

Review of Patents Declared as Essential to WCDMA Through December, 2008¹

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1 Executive Summary

Fairfield Resources has for more than six years, with support from Nokia and other wireless industry leaders, been studying the extent to which patents declared as essential to wireless standards actually are essential, as determined by a team of experienced wireless engineers. To date four such studies have been completed, two of which are in the public domain:

- Patents declared to ETSI³ and ARIB⁴ as essential to WCDMA Release 4 and CDMA2000 through December 31, 2003⁵
- Patents declared to ETSI as essential to GSM⁶
- Patents declared to ETSI and ARIB as essential to WCDMA Release 6 through February 1, 2005
- Patents declared to the Korean TTA⁷ as essential to WCDMA through January 1, 2006

The present report extends through December, 2008 our reviews of patents declared as essential to one of the two third generation cellular technologies, WCDMA, Wideband Code Division Multiple Access, and also summarizes the judgment of our panel of expert engineers as to the essentiality of all patent families declared as essential to WCDMA in all our studies to date.

The primary report below covers patents and issued applications in 380 families issued or declared to ETSI or ARIB as essential to WCDMA Release 7 since our 2/1/2005 report, of which 150 (39%) were judged essential (E) or probably essential (E*). A total of 477 patents were reviewed in the present project including 97 additional family members that we found it necessary to review. These results are then combined with those of the three previous reports concerning WCDMA essential patents, resulting in a total of 1889 families studied of which 529 (28%) were judged essential.

¹ Robert A. Myers is responsible for the content of this report. David J. Goodman made a significant technical contribution.

² This study was funded by Nokia which, however, was contractually bound to exert no influence on its content.

³ ETSI: European Telecommunications Standards Institute

⁴ ARIB: Association of Radio Industries and Businesses

⁵ David J. Goodman and Robert A. Myers, *3G Cellular Standards and Patents*, IEEE Wireless2005 Proceedings, available at www.frlicense.com.

⁶ David J. Goodman and Robert A. Myers *Analysis of Patents Declared as Essential to GSM as of June 6, 2007*, (unpublished), available at www.frlicense.com

⁷ TTA: Telecommunications Technology Association

One important new element of this latest study concerns Chinese patents. Our earlier studies were restricted to patent families in which there was at least one issued US, EP or JP patent. The last five years, however, have seen an explosion in the number of issued Chinese patents which were declared to ETSI as essential to WCDMA. Therefore, in this study we have also reviewed patent families in which the only issued patent is a Chinese patent. Fortunately, two members of our review team are native speakers of Chinese, so we did not have to contend with translation problems.

The following table summarizes the results of the present study where E means “judged essential”, E* means judged “probably essential”, N* means judged “probably not essential” and N means judged “not essential”.

Table E-1 Summary of patent families evaluated

	Families Reviewed	Families Judged E/E*	Families Judged N/N*	Per Cent E/E*
European	138	57	81	41
United States	138	46	92	33
Japanese	6	3	3	50
Chinese	98	44	54	45
Total	380	150	230	39

The two most striking results are the large number of Chinese patents declared as essential and the 39% of all declared patents that our experts judged as essential, compared with 25% in our 2006 study and 28% overall.

As discussed in detail below, patents in the “network” category now dominate our study, as shown in the next two tables which present the top three technology categories. The percentages shown here refer to the total number of families reviewed. We refer to the present report in the following as the “2009 Study”, since the following analysis was carried out in 2009.

Table E-2: Technical categories declared essential

Technical category	Patents declared Essential to WCDMA in 2009 Study		Patents declared Essential to WCDMA in 2006 Study		Total Patents Declared Essential including Korean TTA Study	
	number	percent	number	percent	number	percent
network	115	31.1	107	7.6	223	12
layer 2	60	16.2	96	6.8	184	9.8
radio resources	55	14.6	236	16.7	305	16.2

Table E-3: Technical categories judged essential
 [percentages here refer to per cent of the number of patents judged essential]

Technical category	Patents Judged Essential to WCDMA in 2009 Study		Patents Judged Essential to WCDMA in 2006 Study		Total Patents Judged Essential including Korean TTA Study	
	number	percent	number	percent	number	percent
network	54	37	35	9.8	89	16.9
layer 2	29	20	43	12	82	15.6
radio resources	20	13	49	13.7	70	13.3

Although Ericsson, Nokia and Qualcomm continue to lead in the total number both of patents declared essential and patents judged essential, Huawei was the clear leader in both categories in the current study. Samsung, as a result of its many declarations to the TTA, not among the leaders in the present study, owns almost as many declared essential patents as Huawei, although our experts judged fewer Samsung patents essential.

