information about relevant standards. For example, **Appendix 6** at 6, 9 ("The latest specifications can be obtained from 3GPP [9]", "[9] http//:www.3GPP.org"); **Appendix 8** at 10

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("3GPP TSs and TRs are publicly available at the 3GPP web site at either of the following URIs: http://www.3gpp.org/specs/specs.htm [or] http://www.3gpp.org/ftp/Specs/archive/"). Because the purpose of 3GPP is the worldwide adoption of a common standard, no restrictions on distribution or discussion have ever been placed on 3GPP documents. **Appendix 11** at 3 ("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

26. Within 3GPP, responsibility for producing specifications was delegated to the Technical Specification Groups (TSGs). **Appendix 5** at 11, 12 (3GPP Working Procedures, "TSG tasks"). At its inception, 3GPP was divided into four Technical Specification Groups (TSGs), each covering a particular category of technology. **Appendix 2** at 31 (3GPP Partnership Project Description); **Appendix 6** at 5, 6 (textbook listing four TSGs and noting the subsequent addition of a fifth TSG); **Appendix 4** at 6, 11, 12. Each TSG is further divided into a number of Working Groups (WGs). **Appendix 8** at 8, 9; **Appendix 4** at 6; *see also* **Appendix 5** at 11, 14 (3GPP Working Procedures). Two of the TSGs from 1999 are still in existence in 2024: TSG Radio Access Networks (RAN) and TSG Service & Systems Aspects (SA). The activities of two other TSGs, TSG Core Networks (CN) and TSG

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Terminals (T), were amalgamated under Core Network and Terminals (CT) following the closure of TSG T in 2005, with responsibility for terminal test specifications being moved to a RAN working group (RAN WG5). The fifth TSG, GSM EDGE Radio Access Networks (GERAN), was responsible for evolution of the GSM radio technology from 2000 until that TSG closed in 2016 and its work was transferred to a RAN working group (RAN WG6) which was itself closed in July 2020.

27. The TSGs held quarterly plenary meetings where members' contributions, draft specifications/reports, and other documents that had been agreed upon by the Working Groups were presented for discussion and approval. **Appendix 5** at 23 (3GPP Working Procedures, "Deliverable types," stating that Technical Specifications and Technical Reports are "drawn up by the TSGs" and are approved by TSGs); **Appendix 8** at 9 ("3GPP Deliverables"). Once a Technical Specification was, or Change Requests creating a new version of a Technical Specification were, formally approved by TSG plenary, the latest version of said Technical Specification would be created by the Mobile Competence Centre (MCC) and uploaded to the file server. **Appendix 11** at 6, 7; **Appendix 12** at 1. In that way, the conclusion of 3GPP TSG plenary meetings serves as notice that new versions of specifications incorporating Change Requests approved by the TSG meeting will shortly be made

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available on the public 3GPP server.

28. As part of the standards development process, delegates could submit contributions on behalf of the Individual Members. Members had an incentive to stay updated on 3GPP developments because those members usually wanted to contribute to the standard and make suggestions as to what technology and/or features should (or should not) be included. Delegates also attended 3GPP meetings to keep their employers abreast of developments related to the standards that would ultimately apply to those members and the products those members (*e.g.*, companies) produced. 3GPP members around the world, and the interested POSITAs employed by them, would have been motivated to stay up to date regarding 3GPP technology evolution to ensure their research and development programmes remained relevant to the systems being specified and that their products were compliant with the published 3GPP specifications. In light of this need to follow the standards development process, delegates often distributed 3GPP-related documents far beyond the attendees at 3GPP meetings. This was certainly my experience at Samsung.

D. 3GPP Documents

1. Technical Specifications and Reports

29. The Technical Specifications and Reports developed by 3GPP were,

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and still are, driven by the technical contributions of 3GPP members. As part of that development process, various types of documents were produced. The 3GPP process involved the consideration of temporary documents ("TDocs," also referred to as "contributions"), many of which constituted technical proposals for how the system should be implemented and some of which were adopted as the basis for parts of the Technical Specifications.

30. As I noted in paragraphs 20 and 22, a primary purpose of 3GPP is to prepare, approve, and maintain globally applicable Technical Specifications and Technical Reports. **Appendix 5** at 6 (3GPP Working Procedures, "Purpose"). A "Technical Specification" as defined by 3GPP is "[a] 3GPP output document containing normative provisions approved by a Technical Specification Group." **Appendix 5** at 22. 3GPP would (and still does) periodically freeze a complete set of standards (referred to as a "Release"), and each set would include some new specifications. **Appendix 11** at 6. 3GPP would also make publicly available draft specifications that would usually be included as part of the next Release once approved.

31. It was widely known that Technical Specifications (and Technical Reports) were publicly available on 3GPP's website. It was also well known that the latest version of a given specification that was under change control would be made

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available following each TSG Plenary meeting responsible for that specification, and that TSG Plenary meetings usually occur four times per year. **Appendix 11** at 6, 7; **Appendix 12** at 1.

32. Latest and previous versions of Technical Specifications could be easily accessed from the 3GPP website. The specifications page provided direct links to the specifications area in the 3GPP website's file repository. **Appendix 12** at 1. In the 2017 timeframe, the specifications page listed the specifications by the date of the approval of the latest versions reflecting the TSG plenary meeting date. *E.g.*, **Appendix 12** at 1.

33. Additionally, the 3GPP specifications followed a clear numbering scheme to help the public, including interested POSITAs, identify the subject matter of each specification. **Appendix 13** at 1. As described on the 3GPP Numbering Scheme webpage, all 3G and GSM specifications had a specification number of 4 or 5 digits, where the first two digits defined the series. **Appendix 13** at 1. The Numbering Scheme webpage included a table showing the subject matter corresponding to each series. **Appendix 13** at 1. For example, the "21 series" focused on "Requirements". **Appendix 13** at 1. An interested POSITA could narrow down the relevant specifications based on whether the specification applied to only UMTS (3G), GSM, or to GSM and UMTS. GSM-only specifications were

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transferred from ETSI to 3GPP in July 2000. **Appendix 13** at 1. For a specification in the 21–35 series, this could be determined based on the third digit of the specification number, where a "0" indicates that the specification applies to both systems. Specifications outside the 21–35 series in 2003 applied only to GSM systems. **Appendix 13** at 1.

34. The specifications were stored on the 3GPP website's file repository as zipped files, where the filenames followed the structure: SM[-P[-Q]]-V.zip. This format corresponded to the numbering scheme discussed in paragraph 33. **Appendix 13** at 1, 2. "S" represented the series number; "M" represented the mantissa (the part after the series number); "P" represented an optional part number; "Q" represented an optional sub-part number; and "V" represented the version number (without the separating dots). **Appendix 13** at 2.

35. The Working Groups would create incremental versions of the draft specifications (*e.g.*, V0.2.1, V1.0.0, V1.1.0, etc.). These versions were made available on the 3GPP website's file repository which is accessible from the 3GPP specifications page. The version numbering scheme for Technical Specifications and Technical Reports was standardized by 3GPP. The version number included three fields: the major version field, the technical version field, and the editorial version field. **Ex. 1009** at 5. The major version field reflects the stage of the specification,

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with "0" representing an immature draft and a value of "3" or greater representing a specification that has been approved by the relevant TSG and thus placed under change control. **Ex. 1009** at 5. The technical version field begins at zero and is incremented every time a technical change is made to the specification (either as part of the drafting process or as part of an approved change request). **Ex. 1009** at 5. The editorial version field begins at zero and is incremented each time a non-technical change is made to the specification (*e.g.*, to fix a typographical or formatting issue). **Ex. 1009** at 5.

36. I understand that the alleged invention in the '932 patent relates to cellular telecommunications networks, and more particularly the configuraton of a wireless connection between a terminal and a network. A POSITA interested this type of configuration would have been monitoring 3GPP's activities in this area and would probably have been already participating as a full or associate member or observer in the standard development process, or would have at least known that information regarding the proposed revisions to the technical specifications under discussion were available through 3GPP.

E. The 3GPP Website's Public File Repository

37. All TDocs, Technical Reports, and Technical Specifications were also freely available to interested members of the public through the public file repository

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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. **Appendix 11** at 3.

38. Any interested member of the public could 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. The Technical Specifications and Reports were (and remain) organized according to their subject matter as indicated by their series number and version. POSITAs 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). In 2003, to locate a Technical Report from the 3GPP home page, a user could have clicked "Technical Bodies" **Appendix 14**. The corresponding webpages contained links to the 3GPP's public file repository (*e.g.*, through the "Documents area" link of a Working Group page). **Appendix 15, Appendix 16**. To locate specifications, a user

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could have clicked "Specifications" and followed links as described in section III.D.1 above. 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 directly using ftp client software connected to ftp.3gpp.org. A POSITA was also able to search for relevant documents using keywords on the search facility on the 3GPP website from at least 2000.

40. The top two levels of indexing within the file repository were based wholly on subject matter, as reflected by the division of subject matter among the various TSGs and Working Groups, or into various Specifications. Specifically, an individual could select the relevant Specification (or TSG) covering the subject matter of interest. **Appendix 16**.

41. For example, if the individual were interested in TR 21.905, being the vocabulary requirements, they would click "specs." From there, the individual would click on the particular date required or could look in the latest or archive directory for the report. **Appendix 17, Appendix 18**.

42. In my experience, whilst the servers used for 3GPP file repository and many of its directories have been updated since 1999, and directories may as a result have later dates associated with them (*e.g.*, reflecting the last time they were modified in some way or their contents were updated), the original upload date for

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files including specifications has always been preserved, providing a true and accurate indication of their earliest availability for download.

43. 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. This has been the practice regarding uploading documents to the 3GPP file repository since 3GPP was inaugurated, 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.

44. Following each 3GPP meeting, the secretary would often distribute the meeting minutes via the corresponding email list with a request for comments. *E.g.*, **Appendix 24**. Said email would effectively therefore inform subscribers that the meeting had taken place, would inform subscribers of the documents that had been treated (or not), and in the event that the meeting was a TSG plenary meeting, serve as notice that new versions of specifications incorporating Change Requests approved by the TSG meeting, would shortly be made available on the 3GPP public

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server. Further, an interested member of the public following a certain topic would have known to check said report for related contributions.

IV. 3GPP EXHIBITS

A. Ex. 1009: 3GPP TR 21.905 v4.5.0 (2003-06) 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Vocabulary for 3GPP Specifications (Release 4)

67. 3GPP TR 21.905 v4.5.0 is a Technical Specification titled "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Vocabulary for 3GPP Specifications (Release 4)".

68. The date on the face of the specification ("2003-06") corresponds to the year (2003) and month (June) that this version of the specification was approved by 3GPP TSG SA and subsequently made publicly available.

69. 3GPP TR 21.905 v4.5.0 being an approved version of the Release 4 Vocabulary for 3GPP specifications, was approved by TSG SA #20 held June 9 – 12, 2003. An interested member of the public would know that the latest version of an approved specification or report would be available following the plenary meeting responsible for that specification (in this case TSG SA) in accordance with 3GPP standard practice as described in paragraphs 31. The approval of the TR 21.905 v4.5.0 is confirmed by the approval of the Change Requests to TR 21.905 Rel-4 as documented in the meeting report from TSG SA #20 (**Appendix 22** at 6).

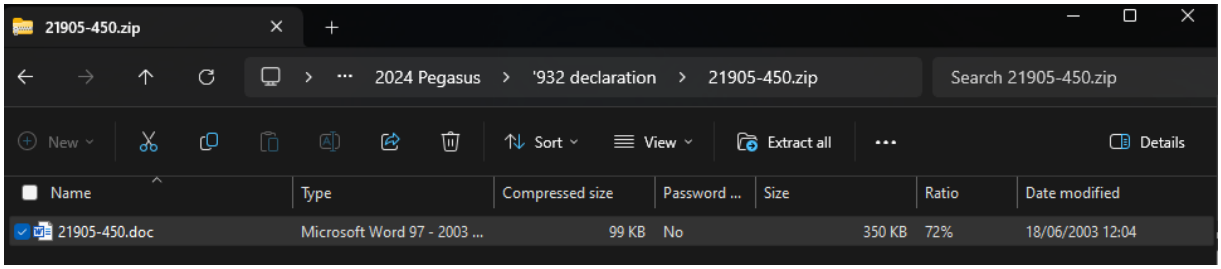
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70. The 3GPP file server is and always has been open to all and free from restriction such as username or password. By way of example of how an interested member of the public could access the TR 21.905 v4.5.0 technical report from the 3GPP website, I accessed the file server by going to the 3GPP website at http://www.3gpp.org/, selected "Specifications & Technologies" from the menu bar, and then selected "Specifications by series" from the dropdown menu. I then selected the "21 Series" link to access the public file server where the specifications are stored. I then searched for "21.905" in the specification number search bar, and for the TR 21.905 specification selected the eyeglasses icon that says "See details" when a cursor is placed on it. From there, I selected "Click to see all versions of this specification," which took me to the archive housing all versions of TR 21.905 found at the following URL: https://www.3gpp.org/ftp/Specs/archive/21_series/21.905. A true and correct copy of the relevant portion of the directory listing produced by the file server website is provided below and in **Appendix 23** at 1.

21905-440.zip	2001/10/05 13:57	89,1 KB
21905-450.zip	2003/06/18 13:31	98,3 KB
21905-500.zip	2001/06/27 8:44	87,6 KB

71. The archive directory index stated that TR 21.905 v4.5.0 was uploaded on "2003/06/18". Selecting the link for "21905-450.zip", I downloaded a zip file of

the same name. The zip file contained a Microsoft Word document with the filename "21905-450.doc" and having a date stamp of "18/06/2003" (European date format). An excerpt of the zip file directory is provided below.



72. I have confirmed that the Word document with the filename "21905-450" is TR 21.905 v4.5.0. A true and correct copy of the compiled Microsoft Word documents with the filename "21905-450" is the TR 21.905 v4.5.0 that is provided in Ex. 1009.

73. Based on my experience, I understand these date stamps to mean that 21905-450.zip was uploaded to 3GPP's publicly available website on June 18, 2003, and that an interested member of the public could have downloaded the zip file, extracted the Word document enclosed, viewed the contents of the Word document, and further disseminated said document without restriction on June 18, 2003 and thereafter.

V. CONCLUSION

45. I declare under penalty of perjury under the laws of the United States

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of America that the foregoing is true and correct. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that wilful 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.

October 15, 2024



Printed Name: Craig Bishop

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APPENDIX 1

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

- 35 years Telecoms, Radio and Broadcast experience
- 27 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 Telecommuncations Standards and Intellectual Property Consultant

Company is a full ETSI member

Activities have included:

- 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 acquring relevant documentation.
- 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. Ouput 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. Ouput published July 2019 as ETSI TR 103 582.
- 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, 5G NR radio interface technologies (Phy, MAC, RLC, RRC), 3GPP access and core networks (GPRS/UMTS & EPC NAS), IMS. Organisations covered include 3GPP & ETSI.

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Clients served / represented include: ADT, Apple, AT&T, Blackberry, Cradlepoint, DELL, Ericsson, Honeywell, HTC, Huawei, LG, Lenovo, Motorola, Nokia, Oneplus, Oppo, Samsung, Sierra Wireless, Thales, T-Mobile, Sprint, Verizon, Vodafone, Xiaomi, ZTE.

Working with: Addy Hart LLP, Alston & Bird LLP, 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, Kirkland & Ellis LLP, K&L Gates 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* nc.*, 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 activites with head office, acting as official Samsung contact for the European Telecommunications Standars 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 technolgies 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 Acces 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

Radiocommunications Agency 06/93 -11/96

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: Cousera, Udemy, and Zenva courses covering Machine Learning, Python, Data Science, and Natural Language Processing

APPENDIX 2

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- 13- Market Representation Partners (1)
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- 30- Internal structure of 3GPP
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- 34- Work areas to be covered by the Terminal TSG
- 35- Work areas to be covered by the System Aspects TSG
- 36- Primary responsibilities of PCGs and TSGs (1)
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THIRD GENERATION PARTNERSHIP PROJECT (3GPP)

PARTNERSHIP PROJECT DESCRIPTION

During the meeting held in Copenhagen, 2 - 4 December 1998 ARIB, ETSI, T1, TTA and TTC agreed this Partnership Project Description.

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Preamble

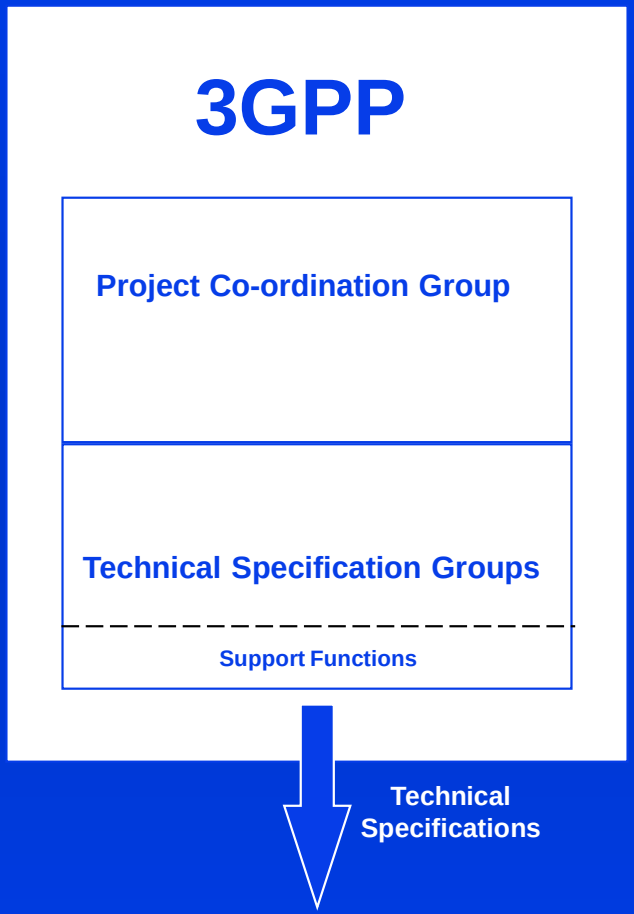
Standards organizations and other related bodies have agreed to co-operate for the production of a complete set of globally applicable Technical Specifications for a 3rd Generation Mobile System based on the evolved GSM core networks and the radio access technologies supported by 3GPP partners (i.e., UTRA both FDD and TDD modes).

The Project is entitled the "Third Generation Partnership Project" and may be known by the acronym "3GPP".

3GPP has been established for the preparation and maintenance of the above mentioned Technical Specifications, and is not a legal entity.

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3GPP Overview



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Definition of the Third Generation Partnership Project

3GPP will provide globally applicable Technical Specifications for a 3rd Generation Mobile System based on the evolved GSM core network, and the Universal Terrestrial Radio Access (UTRA), to be transposed by relevant standardization bodies (Organizational Partners) into appropriate deliverables (e.g., standards).

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Scope and objectives (1)

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

The 3rd Generation Mobile System and its capabilities will be developed in a phased approach. Initially, 3GPP will elaborate, approve and maintain the necessary set of Technical Specifications 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)**
- **System and service aspects**

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Scope and objectives (2)

The set of global specifications for the first phase of the 3GPP core network and the specifications for the GSM core network should be common to the largest extent possible and should not be needlessly different.

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

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

In the framework of agreed relationships, 3GPP will elaborate Technical Specifications that will form the basis of standards, or parts of standards, of the Organizational Partners.

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Characteristics of 3GPP (1)

3GPP is characterized by the following attributes:

- **Minimum production time for Technical Specifications from conception to approval**
- **Fast, electronic based approval process**
- **Maximum use of modern (electronic) working methods**
- **Minimum number of hierarchical levels with decision making taking place at the lowest appropriate levels**

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Characteristics of 3GPP (2)

- **A Project Co-ordination function and a Technical Specification function**
- **Task oriented, ensuring that on completion of the tasks the future of the project is re-evaluated**
- **Cost effective use of financial/human resources provided by Partner Organizations (if required)**

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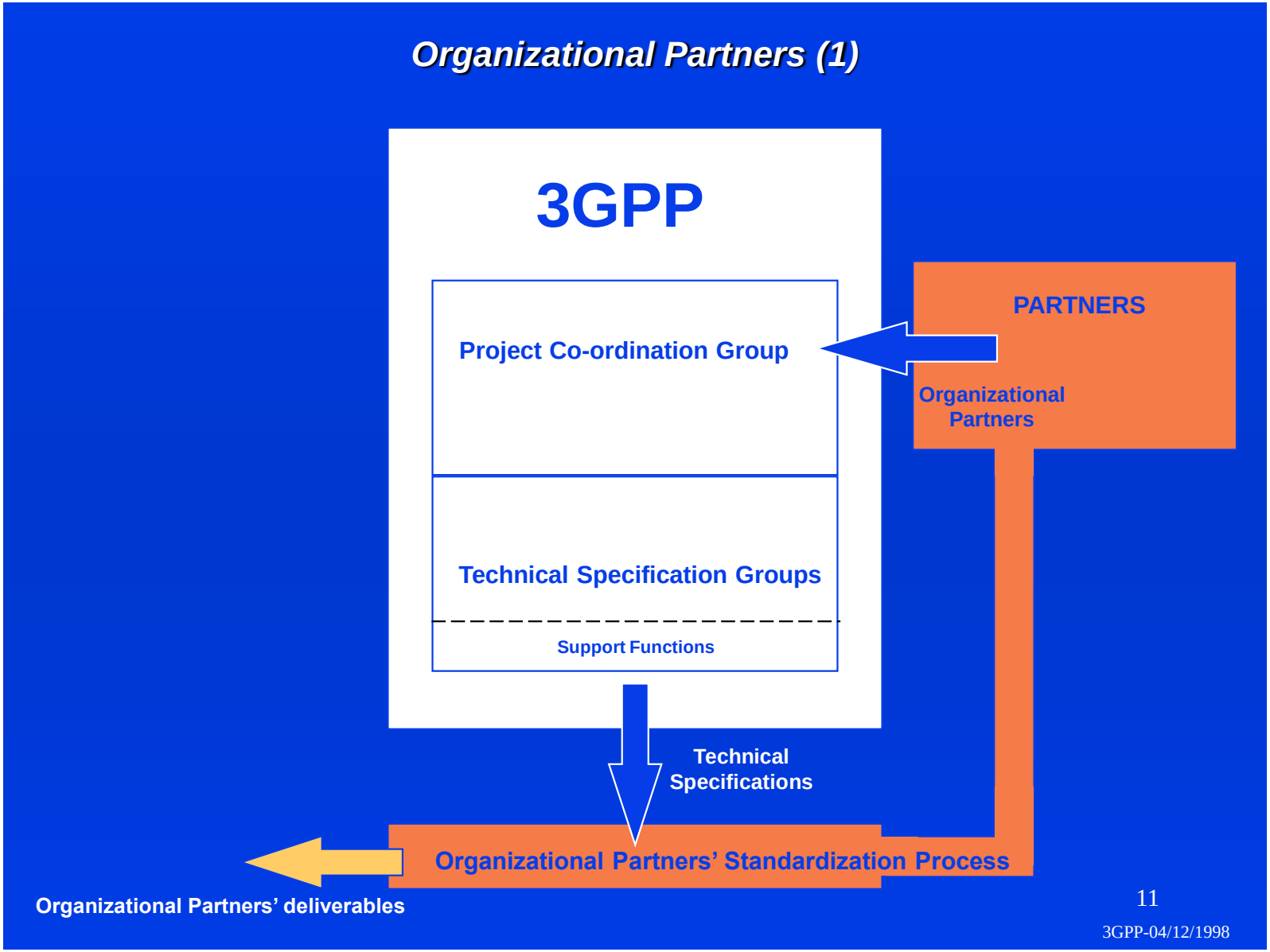
Partnership and Membership

3GPP comprises of:

- **Partners:**
  - **Organizational Partners**
    - **3GPP is open to all standards organizations irrespective of the geographical location.**
  - **Market Representation Partners**
- **Individual Members**

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Organizational Partners (1)



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Organizational Partners (2)

An Organizational Partner is:

An open standards organization with a national, regional or other officially recognized status (in their country or region)

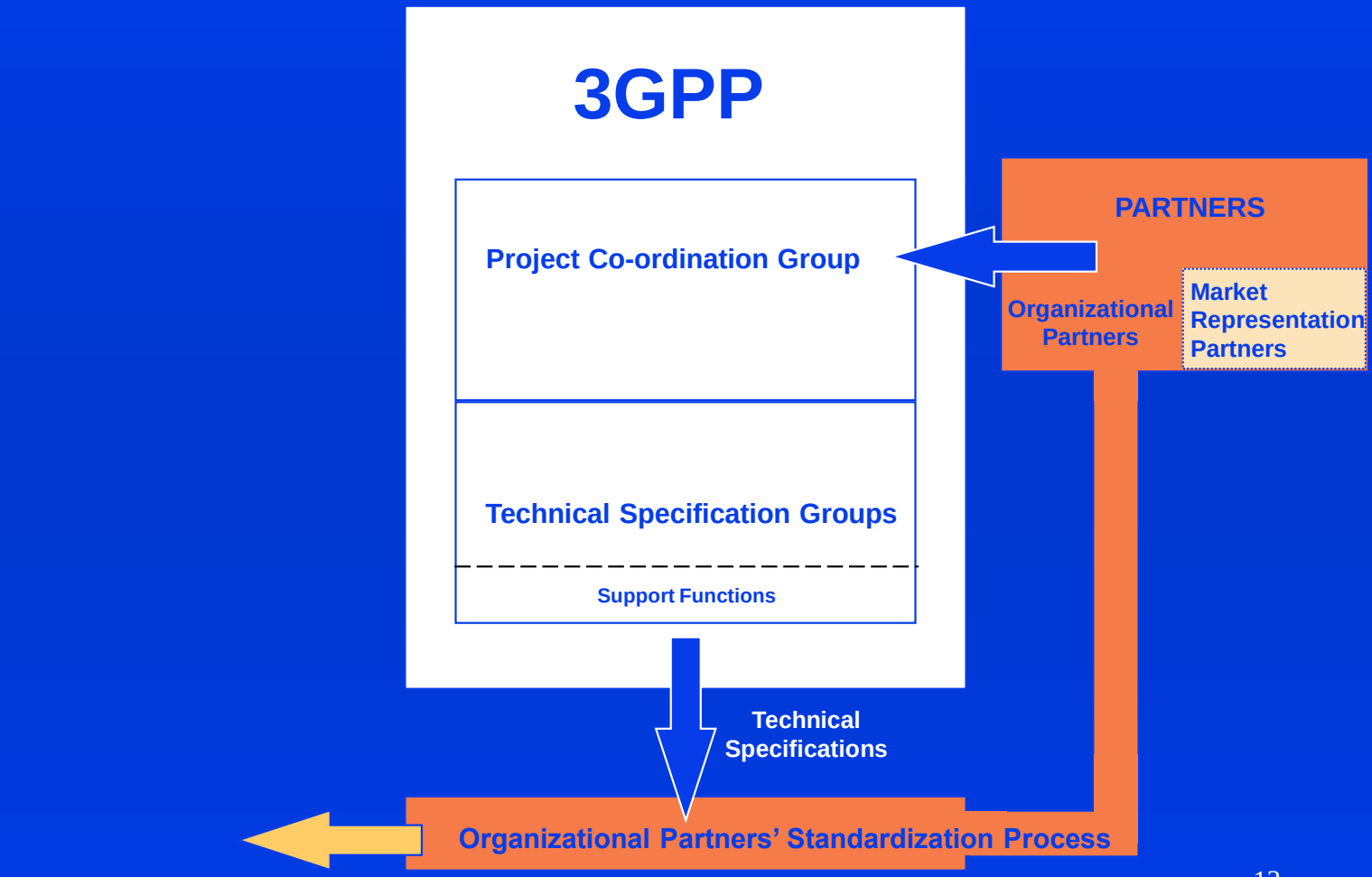
that:

- **has the capability and authority to define, publish and set standards nationally or regionally and**
- **has signed (or whose sponsor has signed) the Partnership Project Agreement**

Organizational Partners will meet as approriate and make decisions by consensus.

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Market Representation Partners (1)



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Market Representation Partners (2)

Standardization should meet market needs.

In order to identify market requirements, the high competence of Market Representation Partners should be used.

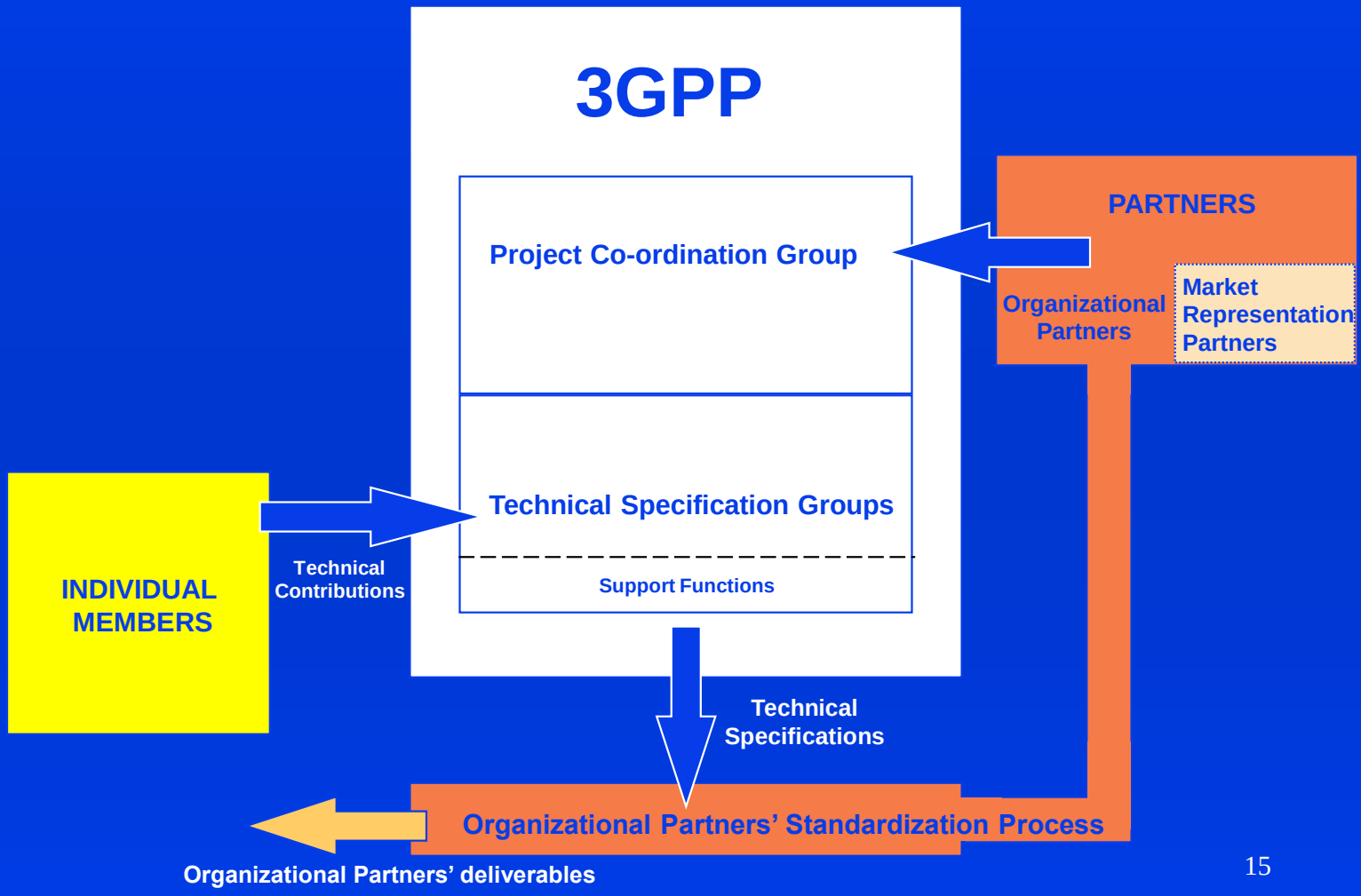
A Market Representation Partner is an organization invited to participate by the Organizational Partners to offer market advice to 3GPP and to bring into 3GPP a consensus view of market requirements (e.g. services, features and functionality) falling within the 3GPP scope.

A Market Representation Partner:

- **does not have the capability and authority to define, publish and set standards nationally or regionally**
- **has signed (or whose sponsor has signed) the Partnership Project Agreement**
- **has committed itself to the 3GPP scope**

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Individual Members (1)



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Individual Members (2)

Membership in an Organizational Partner is a pre-requisite for Individual Membership in 3GPP.