Table E-4. Ownership of Declared IP

	2009 Study			2006 Study			Summary of All Studies incl. Korean TTA		
	Total	E/E*	N/N*	Total	E/E*	N/N*	Total	E/E*	N/N*
Huawei	111	51	60	-	-	-	111	51	60
Nokia	72	35	32	198	103	95	270	138	127
Ericsson	48	16	32	254	83	171	302	99	203
Qualcomm	35	9	27	457	44	413	493	53	440

Content of this report. Section 2 reviews the inherent conflict between standards and patents. Section 3 describes the evolution of cellular technology and the roles of two international Partnership Projects in standardizing third generation systems. Section 4 explains our definition of “essential” and where we find declarations of essentiality. Section 5 offers a concise review of WCDMA standards. Section 6 explains that after removing duplicate declarations (e.g., to two or more standards) and leaving only US, EP, JP and CN issued patents, the issued patents we have reviewed are clustered in 1872 “families”. All the patents in a family cover substantially the same invention. Section 6 describes the process we have consistently followed to identify patents our experts judge to be essential. Section 7 presents a detailed discussion of the details of the concept of “patent family”. In Section 8, we report the results of the current technical assessment of each patent family in order to estimate the number of inventions that are actually essential to WCDMA, presenting the data regarding patents declared as essential and patents judged as essential both by patentee and by technology category. These results are compared with the results for our earlier comprehensive review of patents declared as essential to WCDMA Release 6 and also with the sum of all our experts’ opinions. Section 9 summarizes the results of our study of patents declared to the Korean TTA (Telecommunications Technology Association) as essential. In section 10 we discuss the significance and limitations of our results. Appendix A defines our technology categories.

In the interests of comprehensiveness, we have extracted considerable relevant material from our earlier reports for this summary report.

As further discussed below, any such analysis is intrinsically “preliminary”, to the extent that other experts may disagree with ours. Further, intellectual property experts widely recognize that no patent opinion is final until and unless it has been litigated to a decision.

2 Standards and Patents

Information technology professionals are educated to seek the best technical solution to the tasks they address. However, the success or failure of these efforts, as indicated by the adoption of their contributions, depends on many factors besides the technical quality of the work. Two of these factors are technical standards and intellectual property rights (IPR) to technology that complements or competes with the proposed solutions. Standards can accelerate technology proliferation; they can also be barriers to innovation⁸. Governments issue patents to reward innovation and stimulate technology creation. However, distortions in the patent system can stifle creativity and block deployment of the best technology⁹. The problem is especially acute when “... a user needs access to multiple patented inputs to create a single useful product.” In these circumstances the patent system can retard, rather than encourage, innovation¹⁰.

An article in *IEEE Spectrum* documents the tug of war between patent ownership and formulation of information technology standards¹¹. Open (as opposed to proprietary) standards promote positive externalities and encourage widespread technology deployment. On the other hand, patents, by their nature as exclusionary monopolies, restrict technology deployment in order to encourage technology creation. Organizations that formulate open standards would like to exclude patented technology from the standards. If that is not possible, as is often the case, they prefer that patent owners grant free licenses to implement their patents in products that conform to the standards. In practice, however, information technology standards organizations are populated by representatives of companies that aim to profit from ownership of their IPR.

From the point of view of the public interest, standards organizations have to compromise between the goal of unimpeded access to the standard and the possibility that “excluding a patented invention from a standard can unreasonably restrain trade by ... excluding a technically advanced product from the market”¹². To reconcile the contradiction between open standards and patent ownership, standards organizations encourage members to disclose “essential” patents and to agree to license the patents to all interested parties on “fair, reasonable, and non-discriminatory” terms. The difficulties inherent in applying

⁸ P. Passal, Why the best doesn't always win, *New York Times Magazine*, May 5, 1996, pp 20 - 21.

⁹ A. B. Jaffe and J. Lerner, Patent Prescription, A Radical Cure for the Ailing U.S. Patent System, *IEEE Spectrum*, Vol. 41, No. 12, December 2004, pp 38-43.