Individual Membership is open to legal entities committed to support 3GPP and to:

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

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

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Individual Members (3)

All entities registered as members of an Organizational Partner and eligible for participation in the technical work of that Partner, can become Individual Members of 3GPP. Individual members shall apply to their Organizational Partner to participate in 3GPP.

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

Individual Membership applicants residing in a country/area without an Organizational Partner can apply for membership in an Organizational Partner according to the rules of each Partner. (e.g. ETSI Associate Membership is available)

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Observership

In order to ensure globally applicable Technical Specifications, the status of "Observer" may be granted by the Organizational Partners to an entity which has the qualifications to become a future Organizational Partner. The status of "Observer" includes obligations to:

- **identify as early as possible any regulatory requirements that may lead to options within Technical Specifications**
- **make their IPR policy available for consideration**
- **contribute to the common objective of the 3GPP and avoid duplication of work related to the 3GPP**

The participation rights of an Observer will be decided on a case by case basis.

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Documentation for 3GPP

The following 3 documents describe 3GPP:

- **The Partnership Project Agreement**
- **The Partnership Project Description (this present document)**
- **The Partnership Project Working Procedures**

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The Partnership Project Agreement (1)

The Partnership Project Agreement is a concise legal document signed by participating Partners (or their sponsor).

It contains the minimum legal text necessary for 3GPP to function correctly.

The Partnership Project Agreement refers to the Partnership Project Description and the Partnership Project Working Procedures.

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The Partnership Project Agreement (2)

The Partnership Project Agreement includes obligations on Organizational Partners to commit themselves to the 3GPP scope:

- **to encourage their members to contribute to the common set of Technical Specifications and to avoid duplication of work**
- **to convert / transpose / adopt all relevant Technical Specifications resulting from 3GPP into their own relevant deliverables through their normal processes**
- **to identify as early as possible, any national / regional regulatory requirements that may lead to options within the Technical Specifications**
- **to make their IPR Policy available for consideration**

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The Partnership Project Agreement (3)

The Partnership Project Agreement includes obligations on Market Representation Partners to identify market and service requirement of 3GPP and to contribute to:

- **the promotion of 3GPP**
- **the definition of 3GPP System and Service scenarios**

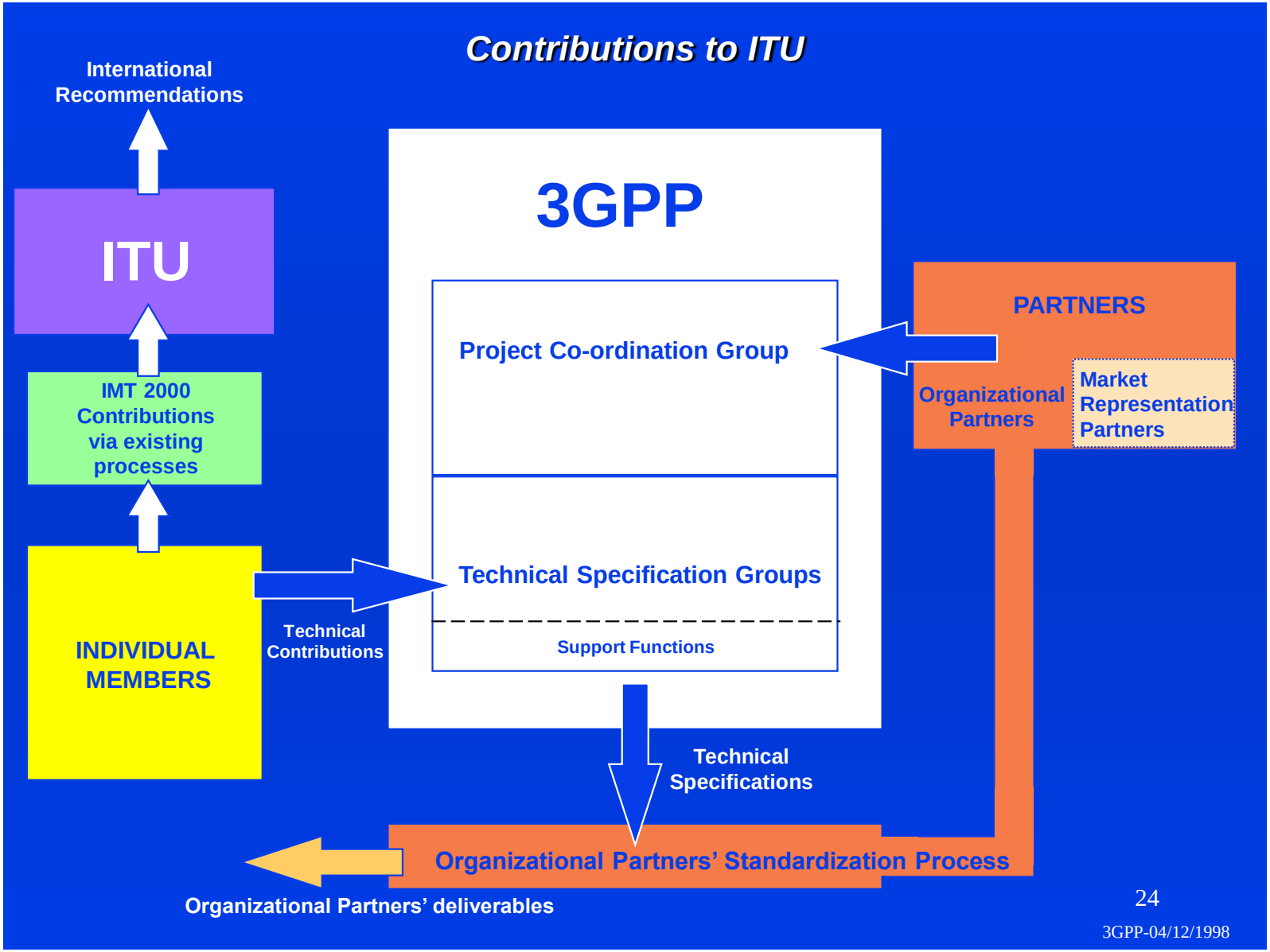
The Market Representation Partners should also encourage their members to contribute to the common objectives of 3GPP and to avoid duplication of work.

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Ownership of the Partnership Project results

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

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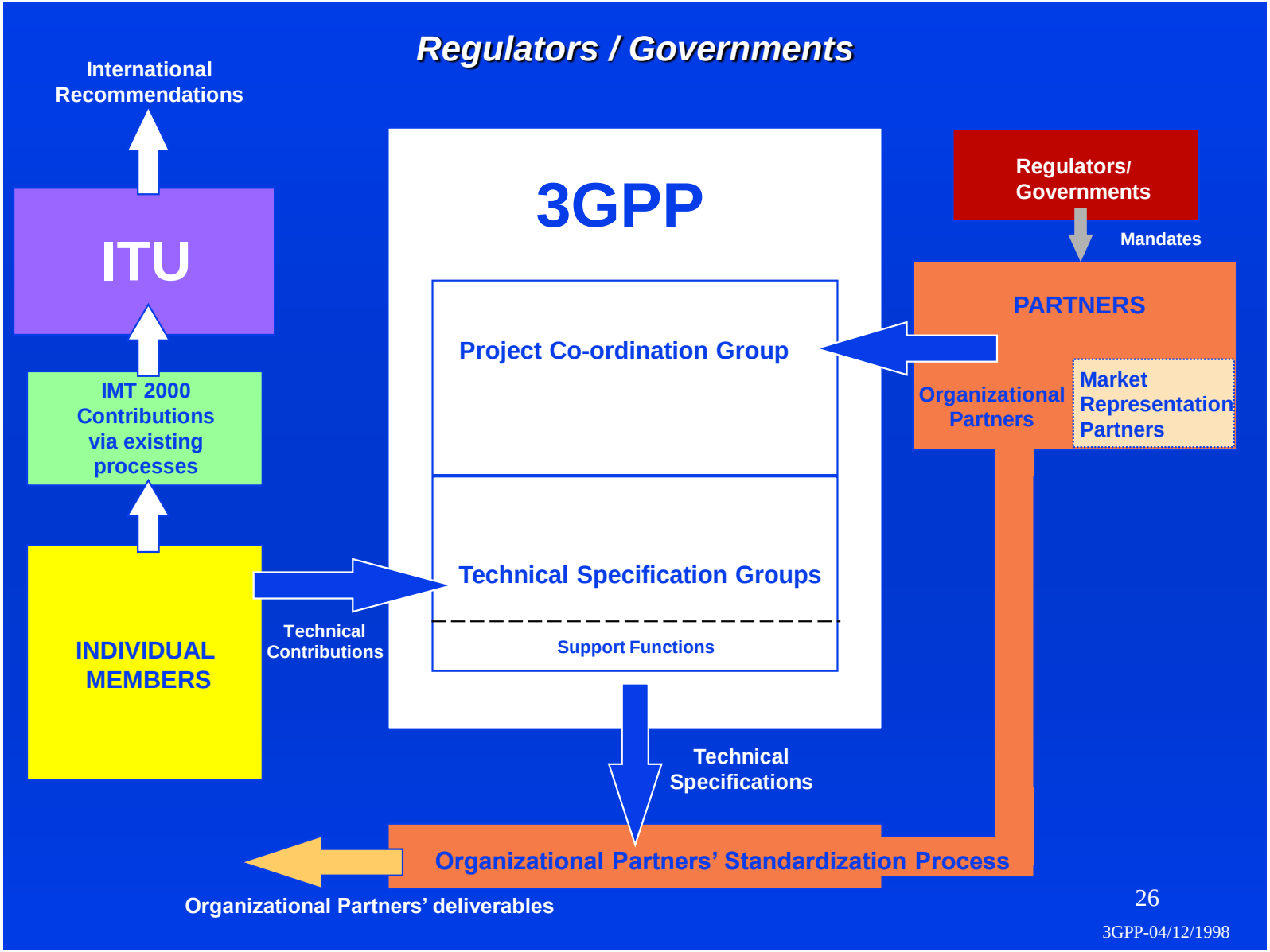
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Submission of 3GPP results to ITU

3GPP will not contribute directly to the ITU.

Formal contributions to ITU Study Groups are made by ITU members following existing national/regional processes.

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National / regional regulatory requirements

Variations imposed by national / regional regulatory requirements will be included in the Technical Specifications as defined by the Technical Specification Groups.

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Resource requirements for establishing 3GPP

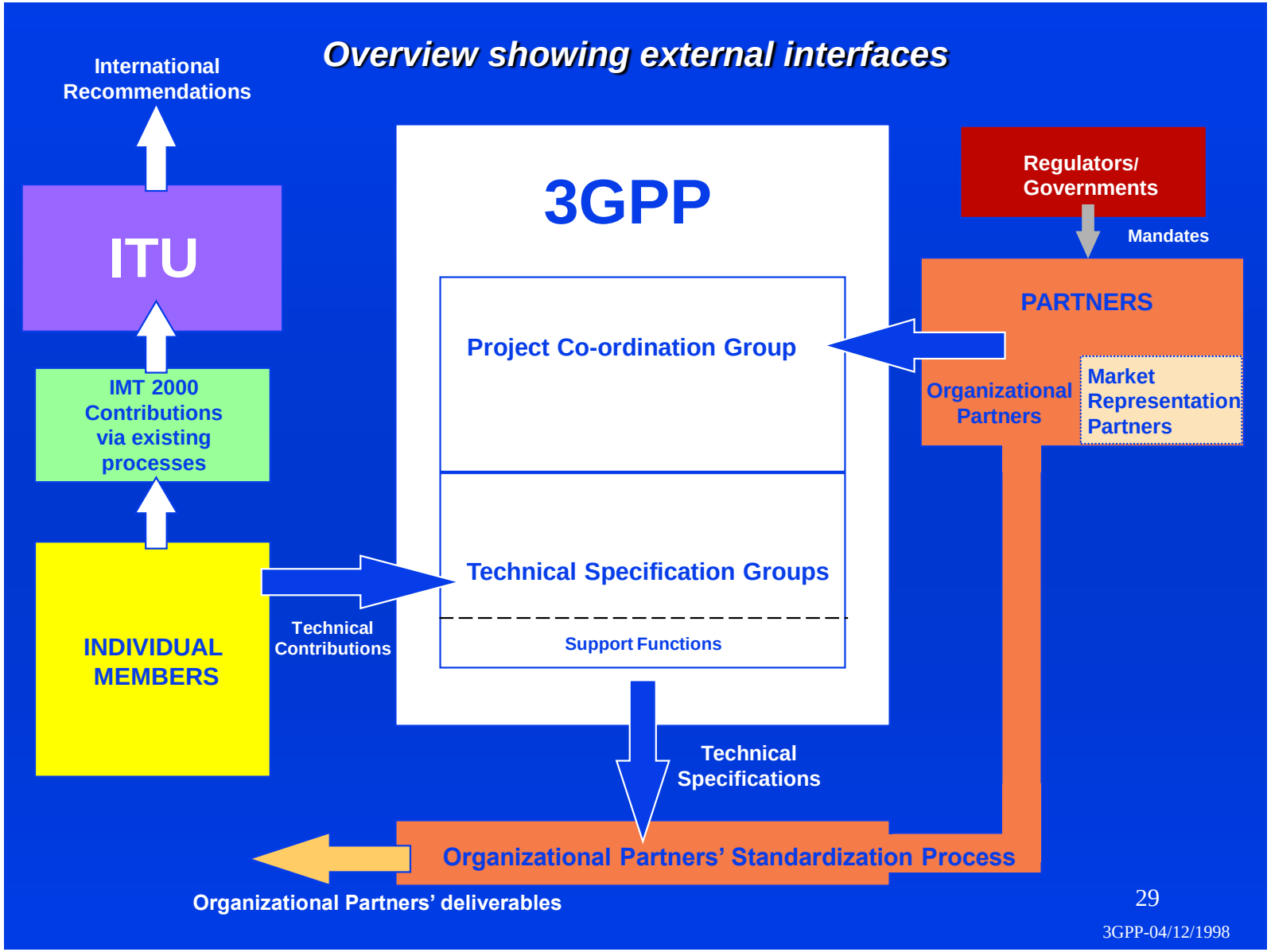
ETSI will absorb the initial cost of establishing the 3GPP, if required.

Thereafter, the costs will be shared by the Organizational Partners. There will be no direct 3GPP membership fee for Individual Members.

Partners and Individual Members may provide support functions to the extent that they are able (eg hosting of meetings and provision of Secretariat support).

The longer term financial requirements are for further study.

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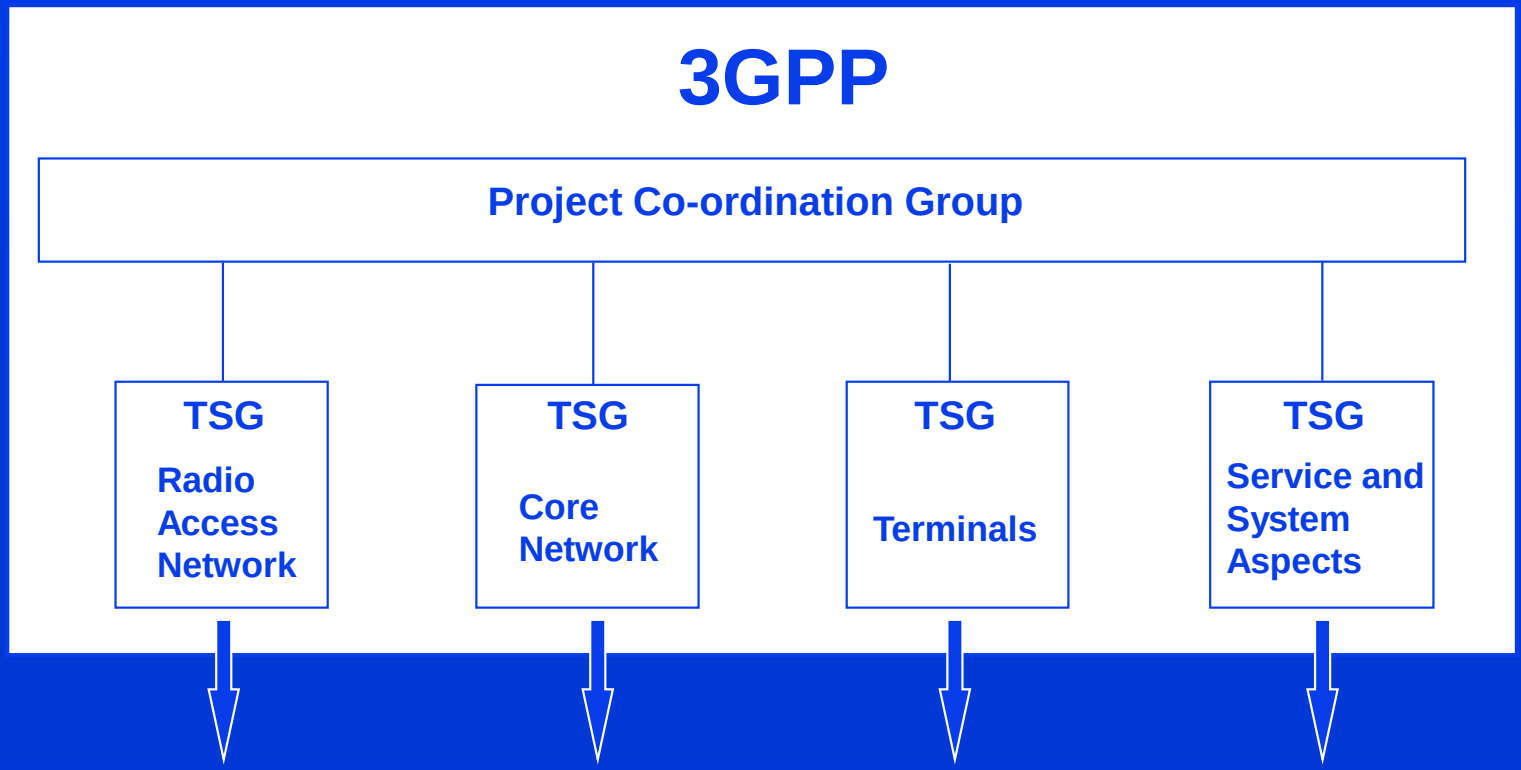
Internal structure of 3GPP (1)

3GPP consists of a Project Co-ordination Group (PCG) and Technical Specification Groups (TSGs).

To assist in the co-ordination of the technical activities, the TSGs are encouraged to meet at the same time and place, as and when appropriate (e.g. twice per year).

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Internal structure of 3GPP (2)



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Work areas to be covered by the Radio Access Network TSG

- Radio Layer 1 specification
- Radio Layer 2 specification
- Radio Layer 3 RR specification
- Iub specification
- Iur Interface
- Iu Interface
- UTRAN O&M requirements
- Base station radio performance specification
- Conformance test specification for testing of radio aspects of base stations
- Specifications for radio performance aspects from the system point of view

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Work areas to be covered by the Core Network TSG

- Mobility management, call connection control signalling between the user equipment and the core network
- Core network signalling between the core network nodes. the signalling supports functionality such as user location information, subscription information and control of network services
- Definition of interworking functions between the core network and external networks
- Packet related questions such as mapping of QoS (e.g. transparency for IP domain applications, general for bearer types, special for optimized applications such as Voice over IP)
- Core network aspects of the lu interface
- Core network O&M requiremnents

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Work areas to be covered by the Terminal TSG

- **Service capability protocols**
- **Messaging**
- **Services end-to-end interworking**
- **USIM to Mobile Terminal interface**
- **Model/framework for terminal interfaces and services (application) execution**
- **Conformance test specifications of terminals, including radio aspects**

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Work areas to be covered by the Service and System Aspects TSG

- **Service capabilities**
  - **Definition of services and feature requirements**
  - **Development of service capabilities and a service architecture for cellular, fixed (and cordless) applications**
- **Stage one and two descriptions for:**
  - **Charging and accounting**
  - **Network Management**
  - **Security Aspects**
- **Architecture**
  - **Definition, evolution, and maintenance of overall architecture, including assignment of functions to particular sub-systems and identification of key information flows**
  - **In co-operation with other TSGs, define required services, service capabilities and bearer capabilities offered by the different sub-systems**
- **Codec aspects**
  - **Principles for definition of end-to-end transmission**
  - **Definition, evolution and maintenance of relevant specifications**
- **Project co-ordination**
  - **High level co-ordination of the work performed in other TSGs and monitoring of progress**

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Primary responsibilities of PCG and TSGs (1)

The primary responsibilities of PCG, TSGs and Organizational Partners are given in the following tables:

	Function	Org Partners collectively	PCG	TSGs
1	Approval of new Partners for 3GPP	X		
2	Approval of Organizational Partner funding requirements and contributions	X		
3	Allocation of human and financial resources provided by Partners to PCG	X		
4	Allocation of resources to TSGs		X	
5	Allocation of resources within TSGs			X

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Primary responsibilities of PCG and TSGs (2)

	Function	Org Partners collectively	PCG	TSGs
6	Allocation of voluntary human and financial resources by Market Representation Partners and Individual Members		X	X
7	Handling of appeals from Individual Members on procedural matters	2nd step	1st step	
8	Handling of appeals from Individual Members on technical matters		2nd step	1st step
9	Determine overall time frame and manage overall work progress		X	

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Primary responsibilities of PCG and TSGs (3)

	Function	Org Partner collectively	PCG	TSGs
10	Detailed time frame and manage detailed work progress			X
11	Approval of Technical Specifications			X
12	Proposal and approval of work items within the agreed scope and terms of reference			X
13	Final adoption of work items within the agreed scope and terms of reference		X	
14	Management of work items			X

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Primary responsibilities of PCG and TSGs (4)

	Function	Org Partners collectively	PCG	TSGs
15	Technical Co-ordination (System Aspects TSG will play a role here)			X
16	Appointment of Org Partners meeting Chairman (provided by host on a rotational basis)	X		
17	Appointment of PCG Chairman (for one year term)		X	
18	Election of TSG Chairman and Vice Chairmen			X
19	Creation of TSGs and approval of their terms of reference	X		

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Primary responsibilities of PCG and TSGs (5)

	Function	Org Partners collectively	PCG	TSGs
20	Creation of TSG working groups and approval of their terms of reference			X
21	Election of TSG Working Group Chairmen and Vice Chairmen			X
22	Confirmation of individual member participation rights	X		
23	Approval of 3GPP scope and terms of reference	X		
24	Maintain Partnership Project Agreement, Project Description and Working Procedures (consensus agreement by all Partners)	X		

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Participation rights in PCG and TSGs

The following have a right to participate in the PCG:

- **Representatives of participating Organizational Partners**
- **Representatives of participating Market Representation Partners**
- **Chairman and Vice Chairmen of the TSGs, as ex-officio members**

The following have a right to participate in the TSGs :

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

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Principles for decision making within 3GPP

Decision making within PCGs

- **By consensus amongst the Organizational Partners**
- **By vote amongst the Organizational Partners in unavoidable cases**

Decision making within TSGs

- **By consensus amongst the Individual Members**
- **By vote amongst the Individual Members in unavoidable cases**

The Organizational Partners will conduct a fairness review of the decision making process six months after 3GPP start-up, taking into account all concerns raised

(Note: voting will not be permitted on National/Regional regulatory requirements)

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Principles for voting within TSGs

The following principles will be applied for voting within the TSGs

- **One "Individual company Member", one vote**
- **Organizational Partners to interpret " Individual company Member" according to its own rules of membership**
- **The PCG will maintain a register of eligible voters for the TSGs**
- **Each Individual Member may carry the proxy for up to five other Individual Members**

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Working language for 3GPP

The working language for 3GPP shall be English

- **Meetings of the PCG and TSGs shall be conducted in English**
- **3GPP Technical Specifications shall be prepared in English**

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Relationship with other groups

3GPP will establish and maintain good relationships with groups working on standards for other IMT-2000 family members.

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Intellectual Property Rights (IPR) Principles (1)

The Individual Members of 3GPP are bound by the IPR Policies of their respective Organizational Partner.

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

After comparing their respective IPR policies, ARIB, ETSI, T1, TTA and TTC have agreed that their IPR policies share common principles are quite similar and have agreed on the following additional principles to maximize the success of 3GPP.

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Intellectual Property Rights (IPR) Principles (2)

(i) **To encourage their respective members' declaration of willingness to grant licences on fair, reasonable terms and conditions on a non-discriminatory basis, and consistent with the respective Organizational Partners' IPR policies.**

(ii) **To encourage their respective members who may have IPR which they believe to be essential, or potentially essential, and are unwilling to license such IPR, that early indication of such unwillingness be provided to their respective Organizational Partners.**

(iii) **To understand that essential IPRs mean essential IPRs relative to any or all parts of the content of the 3GPP technical specifications.**

(iv) **A mechanism for exchanging information associated with the patent statement among the Organizational Partners will be introduced so that such information may be used when adopting relevant standards in each Partner Organization.**

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APPENDIX 3

About / Introducing 3GPP

Introducing 3GPP



The 3rd Generation Partnership Project (3GPP) unites seven telecommunications standard development organizations (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC), known as “Organizational Partners” providing their members with a stable environment to produce the Reports and Specifications that define 3GPP technologies.

3GPP specifications cover cellular telecommunications technologies, including radio access, core network and service capabilities, which provide a complete system description for mobile telecommunications. The 3GPP specifications also provide hooks for non-radio access to the core network, and for interworking with non-3GPP networks

The Project’s Scope

The original scope of 3GPP (1998) was to produce Technical Specifications and Technical Reports for a 3G Mobile System based on evolved GSM core networks and the radio access technologies that they support (i.e., Universal Terrestrial Radio Access (UTRA) both Frequency Division Duplex (FDD) and Time Division Duplex (TDD) modes).

The scope was subsequently amended to include the maintenance and development of the Technical Specifications and Technical Reports for evolved 3GPP technologies, beyond 3G.

- The latest 3rd Generation Partnership Project Agreement (Annex 42).
- The discussions that led to the signing of the 3GPP Project Agreement were recorded in a series of slides called the “Partnership Project Description” that describes the basic principles and ideas on which the project is based. The document has not been maintained since its first creation, but the principles within do still remain valid.

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Organizing the work

The 3GPP Working Procedures are the rule book of 3GPP, with sections covering:

- Description, Purpose, Scope and objectives
- Participation
- Structure
- Partners' collective responsibilities
- Project Coordination Group (PCG)
- Technical Specification Groups (Incl. Elections)
- Work Programme & technical co-ordination
- Deliverables (Technical Specifications and Technical Reports)
- Reporting

The 3GPP production of specifications and studies (TRs) are contribution-driven, by member companies, in Working Groups and at the Technical Specification Group (TSG) level. The Technical Specification Groups in 3GPP are:

- Radio Access Networks (RAN)
- Services & Systems Aspects (SA)
- Core Network & Terminals (CT)

The Working Groups, within the TSGs, meet regularly and come together for their quarterly TSG Plenary meeting, where their work is presented for information, discussion and approval. The last meeting of the week of TSG Plenary meetings is TSG SA, which also has responsibility for the overall coordination of the technical work and for the monitoring of its progress.

Generational Approach

The 3GPP technologies from these groups are constantly evolving through Generations of commercial cellular / mobile systems (see table below). With LTE and 5G work, 3GPP has become the focal point for the vast majority of mobile systems beyond 3G.

Although these Generations have become an adequate descriptor for the type of network under discussion, real progress on 3GPP standards is measured by the milestones achieved in particular Releases. New features

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are 'functionality frozen' and are ready for implementation when a Release is completed. 3GPP works on a number of Releases in parallel, starting future work well in advance of the completion of the current Release. Although this adds some complexity to the work of the groups, such a way of working ensures that progress is continuous & stable.

Backward Compatibility

The major focus for all 3GPP Releases is to make the system backwards and forwards compatible where possible, to ensure that the operation of user equipment is uninterrupted.

For 5G, many operators are starting with dual connectivity between LTE and 5G NR equipment – using the 'Non-Standalone' work completed early in Release 15. In the process of completing the early drop of 5G NR care has been taken to build 'forward compatibility' into Non-Standalone NR equipment, to ensure that it will be fit for use on Standalone 5G NR systems.

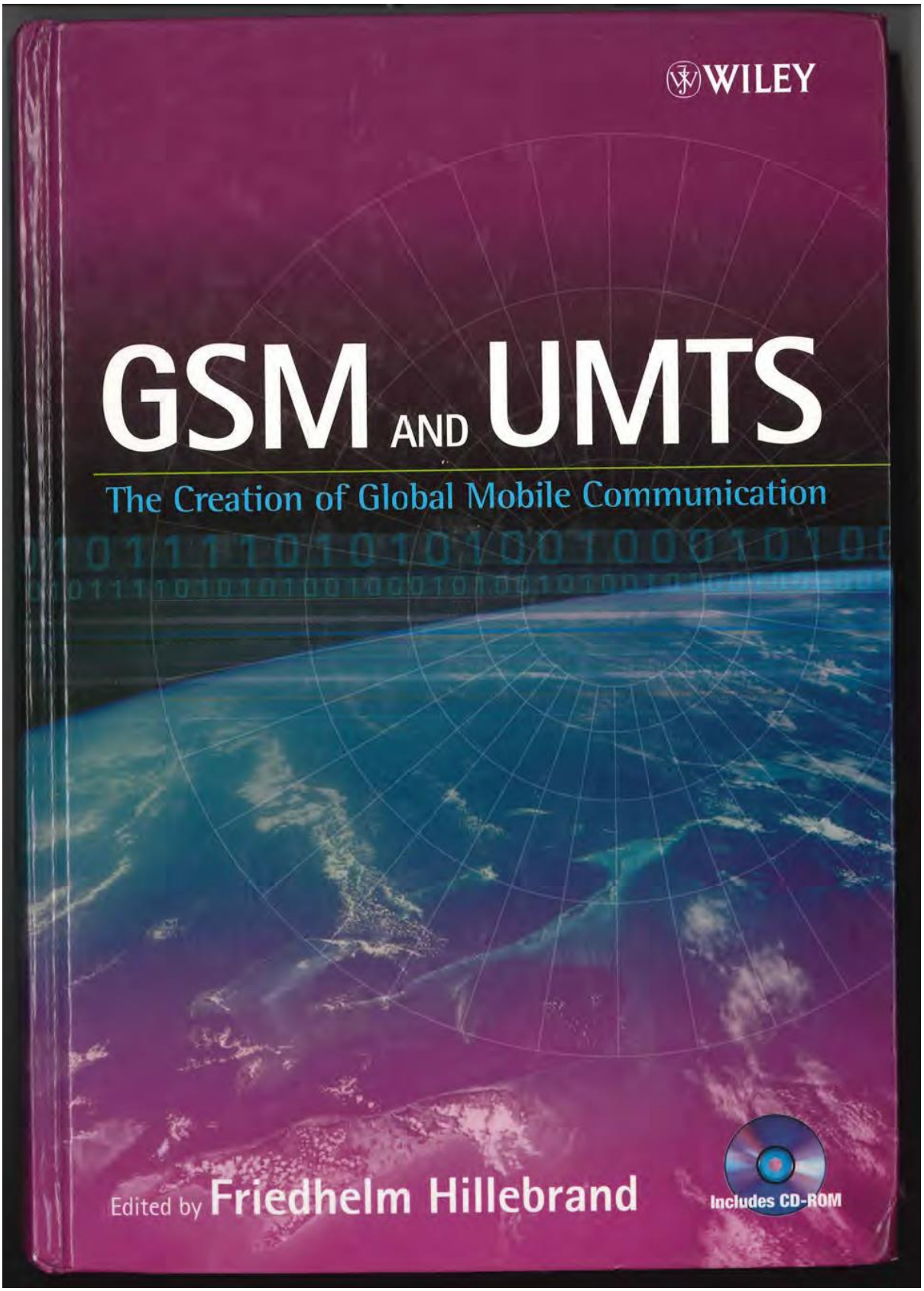
For details of the contents of each Release, see the appropriate 'Release Description' document or go to our dedicated Release page.

Details of all 3GPP Work Items are in the 3GPP Work Plan, which provides details of the cooperation between all of the 3GPP groups on "Features", defined as 'new or substantially enhanced functionality which represents added value to the existing 3GPP system'.