¹⁰ M.A. Heller and R. S. Eisenberg, Can Patents Deter Innovation? The Anticommons in Biomedical Research, *Science*, Vol 280, May 1, 1998, pp 698-701.

¹¹ S. J. Frank, Can you patent an industry standard?, *IEEE Spectrum*, Vol. 39, No. 3, March 2002, pp. 14 – 15

¹² A. A. Marasco, “ANSI Reporter”, Autumn/Winter 2003.

this criterion in the real world are well summarized in a paper by a senior Nokia executive.¹³

3 Evolution of cellular technology and standards

Cellular telecommunications dates from the 1970s, when the first experimental systems demonstrated the technical feasibility of a radically new approach to telephony. The first commercial systems appeared in the early 1980s and since then technical progress has been measured in “generations”. First generation technology relied on analog frequency modulation to transmit voice signals. Second generation systems, introduced in the 1990s, transmit speech in digital format. To promote network security and enable international roaming, they employ standardized signaling protocols for communication among elements of the infrastructure of base stations, mobile switching centers and databases. There are two broad categories of second generation systems, distinguished by their approaches to multiplexing and multiple access of radio signals. Some systems employ time division (TDMA) and others employ code division (CDMA). There are two standards for signaling in the core network: the mobile applications part of the Global System for Mobile Communications (GSM) and Interim Standard 41, published by the Telecommunications Industry Association. In 2008 the ITU estimated that there would be 4 billion cellular subscribers worldwide, with more than 600 million in China by the end of that year. Almost 400 million are estimated to use WCDMA.

In recent years, GSM network operators have introduced two major upgrades to the original radio transmission technology. GPRS is a packet data overlay to the original circuit-switched technology of GSM. EDGE introduces 8-level phase shift keying modulation alongside Gaussian minimum shift keying, the original binary modulation technique of GSM. Both EDGE and GPRS are often referred to as “2.5G” technologies.

In 2005, many network operators began migrating to third generation (3G) technologies, with standardization guided by two “Third Generation Partnership Projects”, 3GPP¹⁴, and 3GPP2¹⁵. The original Partnership Project, 3GPP, is concerned with descendants of GSM. The technology standardized by 3GPP is often referred to as WCDMA (wideband code division multiple access). The other Project, 3GPP2, is concerned with advanced versions of the original CDMA cellular system. The technology standardized by 3GPP2 is often referred to as CDMA2000.

The Partnership Project members are regional and national standards organizations and “individual members,” companies affiliated with one or more of the constituent standards organizations. Table 1 lists the standards organizations - based in Europe, the United States, Japan, China, and Korea – in the two Partnership Projects. There are currently 369 individual members of 3GPP.

¹³ Timo Ruikka, “FRAND” Undertakings in Standardization — A Business Perspective, Les Nouvelles, September, 2008.

¹⁴ www.3gpp.org

¹⁵ www.3gpp2.org

Table 1: Organizational Members of the Partnership Projects

Organizational Member	Nationality	Affiliation
Association of Radio Industries and Businesses	Japan	3GPP and 3GPP2
Alliance for Telecommunication Industry Solutions	United States	3GPP
China Communications Standards Association	China	3GPP and 3GPP2
European Telecommunication Standards Institute	Europe	3GPP
Telecommunications Industry Association	North America	3GPP2
Telecommunications Technology Association	Korea	3GPP and 3GPP2
The Telecommunication Technology Committee	Japan	3GPP and 3GPP2

Third generation cellular standards. Among the many types of standards, the ones that specify the details of telecommunications equipment are in the category of “compatibility specifications”¹⁶. Their purpose is to insure that different types of conforming equipment (for example cellular telephones and base stations) will operate correctly when they interact. The technologies covered by 3G cellular standards reside in three domains: core network, radio access network, and operations¹⁷. At the beginning of 2009, the current 3GPP specifications were components of Releases 7 and 8. These categories are only partly reflected in the organization of the two standardization projects: 3GPP and 3GPP2. Both projects have assigned the formulation of specifications to Technical Specification Groups (TSG). However, the definitions of the TSGs are different in the two projects. The TSGs in 3GPP are concerned with (a) core network, (b) radio access network, (c) terminals, and (d) service and systems aspects¹⁸. In 3GPP2, the TSGs are (a) access network interfaces, (b) CDMA2000, (c) services and systems aspects, and (d) intersystem.