Previous Next

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APPENDIX 4



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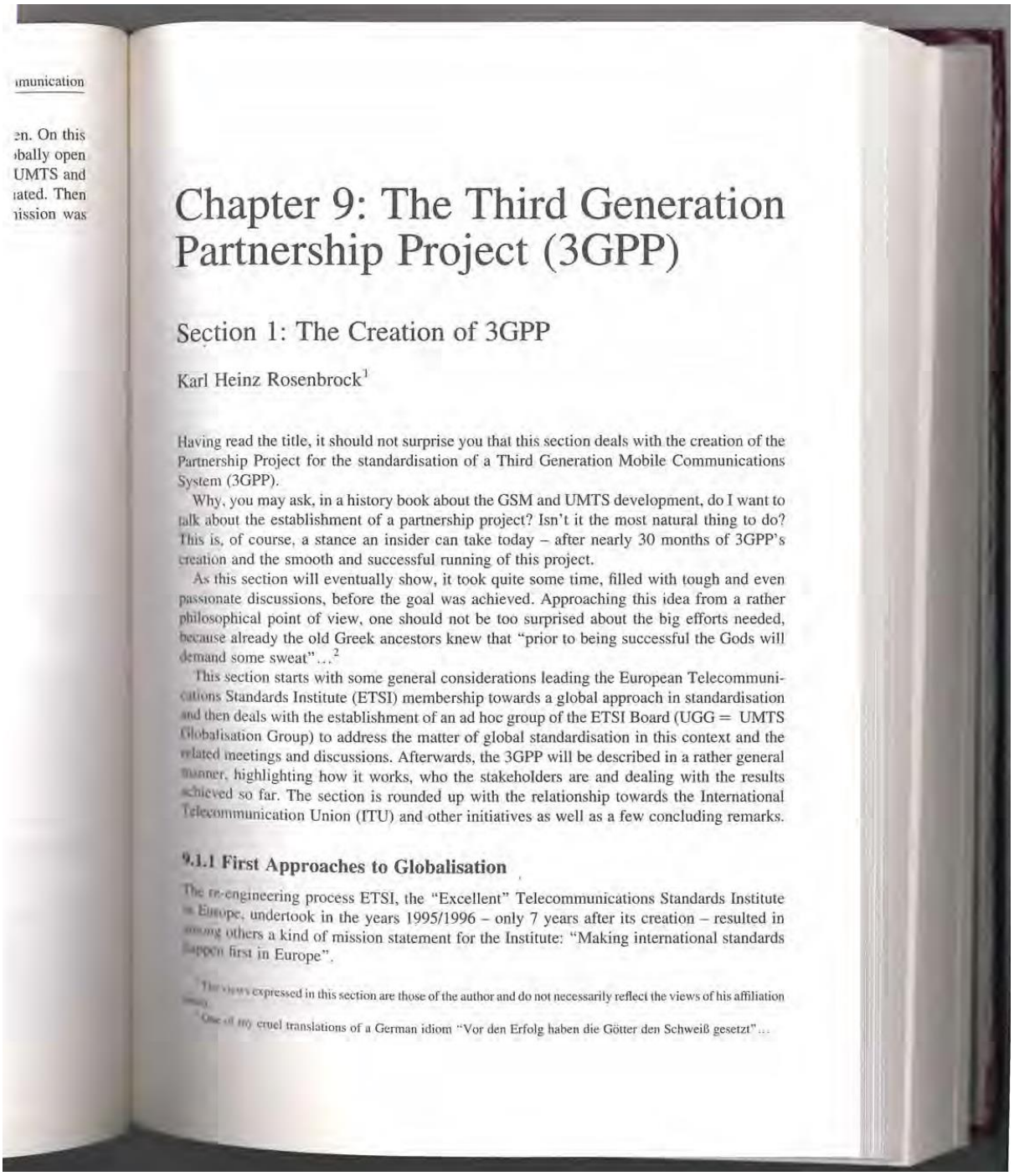
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Chapter 9: The Third Generation Partnership Project (3GPP)

Section 1: The Creation of 3GPP

Karl Heinz Rosenbrock[1]

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 [illegible].

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

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- 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 agreement[8] 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, fora 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

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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

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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 40 000 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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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 liase 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 the 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

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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 Andersen[1]

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 UMTS[2] 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

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

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

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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 than 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 co-ordinate 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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Annex 2: Organisation Evolution of the Technical Groups

Section 3: 3GPP

Adrian Scrase[1]

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.

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APPENDIX 5

Third Generation Partnership Project

3GPP

Working Procedures

17 July 2000

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Foreword

These Working Procedures of the Third Generation Partnership Project (3GPP) are effective from 17 July 2000.

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 acronym "3GPP".

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 a 3rd Generation Mobile System including:

?? UTRAN (including UTRA; in Frequency Division Duplex (FDD) and Time Division Duplex (TDD) modes);

?? 3GPP Core Network (Third Generation networking capabilities evolved from GSM. These capabilities include mobility management, global roaming, and utilisation of relevant Internet Protocols);

?? Terminals for access to the above (including specifications for a UIM); and

?? System and service aspects.

3Gpp shall prepare, approve and maintain the necessary set of Technical Specifications and Technical Reports for:

- the Global System for Mobile communication (GSM) including GSM evolved radio access technologies (e.g. General Packet Radio Service (GPRS) and Enhanced Data rates for GSM Evolution (EDGE)).

3GPP shall consider the long term evolution.

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 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 shall 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, the 3GPP Technical Specifications and Technical Reports will 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 consists 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.Regular TSG elections shall be held every two years in the March time frame in odd numbered years.

Should the office of Chairman or Vice Chairman, of a TSG, become vacant for reasons other than expiration of term of office, a special election shall be conducted to fill the unexpired term. This special election shall be conducted at a regularly scheduled meeting of the TSG, and shall be announced in writing, at least 21 days in advance of the meeting.

When a special election is held to fill the office of Chairman, the announcement shall also indicate that there will be an election to fill the position of Vice Chairman in the case where the Vice Chairman may be elected to the office of Chairman. If at the special election the Vice Chairman is elected to the office of Chairman, that individual, to be proposed to the PCG for appointment, shall become Chairman immediately, the position of Vice Chairman shall be assumed vacant, and an election shall be held for the office of Vice Chairman.

A partial term of office does not count towards the two consecutive term limit.

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. This does not apply to special/regular successive elections.

When a new TSG is established, the Organizational Partners shall appoint a convenor for the first two TSG meetings. The initial special election for TSG Chairman and Vice Chairmen shall take place at the second TSG meeting. The elected Chairman and Vice Chairman shall serve until the next regular TSG election. A partial term of office does not count towards the two consecutive term limit. 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.

If a TSG or Working Group Chairman or Vice Chairman have a change of company affiliation (job change) during their term of office, a new letter of support shall be provided. The decision for the Chair or Vice Chair to continue in office shall be made by consensus of the affected group. If consensus cannot be achieved, an election shall be held for the office.

At the Working Group level the election is for a two year term. At the TSG level the special election is for the unexpired term. A partial term of office does not count towards the two consecutive term limit. If the incumbent is elected, at the TSG or WG level, it is for the unexpired term and that term does count toward the term limit. If the change of affiliation is that of the Chair, he shall select a Vice Chair to determine consensus and if necessary to manage the election. If there is an election, the Vice Chair managing the election should not be a candidate.

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. The draft agenda shall indicate elections to be held (including known candidates).

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 *TS**G*** 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 and WG shall maintain a list of active participants and voting Individual Members (company or agency). To qualify for either list it is necessary to attend TSG or WG meetings. Participants who are absent from three consecutive meetings of a TSG or WG without justification shall be removed from the active participants list. An Individual Member which is absent from three consecutive meetings of the TSG or WG without justification shall be removed from the

voting membership list. In either case, those removed shall be re-instated after attending one meeting. The right to vote is reinstated at the next (second) meeting attended.

When a new TSG or WG is formed an Individual Member is added to the voting membership list at the first meeting that they are represented, and can vote at the second meeting where they are represented. Exceptionally, if inadequate notice (less than 21 days) is given for the first meeting of the new group, an Individual Member may be added to the voting membership list and vote at the groups second meeting (the election meeting) even if they were not represented at the groups first meeting. Only an Individual Member who was represented at the groups first meeting may provide a proxy for the second meeting.

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

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 principal parameters:

?? title;

?? intended output (i.e. 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 3GPPOrganizational 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

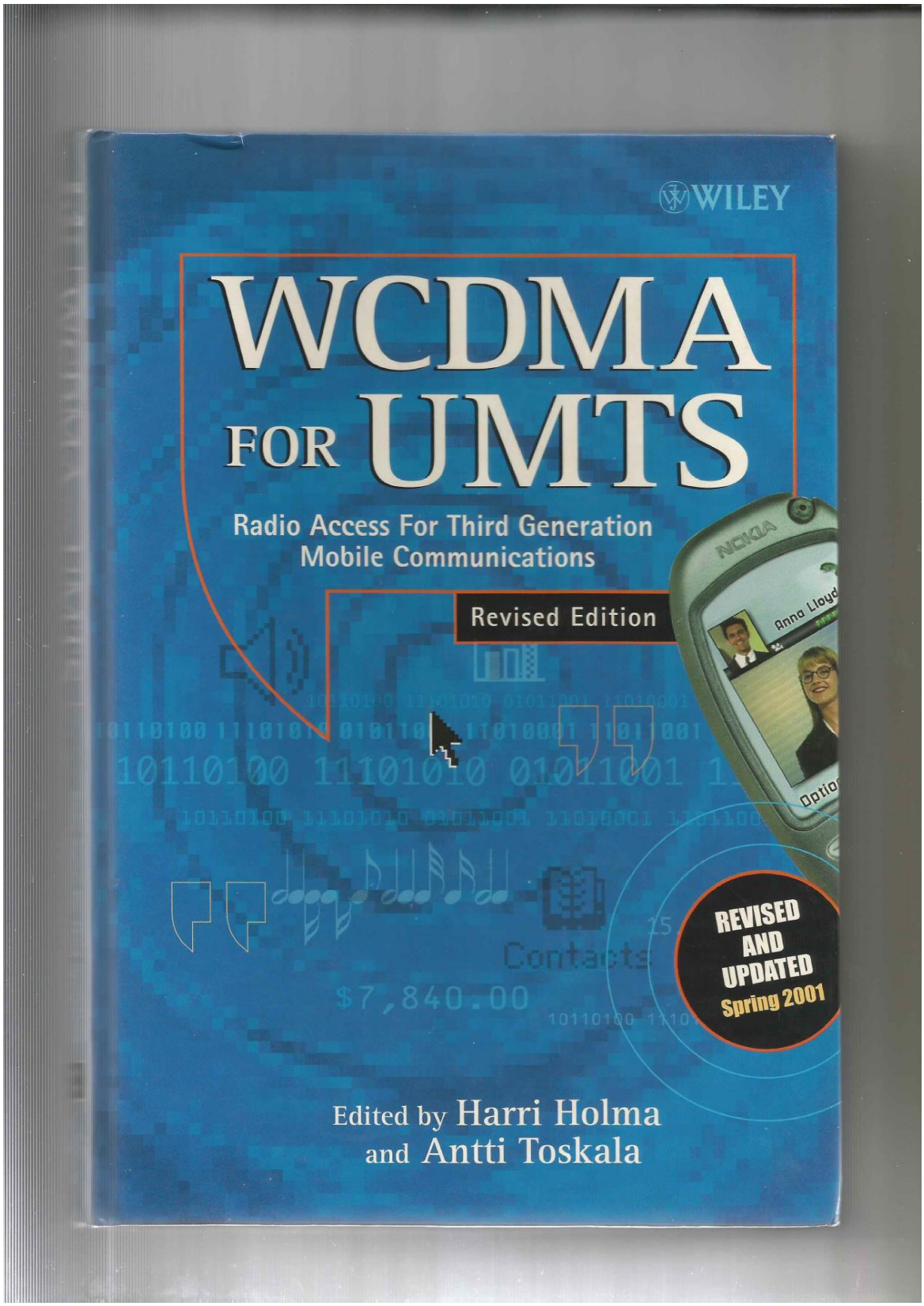
?? Request shall be considered approved unless negative comments received

?? PCG Secretary will inform PCG members and update the web page accordingly

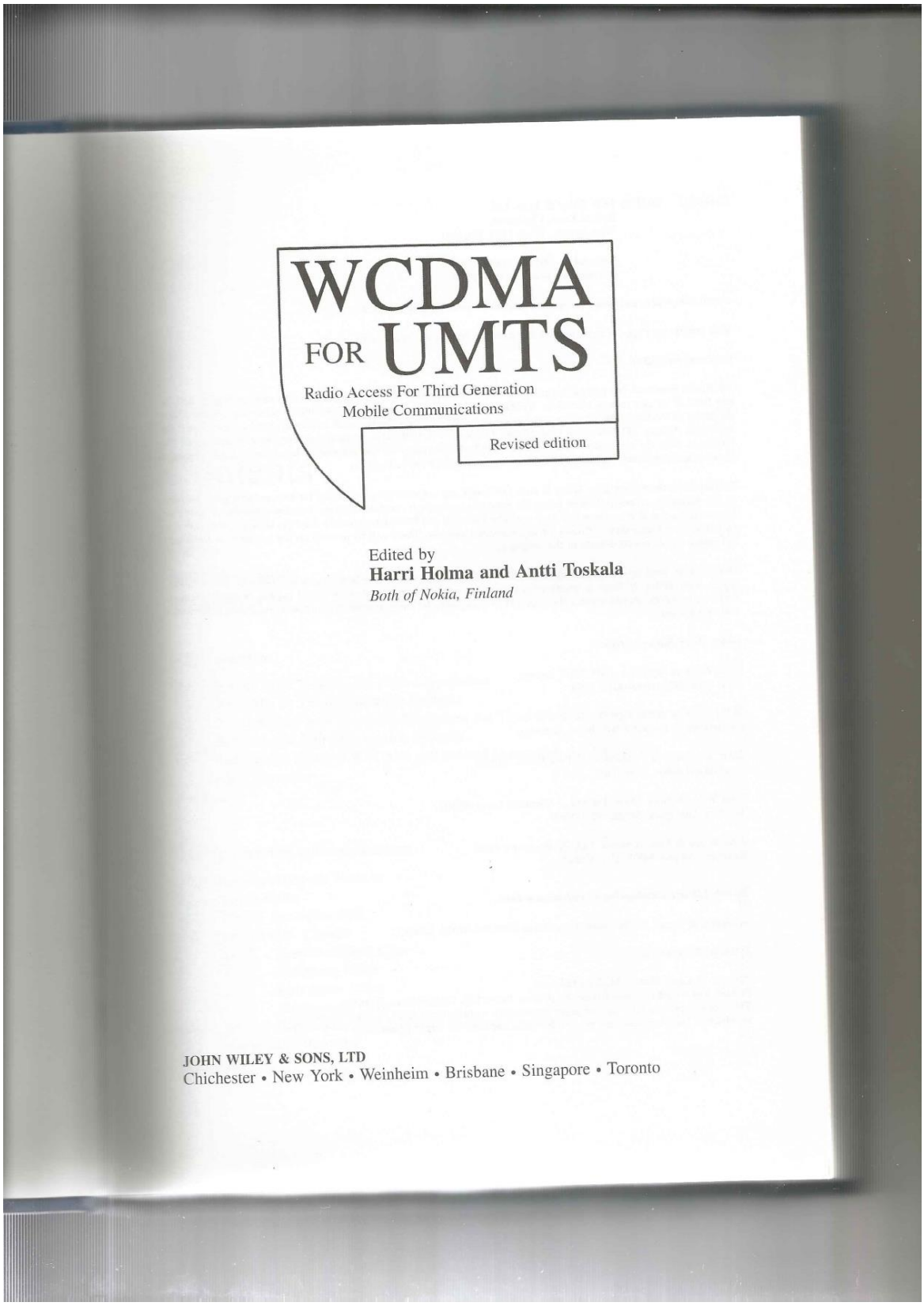
?? A TSG or any subtending Working Group may send individual liaisons to any external organization on that TSGs approved list without further PCG approval, except if the statement is considered "sensitive" by the TSG Chairman, in which case PCG clearance is needed.

?? 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 6



Petitioners' Exhibit 1013
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00037; U.S. Patent No. 10,616,932
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WCDMA FOR UMTS

Radio Access For Third Generation Mobile Communications

Revised edition

Edited by
Harri Holma and Antti Toskala
Both of Nokia, Finland

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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 T1P1 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 the 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 T1P1 (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.

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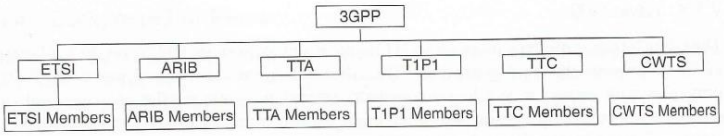


Figure 4.2. 3GPP organisational partners

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.

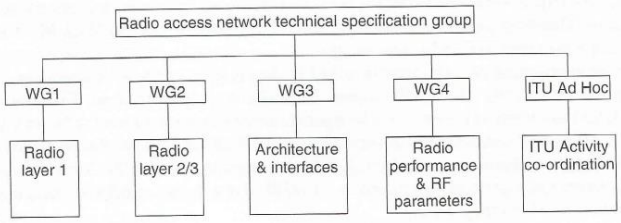


Figure 4.3. 3GPP RAN TSG working groups

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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.

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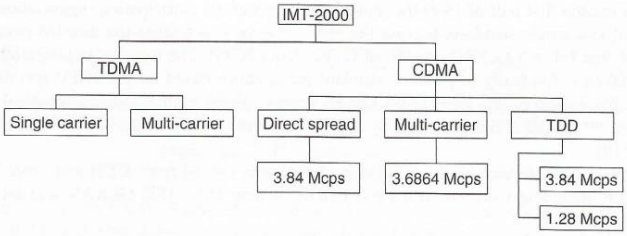


Figure 4.4. ITU-R IMT-2000 grouping

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.

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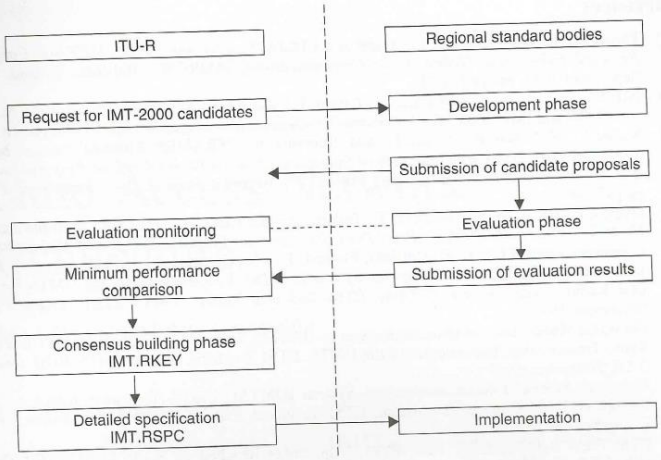


Figure 4.5. Relationship of ITU-R to the regional standards bodies

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 teehnology, 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 7

3GPP PCG#40
Beijing, China,
11 April 2018
PCG40_13

MCC Activity Report

Source

Adrian Scrase

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Departures and Arrivals

At the beginning of November 2017,

Kai-Erik Sunell



joined MCC as a “Project Manager without portfolio” to assist in the MCC duties relating, primarily, to the RAN working groups.

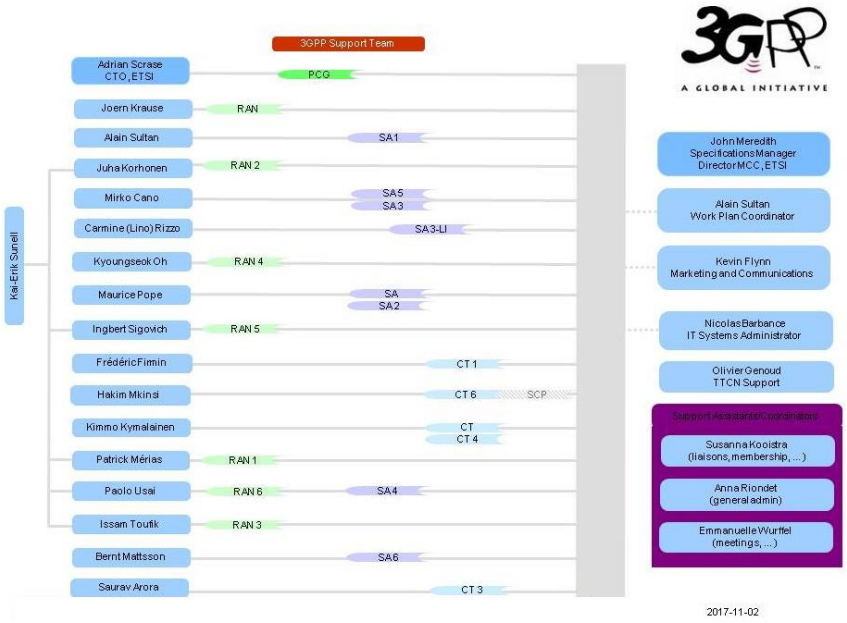
Kai-Erik acts as secretary to some parallel streams during meetings, moving from group to group as the need demands, and assists in implementing Change Requests after TSG plenaries. Kai-Erik will also be available to replace the regular MCC secretary of any 3GPP group in case of indisposition of the regular incumbent.

Find Kai-Erik’s MCC bio page here:
http://www.3gpp.org/people/1908-kai-erik-sunell

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Resource Allocation



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Workload: Change Requests

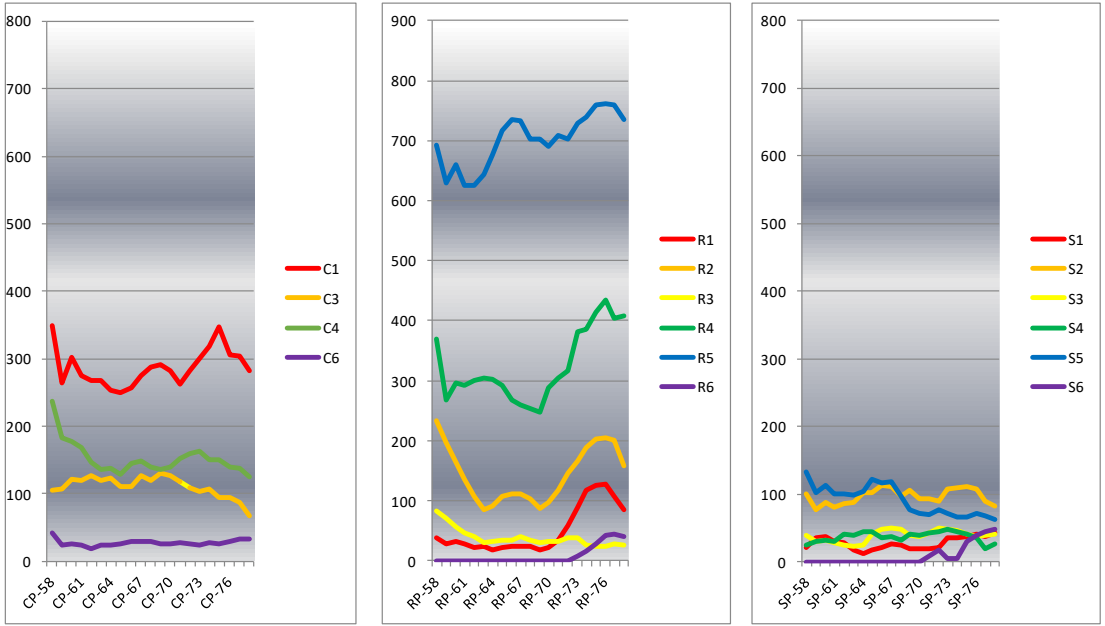
Approved CRs per Release per Year

Release	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
R99	1408	4398	2266	1004	581	512	111	42	23	5	5	1	0							**10356**
Rel-4		376	2828	1900	690	257	122	63	48	22	20	13	11	8	7	2				**6367**
Rel-5		27	644	3274	2842	2162	1357	509	94	25	22	7	7	5	3	2				**10980**
Rel-6				172	1088	2458	3721	2074	1078	212	74	19	17	10	4	4				**10931**
Rel-7					1	20	663	2529	3132	1262	492	176	91	43	25	15				**8449**
Rel-8								49	777	4609	7073	2347	706	347	184	91	46	22	12	**16263**
Rel-9										49	2918	4991	3252	1366	376	165	70	26	23	**13236**
Rel-10											47	1722	3800	3103	1636	584	267	50	21	**11230**
Rel-11												32	1152	4178	3525	2186	622	163	41	**11899**
Rel-12													6	102	2254	5181	4287	1530	197	**13557**
Rel-13															8	200	2648	5571	1681	**10108**
Rel-14																	24	2315	5865	**8204**
Rel-15																		6	1246	**1252**
Rel-16																			0	35	**35**
Total	**1408**	**4801**	**5738**	**6350**	**5202**	**5409**	**5974**	**5266**	**5152**	**6184**	**10651**	**9308**	**9042**	**9162**	**8022**	**8430**	**7964**	**9683**	**9121**	**132867**

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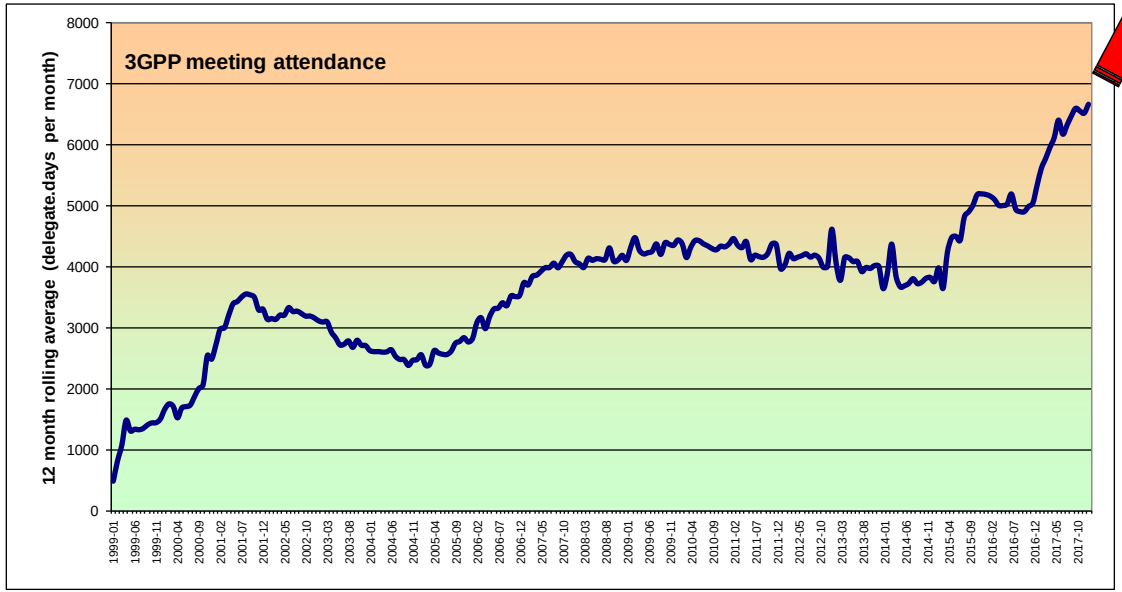
Approved CRs per WG per TSG meeting



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Workload: meeting attendance over time



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Workload: Committee Support

2017 was an exceptionally busy year for 3GPP in general and for MCC in particular. The number of meetings supported and contributions processed enabled the 5G New Radio to be completed six months ahead of the original target. Throughout the year, a total of 75 000 delegate/days were spent in 3GPP groups which is an unprecedented level of activity for the project. More than 100 000 contributions were processed.

This peak workload would not be sustainable in the longer term without increasing the support resources. However, during the recent TSG meetings that took place in Chennai, distinct action was taken to try and limit the number of meetings that will occur from 2019 onwards. It still remains to be seen how many meetings will take place in 2018 but at least we seem to be heading in the right direction.

Two groups within 3GPP have a very low level of participation and activity (CT6 and RAN6). In consultation with the relevant TSG Chairman, consideration is being given reducing the level of support to back-office only. This will of course help to reduce support costs. Decisions are expected to have been taken by the time the PCG next meets.

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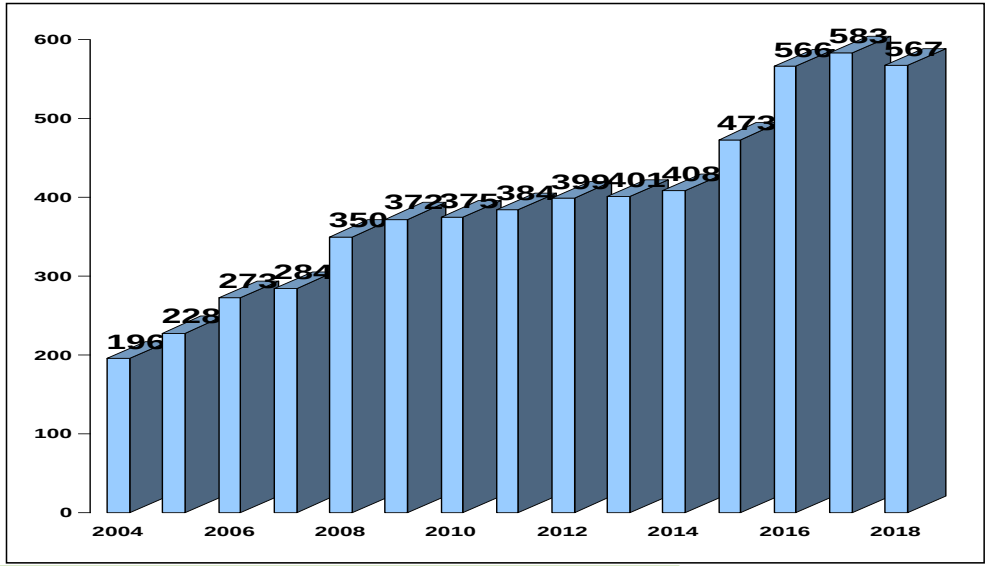
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3GPP Membership

3GPP Membership currently stands at 567 Individual Members. In addition, there are 21 companies having Guest Status, which are potential IMs

Number of Individual Members in 3GPP

3GPP Individual Members come from 45 Countries worldwide



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3GPP Member Territories

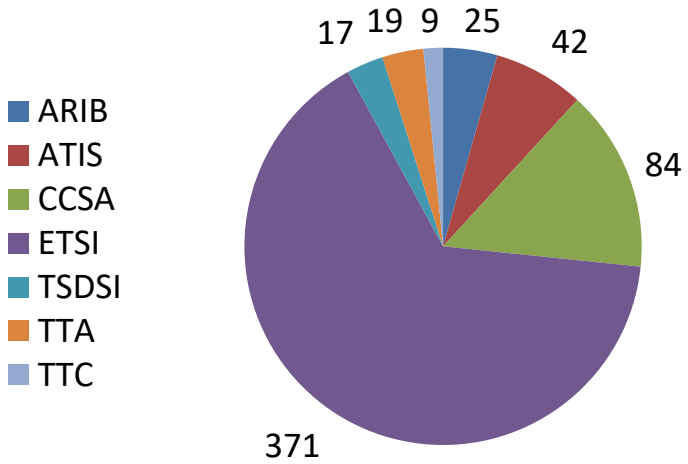
AUSTRALIA	DENMARK	ISRAEL	POLAND	SOUTH AFRICA
AUSTRIA	FINLAND	ITALY	PORTUGAL	SPAIN
BELGIUM	FRANCE	JAPAN	QATAR	SWEDEN
BOTSWANA	GERMANY	KOREA (REPUBLIC OF)	ROMANIA	SWITZERLAND
BRAZIL	HONG KONG	LEBANON	RUSSIAN FEDERATION	TAIWAN, PROVINCE OF CHINA
CANADA	INDIA	LUXEMBOURG	SERBIA	TURKEY
CHINA	INDONESIA	MALAYSIA	SINGAPORE	UNITED ARAB EMIRATES
CZECH REPUBLIC	IRELAND	MEXICO	SLOVAKIA	UNITED KINGDOM
		NETHERLANDS	SLOVENIA	UNITED STATES
		NORWAY		

3GPP Individual Members come from 44 countries worldwide

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567 Individual Members in 3GPP



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Some interesting industry participants…

- **Agricultural** machinery manufacturers (e.g., John Deere, Husqvana, etc)
- **Automotive** manufactures (e.g, Volkswagen, Volvo, Toyota)
- **Rail** (e.g., Internationale Union of Railways)
- **Factory Automation** companies (e.g., Siemens)
- **Energy** Sector (e.g., Legrand)
- **Environment** (e.g., Veolia)
- **Broadcasting** Community (e.g., EBU, BBC, TDF)
- **Satellite** Community (e.g., ESO, Inmarsat)
- **Aerospace** (e.g., Lockheed Martin, BAE)
- **Retail** Sector (e.g., Alibaba)
- **Social Media** (e.g., Facebook)
- **Advertising** (e.g., Google)

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Anti-trust Compliance Training

- Four webinars targeted at elected officials and candidates took place in 2017, each timed to be convenient for those in one of the three regions (Americas, Europe, Asia).
- By decision of the PCG, these webinars are now open for participation by any delegate. For logistical reasons, we may have to limit the number of participants in any one webinar, and elected officials and candidates for election will take precedence.
- Companies are reminded that all personnel they offer for the chairmanship or vice-chairmanship of 3GPP committees must undergo formal training in anti-trust matters, and the letter of support for candidates for election must clearly state this.
- We are currently fixing the dates for 2018 webinars.