¹⁶ D. J. Goodman, *Standards for Personal Communications in Europe and the United States*, Program on Information Policy Research, Harvard University, 1998. http://pirp.harvard.edu/pubs_pdf/goodman/goodman-p98-1.pdf

¹⁷ http://www.3gpp2.org/Public_html/Misc/CommitteesHome.cfm

¹⁸ <http://www.3gpp.org/TB/home.htm>

4 Essential Patents

The Partnership Projects and their constituent standards organizations encourage individual members to “declare” patents and patent applications that they believe are “essential” to implementing third generation cellular standards. The official definition of essential is formulated in negative terminology:

"ESSENTIAL" as applied to IPR means that it is not possible on technical (but not commercial) grounds, taking into account normal technical practice and the state of the art generally available at the time of standardization, to make, sell, lease, otherwise dispose of, repair, use or operate EQUIPMENT or METHODS which comply with a STANDARD without infringing that IPR¹⁹.

Lists of patents declared essential to WCDMA appear at the web site of the European Telecommunications Standards Institute (ETSI)²⁰. Lists of patents declared essential to CDMA2000 and WCDMA appear at the web sites of the Association of Radio Industries and Businesses (ARIB)²¹, The Telecommunication Technology Committee (TTC)²², and the Telecommunications Technology Association (TTA).²³ ARIB and TTC are Japanese standards organizations, while the TTA is a Korean organization. All of these sites are accessible in English. As of November, 2008, we have identified more than 10,000 patents and then-pending applications declared as essential to WCDMA

The most recent release of the WCDMA standards is Release 7.0, and our expert team has analyzed all patents issued since January 1, 2006 for essentiality to this standard. For budgetary reasons, we did not re-review any of the patents previously reviewed against Release 6, but our professional judgment is that there would be a very small number of changes in our experts' opinions.

With the widespread deployment of 3G wireless systems, the engineering community has turned its attention to fourth generation technology. Currently there are two leading contenders. One, based on the use of orthogonal frequency division in the radio access network, is known as LTE, for long term extension. The core network aspects of the related 4G systems are known as SAE, system architecture extension. A competing “4G” technology, already being deployed in some areas, is known as Wi-Max. The standards for LTE are being developed as Release 8.0 of the WCDMA standards.

Third generation cellular standards. Among the many types of standards, the ones that specify the details of telecommunications equipment are in the category of “compatibility specifications”²⁴. Their purpose is to insure that different types of conforming equipment

¹⁹ “ETSI IPR Policy”, Nov. 22, 2000. http://www.etsi.org/legal/documents/ETSI_IPRPolicy.pdf

²⁰ www.etsi.org

²¹ www.arib.or.jp

²² www.ttc.or.jp

²³ www.tta.or.kr

²⁴ D. J. Goodman, *Standards for Personal Communications in Europe and the United States*, Program on Information Policy Research, Harvard University, 1998. http://pirp.harvard.edu/pubs_pdf/goodman/goodman-p98-1.pdf

(for example cellular telephones and base stations) will operate correctly when they interact. The technologies covered by 3G cellular standards reside in three domains: core network, radio access network, and operations²⁵. At the beginning of 2009, the current 3GPP specifications were components of Releases 7 and 8. These categories are only partly reflected in the organization of the two standardization projects: 3GPP and 3GPP2. Both projects have assigned the formulation of specifications to Technical Specification Groups (TSG). However, the definitions of the TSGs are different in the two projects. The TSGs in 3GPP are concerned with (a) core network, (b) radio access network, (c) terminals, and (d) service and systems aspects²⁶. In 3GPP2, the TSGs are (a) access network interfaces, (b) CDMA2000, (c) services and systems aspects, and (d) intersystem.