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Summary and Outlook

3GPP has continued to strengthen its position as the place where the 5G system is being specified. It continues to attract significant interest from new entrants too.

The workload within the TSGs has increased dramatically in the build up to Release 15 and 16 delivery. This workload will be monitored in the coming months and support resources adjusted accordingly.

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APPENDIX 8

The 3G IP Multimedia Subsystem (IMS)

Merging the Internet and the Cellular Worlds

Gonzalo Camarillo and Miguel A. García-Martín

Both of
Ericsson, Finland



John Wiley & Sons, Ltd

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Chapter 2

The History of the IMS Standardization

In Chapter 1 we mentioned that the IMS uses Internet protocols. When the IMS needs a protocol to perform a particular task (e.g., to establish a multimedia session), the standardization bodies standardizing the IMS take the Internet protocol intended for that task and specify its use in the IMS. Still, no matter how simple this may sound the process of choosing protocols to be used in the IMS can sometimes get tricky. Sometimes, the Internet protocol that is chosen lacks some essential functionality, or does not even exist at all. When this happens the IMS standardization bodies contact the standardization body developing Internet protocols to work together on a solution. We will cover this collaboration in Section 2.5. Nevertheless, before jumping into that we will introduce in Section 2.1 all the standardization bodies involved in IMS development. We need to know who is who and which functions of the IMS each of them performs.

2.1 Relations between IMS-related Standardization Bodies

The ITU (International Telecommunication Union) IMT-2000 (International Mobile Telecommunications-2000) is the global standard for 3G (third generation) networks. IMT-2000 is the result of the collaboration between different standards bodies and aims at providing access to telecommunication services using radio links, which include satellite and terrestrial networks.

We will focus on two of the standard bodies involved in IMT-2000: 3GPP (Third Generation Partnership Project) and 3GPP2 (Third Generation Partnership Project 2). Still, they are not the only ones working within IMT-2000. Other bodies, such as the ITU-R (ITU-Radiocommunication Sector), for instance, are also involved in IMT-2000 but on different areas than the IMS.

Both 3GPP and 3GPP2 have standardized their own IMS (IP Multimedia Subsystem). The 3GPP IMS and the 3GPP2 IMS are fairly similar, but, nevertheless, have a few differences (Appendix A lists the most important differences).

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An important similarity between the 3GPP IMS and the 3GPP2 IMS is that both use Internet protocols, which have been traditionally standardized by the IETF (Internet Engineering Task Force). Consequently, both 3GPP and 3GPP2 collaborate with the IETF in developing protocols that fulfill their requirements. The following sections introduce the IETF, 3GPP, and 3GPP2 and provide a brief history of the IETF-3GPP/3GPP2 collaboration.

In addition to the standard bodies we have just mentioned, OMA (Open Mobile Alliance [144]) will play an important role in developing IMS services in the near future. While 3GPP and 3GPP have standardized (or are standardizing) a few IMS services, such as basic video calls or conferencing, from now on OMA will focus on service standardization for the IMS (of course, other standard bodies and third parties besides OMA may also develop services for the IMS).

2.2 Internet Engineering Task Force (IETF)

The Internet Engineering Task Force (IETF) is a loosely self-organized collection of network designers, operators, vendors, and research institutions that work together to develop the architecture, protocols, and operation of the public Internet. The IETF is body that is open to any interested individual. The IETF is not a corporation and, therefore, does not have a board of directors, members, nor dues.

The IETF is the standardization body that has developed most of the protocols that are currently used on the Internet. The IETF does not standardize networks, architectures combining different protocols, the internal behaviour of nodes, nor APIs (Application Programming Interface). The IETF is the protocol factory for IP-related protocols.

2.2.1 Structure of IETF

Work in the IETF is organized in working groups. Each working group is chartered to perform specific tasks, such as the delivery of a precise set of documents. Each working group has from one to three chairs, who take care that the working group completes its chartered tasks in time. Working groups have a temporary lifetime; so, once they have delivered their documents, either they are rechartered or they cease to exist. Figure 2.1 shows a few, but not all, of the working groups in the IETF; there are more than 100 active working groups in the IETF. The complete up-to-date list of active working groups is available at:

`http://www.ietf.org/html.charters/wg-dir.html`

Working groups get an acronym name that identifies the chartered task. For instance, SIPPING is the acronym of "Session Initiation Protocol Investigation", SIMPLE is the acronym of "SIP for Instant Messaging and Presence Leveraging Extensions" or AAA for "Authentication, Authorization and Accounting".

A collection of working groups form an Area Directorate. There are currently eight areas, as illustrated in Figure 2.1.

Each area has one or two area directors who, together with the IETF chairman, form the IESG (Internet Engineering Steering Group). The IESG is the technical

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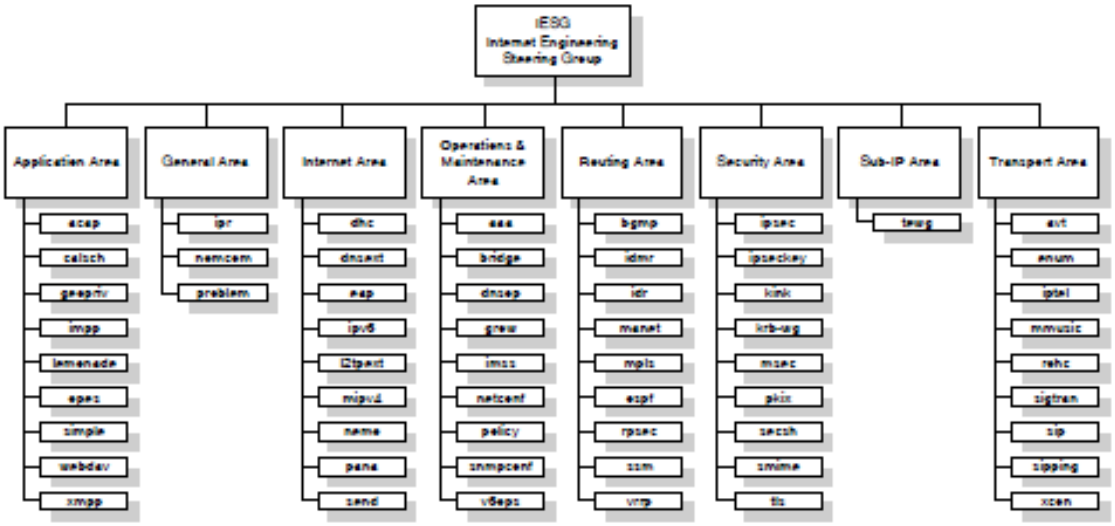


Figure 2.1: The structure of the IETF

management team of the IETF. They decide on which areas the IETF should work and review all the specifications that are produced.

The following web pages contain the complete list of the working groups of all areas and the charter of the SIPPING working group respectively.

```
http://www.ietf.org/html.charters/wg-dir.html
http://www.ietf.org/html.charters/sipping-charter.html
```

The IAB (Internet Architecture Board) is the body that provides technical leadership and handles appeals. Its web page is:

```
http://www.iab.org/
```

2.2.2 Working Group Operations

The technical work in the IETF is done within the working groups. Working groups do not have any kind of membership; they are formed by a number of volunteers that work as individuals. That is, they do not represent their companies when working for the IETF.

Most of the technical discussions within a working group take place in its mailing list. Even the decisions made at face-to-face meetings (held three times a year) have to be confirmed in the mailing list.

The technical documents used within the working groups are called Internet-Drafts. There are two types of them: individual submissions and working group items. Individual submissions are technical proposals submitted by an individual or individuals. If the working group decides that an individual submission is a good starting point to work on a particular topic, it becomes a working group item.

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Individual submissions and working group items can be distinguished by the name of the file where they are stored. Individual submissions start with:

```
draft-author's_name
```

while working group items start with:

```
draft-ietf-name_of_the_working_group
```

A list of all the Internet-Drafts can be found at:

```
http://www.ietf.org/internet-drafts/
```

When a working group feels that a working group item is ready for publication as an RFC the working group chairs send it to the IESG. The IESG may provide feedback to the working group (e.g., ask that working group to change something in the draft) and, eventually, decides whether or not a new RFC is published.

Although most of the Internet-Drafts that the IESG receives come from working groups an individual may also submit an Internet-Draft to the IESG. This usually happens with topics that are not large enough to grant the creation of a working group, but which, nevertheless, are of interest to the Internet community.

It is important to note that Internet-Drafts, even if they are working group items, represent work in progress and should only be referenced as such. Internet-Drafts are temporary documents that expire and cease to exist six months after they are issued. They can change at any time without taking into consideration backward compatibility issues with existing implementations. Only when a particular Internet-Draft becomes an RFC can it be considered a stable specification.

2.2.3 Types of RFCs

The technical documents produced by the IETF are called RFCs (Request For Comments). According to the contents of the document there are three main types of RFCs:

- Standards-track RFCs.
- Non-standards-track RFCs.
- BCP (Best Current Practise) RFCs.

Standards-track RFCs typically define protocols and extensions to protocols. According to the maturity of the protocol there are three levels of standards-track RFCs: proposed standard, draft standard, and Internet standard. Standards-track specifications are supposed to advance from proposed to draft and, finally, to Internet standard as they get more and more mature. An important requirement in this process is that a particular specification is implemented by several people to show that different independently built implementations that follow the same specification can successfully interoperate.

Nevertheless, in practise only a few RFCs reach the draft standard level and even fewer become Internet standards. At present, the specifications of many protocols that are used massively on the Internet are proposed standards.

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There are three types of non-standards-track RFCs: experimental, informational, and historical (which are called *historic* RFCs). Experimental RFCs specify protocols with a very limited use, while informational RFCs provide information for the Internet community about some topic, such as a requirements document or a process. When a standards-track RFC becomes obsolete, it becomes a historic RFC.

BCP RFCs record the best current practise known to the community to perform a particular task. They may deal with protocol issues or with administrative issues.

Figure 2.2 shows the relations between all the RFC types. A list of all the RFCs published so far and their status can be fetched from:

`http://www.ietf.org/iesg/1rfc_index.txt`

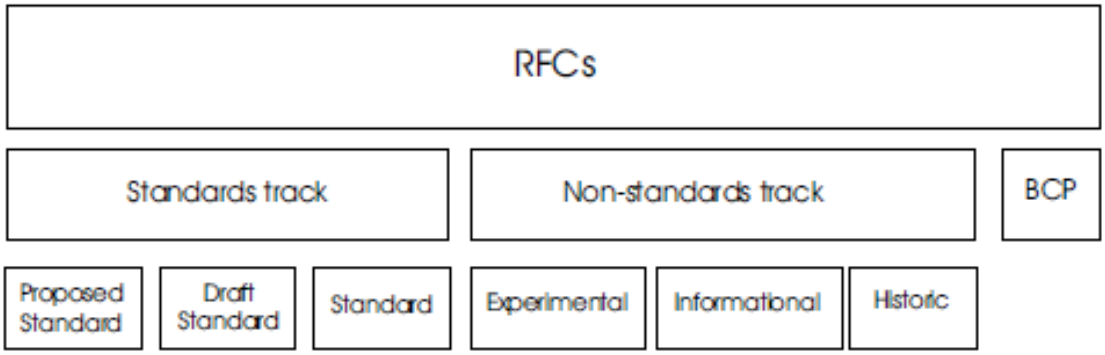


Figure 2.2: RFC types

RFCs can be downloaded from the following web page by just introducing the RFC number:

`http://www.ietf.org/rfc.html`

Additionally, the RFC Editor offers a web page that allows us to search for RFCs by title, number, author and keywords:

`http://www.rfc-editor.org/rfcsearch.html`

2.3 Third Generation Partnership Project (3GPP)

The Third Generation Partnership Project (3GPP) was born in 1998 as a collaboration agreement between a number of regional telecommunication standard bodies, known as *organizational partners*. The current 3GPP organizational partners are:

1. ARIB (Association of Radio Industries and Business) in Japan,

   `http://www.arib.or.jp/english/`

2. CCSA (China Communications Standards Associations) in China,

   `http://www.ccsa.org.cn/english/`

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3. ETSI (European Telecommunications Standards Institute) in Europe,

   `http://www.etsi.org/`

4. Committee T1 in the United States of America,

   `http://www.t1.org/`

5. TTA (Telecommunications Technology Association) of Korea

   `http://www.tta.or.kr/English/`

6. TTC (Telecommunication Technology Committee) in Japan,

   `http://www.ttc.or.jp/e/`

3GPP was originally chartered to develop globally applicable Technical Specifications and Technical Reports for a third-generation mobile system based on GSM. The scope has been reinforced to include maintenance and development of GSM specifications including the supported and evolved radio networks, technologies, and packet access technologies.

Besides the organizational partners, *market representation partners* provide the partnership with market requirements. Market representation partners include, among others, the UMTS Forum, 3G Americas, the GSM Association, the Global mobile Suppliers Association, the TD-SCDMA Forum, and the IPv6 Forum.

3GPP maintains an up-to-date web site at:

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

2.3.1 3GPP Structure

3GPP is organized in a Project Co-ordination Group (PCG) and Technical Specification Groups (TSGs), as illustrated in Figure 2.3. The PCG is responsible for the overall management of 3GPP, time plans, allocation of work, etc. The technical work is produced in the TSGs. At the moment there are five TSGs, responsible for the Core Network (CN), System and Services Aspects (SA), GSM EDGE Radio Access Network (GERAN), Radio Access Network (RAN), and Terminals (T). Each of the TSGs is further divided into Working Groups. Each of the Working Groups is allocated particular tasks. For instance, CN WG1 is responsible for all the detailed design of the usage of SIP and SDP in the IMS, CN WG3 for interworking aspects and CN4 for all the detailed design of the usage of Diameter. SA WG1 is responsible for the requirements, SA2 for the architecture, SA WG3 for the security aspects, SA WG4 for the codecs, and SA WG5 for the operation and maintenance of the network.

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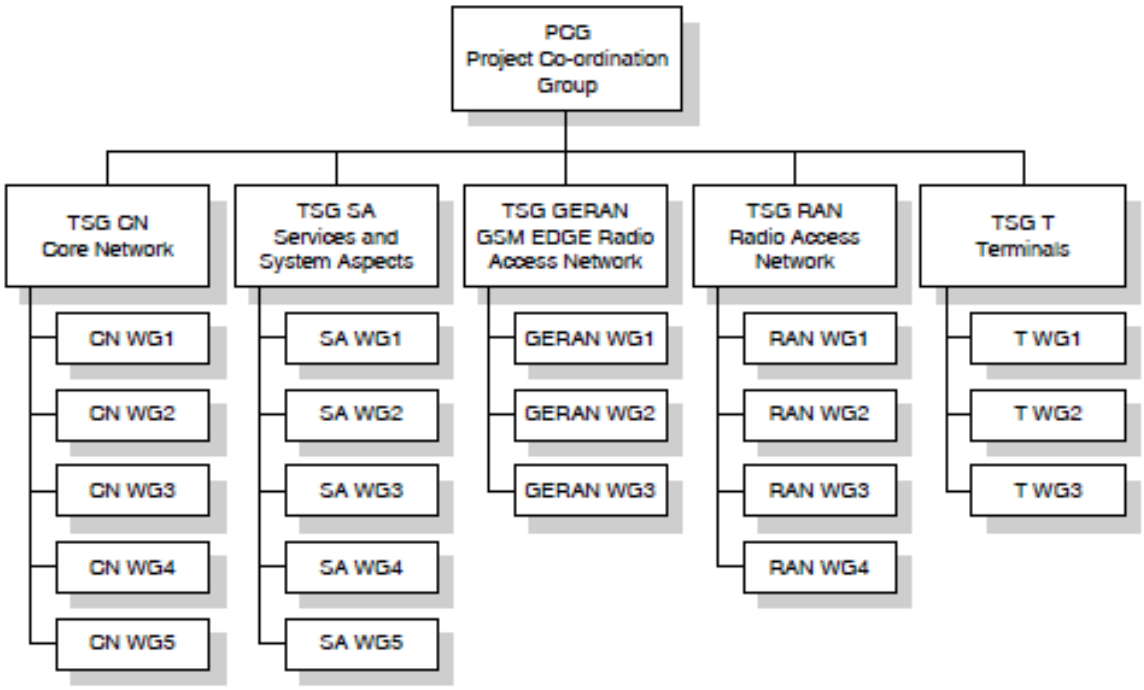


Figure 2.3: The structure of 3GPP

2.3.2 3GPP Deliverables

3GPP working groups do not produce standards. Instead, they produce Technical Specifications (TS) and Technical Reports (TR) that are approved by the TSGs. Once approved they are submitted to the organizational partners to be submitted to their respective standardization processes. The final part of the process is in the organizational partners' hands when they approve the TSs or TRs as part of their standards procedures. As a result, there is a set of globally developed standards that are ready to be used in a particular region.