5 Declared patents

Our sources for patents and patent applications declared essential to WCDMA technology are the web sites of four standards organizations. ETSI lists declarations of patents declared essential to 3GPP, as well as declarations of patents declared essential to other technologies standardized by ETSI²⁷ including GSM. The web sites of the Japanese standards organizations ARIB²⁸ and TTC²⁹ contain information about patents and patent applications declared essential to both third generation technologies as does the web site for the Korean Telecommunications Technology Association (TTA)³⁰. The ARIB notation for 3GPP standards is T63. The TTC notation is 3GA. For 3GPP2, the respective notations are T64 (ARIB) and 3GB (TTC). Finally, the TTA web site lists patents declared as essential to WCDMA. In the United States, the web site of the Telecommunications Industry Association contains statements by companies that have agreed to license essential patents on a non-discriminatory basis³¹, but it does not contain lists of individual patents and patent applications.

The patent families in this 2009 Fairfield study were declared essential to a variety of communications systems standardized by 3GPP. More than 75% of the patents were declared essential to UMTS, the third generation European cellular system based on WCDMA voice transmission. Another 10% of the patents were declared essential only to “3GPP”, without naming a specific system. Other patents were declared essential to second generation technologies, GSM, GPRS, GERAN, and to “fourth generation” LTE³².

Our study of WCDMA intellectual property is based on the ETSI, ARIB and TTA lists containing over 15,000 patents and applications declared as essential to WCDMA and related standards as of December 31, 2008. We have now analyzed the patents and patent

²⁵ http://www.3gpp2.org/Public_html/Misc/CommitteesHome.cfm

²⁶ <http://www.3gpp.org/TB/home.htm>

²⁷ www.etsi.org

²⁸ www.arib.or.jp

²⁹ www.ttc.or.jp

³⁰ www.tta.or.kr

³¹ <http://www.tiaonline.org/>

³² We hope to address the fourth generation patents in a future study.

applications declared essential to WCDMA in order to cluster patents and applications into distinct “patent families”. The members of a family are patents obtained in different countries for a single invention. We determined that for WCDMA, there now 1889 patent families with US, EP, JP or CN patents issued prior to January 1, 2009.

It is important to remember that we examined only patents explicitly declared as essential to 3GPP standards. Many companies, as a matter of policy, do not participate in setting standards nor do they declare any of their patents to be essential and thus agree to license them for a reasonable and non-discriminatory royalty. It is also important to note that the backward compatibility aspects of 3G standards means that patents declared as essential to an earlier standard such as GSM, TDMA or EDGE may also be essential to 3GPP.

After clustering the patents into families, we chose one patent from each family for further analysis. To select a patent declared essential to WCDMA, we first looked for a patent issued by the European Patent Office. If there was no European patent in the family, we selected a United States patent if one was present. Our next choice was a Japanese patent and the final choice was a Chinese patent. We reviewed only three families with no European, United States, Japanese or Chinese patent. For those inventions, we analyzed a German patent, a British patent, and a Swedish patent.

6 Process Followed in the Fairfield Study

The lists of declared patents and patent applications compiled by ETSI, ARIB, TTC and TTA in aggregate contain on the order of 20,000 distinct entries. Each patent or application is published by either a national patent issuing office or the European Patent Office. However, the number of inventions is considerably less than 20,000 mainly because it is customary for inventors to patent a single invention in many different countries.

A major task in our study was to analyze the ETSI, ARIB, TTC and TTA databases in order to select patents to evaluate. In our current study, we limited this analysis to patents declared to ETSI, as we have found that nearly all of the patents declared to the other organizations have also been declared to ETSI. The impact of any families we missed on our results we judge to be *de minimus*. Many of the patents declared as essential to one of the 3G systems are declared to two or even all three standards bodies, so it was first necessary to remove duplicates. Among the unique patents and patent applications, the first selection criterion was to evaluate only issued patents. To do so, it was necessary to examine each declared application to determine whether the application eventually resulted in an issued patent. The study evaluated patents issued and declared as essential to the extent this information is available³³ on or before November 1, 2008. We have also deleted from our final results any patents which expired during the course of our study as well as any patents judged essential by our experts which had been revoked or had otherwise lapsed.

³³ ARIB does not make the date of declaration available.

To make the steps involved clearer, we provide the following high level picture of the process flow Fairfield followed in this study.

1. Establish Criteria and Priority for Patents to Review
 - EP/US/JP/CN/Other major economy
 - Active
 - Issued before 11-1-2008
 - Most recently filed family member

2. Find Declared Patents and Standards on Standards Organization Sites (All have English language links)
 - <http://www.etsi.org/WebSite/homepage.aspx> [European Technical Standards Institute]
 - <http://www.arib.or.jp/> [Association of Radio Industries and Businesses]
 - <http://www.ttc.or.jp/> [Telecommunications Technology Committee]
 - <http://www.3gpp.org> [3GPP Partnership Project]
 - <http://www.tta.or.kr> [Telecommunications Technology Association]

3. Search On-Line Patent Sites for Family Data
 - www.delphion.com
 - www.espacenet.com
 - www.uspto.gov/pair
 - http://218.240.13.210/sipo_EN/search/tabSearch.do?method=init

4. Find All Issued Declared Patent Applications Meeting Criteria

5. Identify and select for initial review most recently filed family member

6. Remove Chaff
 - Duplicates
 - Expired or abandoned patents
 - Other family members
 - Other economies

7. Obtain Translations of JP Patents

8. Assign Patents to Appropriate Technology Category
 - One category per patent

9. Review List for Obviously Non-essential Patents
 - Categorize them as “not essential”

10. Distribute Remaining Patents to Experts for Review³⁴

11. Edit Reviews for Consistency.³⁵

- Determine expiration date of essential patents

For initially reviewed *non-essential* patents

12. Find and Review All Issued EP and US Family Members in that order for Essentiality, halting if/when a family member has been judged as essential³⁶.

- Continuations
- Divisionals
- Other patents listed on cover page, i.e. “related patents”

13. Analyze Results and Prepare Report

7 Patent Families

Although widely used, the term “patent family” is not an accepted “term of the [patent] art” and is thus subject to misinterpretation due to different parties using it differently. Since an understanding of the concept is basic to our process, we provide the following overview of the topic, with links to related web sites.

There are four patent databases for identifying patent families, and each deals with these families differently.

- [World Patent Index \(WPI\)](#) - Derwent Information Ltd.
- [INPADOC](#) - EPIDOS, The European Patent Office
- [EDOC](#) - INPI, The French Patent & Trademark Office
- [CAS](#) - Chemical Abstracts Service

None of these databases provide a complete patent family. Since there are over 170 countries which grant patent protection and INPADOC, which covers the most countries, only covers 60 countries, these databases do not provide a comprehensive survey of patent protection. Also, these databases do not necessarily provide complete coverage for the countries they do cover.”[<http://www.piug.org/patfam.php>].”

In our study, the operational definition we used is either the field “patent family” accessed on the www.delphion.com web site or the INPADOC family data provided by www.espacenet.com. Both Delphion and Espacenet obtain this data from INPADOC [International Patent Documentation Center], maintained by the European Patent Office. Since our study was limited to major economies, the US, the EP, and Japan in particular,

³⁴ See below for a description of our experts’ qualifications.

³⁵ Apart from polishing grammar and spelling, assuring that the rationale language is consistent with the reviewer’s assessment and removing irrelevant comments.

³⁶ In our 2006 study we reviewed all family members if the patent initially reviewed was judged not essential.

the differences between the patent family data in the four databases was not judged to be material.

There are essentially four different kinds of members of a patent family.

Counterpart patents and applications. Since a patent is only enforceable in the jurisdiction in which it has been issued, inventors often file for patents in multiple countries. This is particularly common in fields like telecommunications where the invention may be practiced globally. In order to obtain coverage in a country, the initial patent application, including the claims, must be translated into the local language and the application must be examined and approved by the national patent office. Even though all counterpart patents (“family members”) are based on the same invention and the specifications differ only in translation nuances, negotiation with examiners and the process of translation may lead to significant differences between the different foreign counterparts. In our study, since both United States patents and claims for European patents are written in English, there is no translation issue³⁷. We do not believe there is a significant risk from differences in claim language resulting from the examination process. Since we reviewed Japanese patents in those cases where there was no US or EP counterpart, there remains the possibility inherent in all translations that the professional Japanese-English translations of the claims we secured might have been misunderstood by our reviewers. Since our reviewers reviewed all 118 JP patents without any reported objection, we believe that this did not have a significant effect on our overall results³⁸.