3GPP TSs and TRs are numbered according to the sequence of four or five digits that follow the pattern "xx.yyy". The first two digits "xx" identify the series number, and the last two or three digits "yy" or "yyy" identify a particular specification within a series. For instance, 3GPP TS 23.228 [21] describes the architectural aspects of the IMS.

3GPP groups its specifications in what is called a *Release*. 3GPP Release 5 contains the first version of the IMS. 3GPP Release 6 contains enhancements to the IMS. The reader must note that the IMS is just a fraction of the 3GPP deliverables in a particular Release, as there are other non-IMS specifications included in a 3GPP Release. 3GPP TSs and TRs include a version number that follows the pattern "x.y.z", where "x" represents the 3GPP Release where the specification is published, "y" is the version number, and "z" is a sub-version number. So, 3GPP TS 23.228 version 5.8.0 means version 8.0 of the Release 5 version of TS 23.228.

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3GPP TSs and TRs are publicly available at the 3GPP web site at either of the following URIs:

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

`http://www.3gpp.org/ftp/Specs/archive/`

2.4 Third Generation Partnership Project 2 (3GPP2)

If 3GPP was born to evolve GSM specifications into a third-generation cellular system, the Third Generation Partnership Project 2 (3GPP2) was born to evolve North American and Asian cellular networks based on ANSI/TIA/EIA-41 standards and CDMA2000© radio access into a third-generation system. 3GPP2 like 3GPP is a partnership project whose members are also known as *organizational partners*. The current list of organizational partners include ARIB (Japan), CCSA (China), TIA (Telecommunications Industry Association) (North America), TTA (Korea), and TTC (Japan). Probably, the reader has noticed that most of them are also organizational partners of 3GPP.

Like 3GPP, 3GPP2 gets market requirements and advice from *market representation partners*. At the moment the list includes the IPv6 Forum and the CDMA Development Group.

2.4.1 3GPP2 Structure

The 3GPP2 structure mimics the structure of 3GPP, as illustrated in Figure 2.4. A Steering Committee (SC) is responsible for the overall standardization process and the planning. The technical work is done in Technical Specification Groups (TSGs). TSG-A is focused on the Access Network Interface, TSG-C on CDMA2000© technology, TSG-S on Service and System Aspects, and TSG-X in Intersystems Operations. TGS-X was born as a merger between the former TSG-N (Core Networks) and TSG-P (Packet Data) TSGs. The structure of TSN-X is not completely defined yet.

2.4.2 3GPP2 Deliverables

Like 3GPP, 3GPP2 does not produce standards but, instead, Technical Specifications (TSs) and Technical reports (TRs). The documents are created by the TSGs and approved by the SC. Then, they are submitted to the organizational partners to be submitted to their respective standardization processes.

3GPP2 TSs and TRs are numbered with a sequence of letters and digits that follows the scheme "A.Bxxxx-yyy-R" where "A" is a letter that represents the name of the TSG that delivers the document, "B" can be an "R" letter to indicate a TR or a requirements document, but it can also be an "S" letter to indicate a TS. "xxxx" is a sequential number allocated to the document. An optional "yyy" sequence of digits can further identify the chapter within a specification series. The "R" letter identifies the revision. The version number follows the specification and indicates a major and

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APPENDIX 9

The Wayback Machine - https://web.archive.org/web/20000817060414/http://www.3gpp.org:80/Participation…

List of 3GPP Individual Members

- About 3GPP
- Organizational Partners
- Project Coordination Group
- Technical Specification Group
- Meetings
- Participation
  - List of Individual Members
- Documents Area
- 3G Specifications
- Mobile Competence Centre

ARIB

ADVANTEST Corporation	Agilent Technologies Japan, Ltd
ANRITSU CORPORATION	Asahi Chemical Industry Co. Ltd
Dai Nippon Printing Co., Ltd	DDI Corporation Japan
DENSO CORPORATION	FUJITSU LIMITED
Hitachi, Ltd.	Intel K.K.
Japan Radio Co., Ltd.	JAPAN TELECOM CO.,LTD.
KENWOOD CORPORATION	Kyocera
LSI LOGIC	Lucent Technologies Japan Ltd.
Matsushita Communication Industrial Co., Ltd.	MITSUBISHI ELECTRIC CORPORATION
Motorola Japan Ltd.	NEC Corporation
Nippon Ericsson K.K.	Nippon Telegraph and Telephone Corporation (NTT)
Nokia Mobile Communications Co., Ltd.	Nortel Networks
NTT Mobile Communications Network Inc. (DoCoMo)	Oki Electric Industry Co., Ltd.
Pioneer electronic corporation	SAMSUNG Electronics Co., Tokyo R&D Branch
SEIKO EPSON CORPORATION	SHARP CORPORATION
Siemens K.K.	Sony Corporation
Texas Instruments Tsukuba Research & Development Center Ltd.	TOSHIBA CORPORATION
TU-KA Cellular Tokyo	Yokogawa Electric Corporation

CWTS

Beijing Pacific LinkAir Communications, Inc.	CATT
China Mobile Company Corporation (CMCC)	Eastern Communications Co., Ltd.
HuaWei Technologies Co., Ltd	Jin Peng Mobile Communications System Co., Ltd.
RITT	SHANG HAI BELL
XOCECO Mobile Communication Equipment Co, LTD	Zhongxing Telecom Ltd.

ETSI

3COM	3G.COM (UK) Ltd
3G Lab Ltd	7 Layers AG
ACER Peripherals Holland B.V.	Across Wireless AB
ADVANCED MICRO DEVICES (UK) Ltd	AGILENT TECHNOLOGIES LTD
Airnet Communications Corp.	AIRTEL Movil SA
Airtouch Belgium S.A.	ALCATEL BELL
ALCATEL France	ALCATEL SEL AG
ALLGON AB	AMENA Retevision Movil
Analog Devices	Anite Telecoms Ltd
Aran Technologies	ASCOM AG
ASPECTS Software Ltd	ATMEL
AT&T COMMUNICATIONS (UK) LTD	BABT Product Service Ltd.
BELGACOM, S.A. de droit public	BELLSOUTH International Limited
BLU S.p.A	BMWi
BOUYGUES Telecom	Brand Communications Ltd

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BT	BT CELLNET
BULL S.A.	
CABLE & WIRELESS COMMUNICATIONS plc.	Canon CRF
CCL/ITRI	CEGETEL
Centre For Wireless Communications	CETECOM GmbH
Cisco Systems Inc.	CMG Telecommunications & Utilities B.V.
COMNEON GmbH & Co	Compagnie Financiere Alcatel
Compaq Computer SpA	Comverse Network Systems (CNS) Europe B.V.
Condat AG	Danish Wireless Design A/S
DEFENCE EVALUATION & RESEARCH AGENCY	DE LA RUE CARTES & SYSTEMES
Deutsche Telekom MobilNet GmbH (T-Mobil)	diAx Telecommunications
DoCoMo Europe S.A.	DOLPHIN TELECOMMUNICATIONS LTD
DTI - Department of Trade and Industry	E-PLUS Mobilfunk
EIRCELL	Elektrobit Ltd.
ERA-GSM POLSKA TELEFONIA	ERICSSON L.M.
EUSKALTEL S.A.	EUROPOLITAN AB
FEEI	Finnet Group
France Telecom	Fraunhofer Gesellschaft
FUJITSU Europe Telecom R & D Centre	FUJITSU Telecommunications Europe Ltd
GEMPLUS Card International	GIESECKE & DEVRIENT GmbH
GLOBALSTAR	Global Simulation Systems Limited
Golden Bridge Technology Inc.	Hewlett-Packard
High Definitions Systems AB	HuaWei Technologies Co., Ltd
IAEI	IBM EUROPE
ICO Services Ltd	ICP - Instituto das Comunicacoes de Portugal
IFR Ltd	IMST GmbH
INCARD SpA	INDRA SISTEMAS AS
Inmarsat	Integrated Silicon Systems Ltd
Intel Sweden AB	InterDigital Comm.
InterWAVE Communications International B.V.	Iridium LLC
ITALTEL S.p.A.	JetCell. Inc.
KENWOOD ELECTRONICS EUROPE B.V.	KEYCORP Ltd
KPN - Koninklijke PTT Nederland NV	LG Technology Center Europe
LIBERTEL B.V.	LSI Logic Europe plc
Logica Aldiscon	Lucent Technologies BCS & ME GmbH
Lucent Technologies EMEA B.V.	Lucent Technologies Network System GmbH
Lucent Technologies Network Systems UK	MANNESMANN Mobilfunk GmbH
MARCONI COMMUNICATIONS	MATRA NORTEL COMMUNICATIONS
MATSUSHITA COMMUNICATION INDUSTRIAL UK LTD	MATAV, PKI Telecommunications Development Institute
MICROSOFT EUROPE SARL	MIKOM GmbH
MINISTERIO DELLE COMUNICAZIONI	MITEL Semiconductor Ltd
MITSUBISHI Electric France	Microelectronica Espanola SA
Mobile-Mind Inc.	MOBILINK TELECOM, INC.
MOBITEL d.d.	MOTOROLA A/S
MOTOROLA GmbH	MOTOROLA India Electronics Ltd.
MOTOROLA Israel	MOTOROLA Ltd
MOTOROLA SA (France)	MURATA Europe Management GmbH
National Semiconductor Corp.	NEC Electronics (Europe) GmbH
NEC Europe Ltd	NEC Technologies (UK) Ltd
NETCOM GSM A/S	NIIR (Radio Research and Development Institute)

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NOKIA Corporation	NOKIA UK Ltd
NOKIA Telecommunications GmbH	NORTEL NETWORKS (EUROPE)
Northstream AB	NTT DoCoMo Inc.
OFCOM	ÖFEG - Österreichische Fernmeldetechn. Entwicklungs-Förderungs Gesellschaft
OMNITEL Pronto Italia SpA	One 2 One Personal Communications Limited
ORANGE PCS LTD	PA Consulting Services Ltd
PANAFON SA	PANASONIC Deutschland GmbH c/o Matsushita European Technology Center (E-TEC)
PANASONIC Europe	PANASONIC Mobile Communications Development Centre
PHILIPS Communication Systems	PHILIPS CONSUMER COMMUNICATIONS
PHILIPS Semiconductors	PHILIPS Semiconductors Sophia
PMC-Sierra, Inc	Polkomtel S.A.
Portugal Telecom SA	PRAIRIECOMM Inc.
PT - Norwegian Post and Telecommunications Agency	PTK Centertel
QUALCOMM EUROPE S.A.R.L.	
RACAL INSTRUMENTS LTD.	Radio Frequency Investigation Ltd
RadioScape Limited	ROBERT BOSCH GmbH
ROHDE & SCHWARZ GmbH & Co.KG	SAGEM Group
SAMSUNG Electronics Research Institute	SCANDEW PTY Ltd
Schlumberger Industries	Secretariat d'Etat Industrie
SETEC OY	Sensei Ltd.
SIEMENS AG	SIEMENS ATEA N.V.
Siemens Information and Communication Networks SpA	Silicon Automation Systems Ltd
Siemens Mobile Phones A/S	SOFIMATION OY
Solinet GmbH	SONERA Corporation
SONY Broadcast & Professional Europe	SONY INTERNATIONAL (EUROPE) GmbH
STMicroelectronics S.A.	Sun Microsytems, Ltd
SWISSCOM	SYMBIONICS Ltd.
Symmetry Communications Systems	SYMBIAN Ltd.
SYNOPSYS GmbH	
TDF - Telediffusion De France	Tecnomen Oy
TEKTRONIX GmbH & Co KG	TELE DANMARK A/S
Telecom Analysis Systems (TAS)	TELECOM ITALIA S.p.A.
TELECOM MODUS LTD	TELECOMMUNICATIONS ADMINISTRATION CENTRE
Teledesic LLC	TELEFONICA DE ESPAÑA SA
TELEKOM AUSTRIA AG	Telelogic AB
Telenor AS	TELIA AB
TELIT Mobile Terminals S.p.A.	TELIT NETWORKS S.p.A.
TELITAL R&D Denmark A/S	TELLABS Ltd
Telkom SA Ltd	Telrad Networks Ltd.
Texas Instruments France	Texas Instruments A/S
THOMSON-CSF	TNO Physics and Electronics Laboratory
TOSHIBA Electronics Europe	TTP Communications Limited
Ubest India Limited	Unisys Deutschland GmbH
ULB-STC	VIAG INTERKOM GmbH & Co
Victory Telematics Ltd.	VIP-NET GSM d.o.o.
VODAFONE AirTouch Plc	VoiceStream Wireless Corporation
WaterCove Networks Inc.	WAVECOM
WAVETEK GmbH	WIND TELECOMUNICAZIONI SPA

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Wiscom Technologies	

T1

ADC	AERIAL
AT&T Corp.	Alcatel USA Inc.
Bellsouth Cellular	BOPS, Inc.
Catapult Communications	Cisco Systems Inc.
Comsat Corporation	Conexant Systems, Inc.
Ericsson Inc.	Golden Bridge Tech, Inc.
Hewlett-Packard	Hughes Network Systems
Lucent Technologies	Motorola Inc.
Nokia Telecommunications Inc.	Nortel Networks
Pacific Bell Wireless	Powertel, Inc.
Rogers Wireless Inc.	SBC Communications Inc.
Siemens Information and Communication Networks Inc.	Telcordia Technologies Inc.
VoiceStream Wireless Corporation	

TTA

ACCTIMS Corp.	Conexant Systems Korea, Ltd
DACOM Corporation	DAEWOO TELECOM LTD
ERICSSON Korea	ETRI
Hanaro Telecom, Inc	HANSOL PCS
HYUNDAI Electronics Industries Co., Ltd	Jung Myung Telecom Co., Ltd.
KOREA TELECOM Corp.	Korea Telecom Freetel
LG TeleCom., Ltd.	LG Information & Communications, Ltd.
Motorola Electronics & Communications Inc.,	NOKIA KOREA
People & Technology Inc	RADIO RESEARCH LABORATORY
Samsung Electronics Co., Ltd	Sejung Telecom Co.
Seoul Mobile Telecom	Shinsegi Telecom, Inc
SK Telecom	TELEMANN CO., LTD
Unicon Telecommunication Co., Ltd.	

TTC

ANRITSU CORPORATION	CANON, INC.
FUJITSU LIMITED	Hitachi, Ltd.
JAPAN TELECOM CO.,LTD.	Lucent Technologies Japan Ltd.
Matsushita Communication Industrial Co., Ltd.	MITSUBISHI ELECTRIC CORPORATION
NEC Corporation	Nippon Ericsson K.K.
Nippon Telecommunications Consulting Co., Ltd	Nippon Telegraph and Telephone Corporation (NTT)
NOKIA-Japan Co., Ltd	NTT Communication Ware Corporation
NTT Mobile Communications Network Inc. (DoCoMo)	NTT Software Corporation
OKI ELECTRIC IND., Co., LTD	Siemens K.K.

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