Continuations and continuations-in-part. “A *continuation* is a second application for the same invention claimed in a prior nonprovisional application and filed before the original prior application becomes abandoned or patented. The disclosure presented in the continuation must be the same as that of the original application; i.e., the continuation should not include anything which would constitute new matter if inserted in the original application. A *continuation-in-part* is an application filed during the lifetime of an earlier nonprovisional application, repeating some substantial portion or all of the earlier nonprovisional application and *adding matter not disclosed* in the said earlier nonprovisional application”³⁹. Continuations and continuations-in-part are not permitted by the EPO or the JPO. United States inventors have the ability to “continue” a patent application by filing a new patent application which claims priority from the initial filing date but which has new claims which must, however, be based on the original specification which is ordinarily not changed [possibly except for typographical corrections]. The continuation application’s claims must be examined and approved as would an original patent application. A continuation may itself be continued. Inventors may file for a continuation to in effect obtain a further examination, (e.g., when they are unable to persuade the examiner regarding their position) or to adapt the initial claims to cover new products, services, or technologies. A continuation-in-part may also provide a mechanism for extending the life of a patent.

³⁷ Claims are normally provided in English, French and German, although the specification (and drawings) may be only in the original language.

³⁸ The percentage of 118 JP patents judged essential, 18%, was close enough to the rate for all other patents to further suggest that our reviewers were not unduly troubled by the translations.

³⁹ US Manual of Patent Examination Procedure

Divisional patents. “A later application for an independent or distinct invention, carved out of a pending application and disclosing and claiming only subject matter disclosed in the earlier or parent application, is known as a divisional application or “division.” A divisional application is often filed as a result of a restriction requirement made by the examiner.”⁴⁰ A common reason for such restrictions is the case in which the initial patent application is judged by the examiner to cover more than a single discrete invention. As in the case of continuations, the specification [“disclosure”] for all of the divisional patents is usually unchanged. Since divisional patent applications need not be contemporaneous with the original application, such applications offer another means to “tune” a patent’s claims to changing circumstances. Divisional patents are permitted by the EPO, and provide a kind of alternative to continuations where this is allowed by the patent office. Divisional applications are also available in Japan, for example, “when (a) the claims are rejected due to lack of unity of invention, (b) a part of the claims is rejected, (c) a desired amendment cannot be made due to restriction on amendment or (d) a pending application (insurance) is needed.”⁴¹

Related patents. “Related patent applications are those filed after an initial original application is filed but before it is issued as a patent and that involve similar or related technologies. For example, an inventor may come up with an improvement to technology disclosed in an earlier filed application. Instead of filing a new patent application for the improvement, the patent laws allow the inventor to supplement the earlier application by filing a continuation-in-part (CIP). A CIP is just one of the several types of related applications.”⁴²

The four different sources of patent family information do not follow a single procedure for linking family members. One linkage would be all patents claiming the same priority date. Another would be a series of patents with the same title and inventors but different priority dates. Yet another would be patents with the same title but different inventorship, as might be the case in a divisional patent. Different primary sources (INPADOC, EDOC) might not agree on all the “related” members of a family. In INPADOC, priority numbers and application numbers are used for establishing family links. The United States Patent and Trademark Office does not appear to have a hard and fast rule about what constitutes a “related patent” and a patent applicant may state in his application that it is related to other pending or issued patents. As a practical matter, we do not believe that choosing a different “related” member of a family from the one we chose to review would have a significant effect on our findings. See also, the discussion above regarding continuations and continuations-in-part that we reviewed.

Our motivation for seeking out the most recently filed member of a series of continuations is the recognition that a continuation application provides the inventor(s) an

⁴⁰ US Manual of Patent Examination Procedure

⁴¹ <http://www.taniabe.co.jp/e/infomation/main-patent023.html>

⁴² David Radack, *Understanding “Related” US Patent Applications* <http://www.tms.org/pubs/journals/JOM/matters/matters-0406.html>

opportunity to “tune” the claims to the latest version of a standard. However, in response to questions about the validity of this premise, we asked our reviewers to review *every* forward and backward continuation and division of and related patents declared as essential to WCDMA which were initially judged “not essential”. Out of 147 such families, eleven additional families were judged as essential.

Caveat. Since we eventually examine every patent in a family, our process provides assurance that if any family member is essential we will review it. A contributor to possible errors arises from the fact that in the definition of family member followed by INPADOC the first consideration is priority date, followed by IPC code and assignee. Since many major patentees batch their patent applications, this can result in the appearance on the Delphion⁴³ or Espacenet⁴⁴ web sites of spurious family members. More troubling is the appearance of ostensible family members which are assigned to different entities. We have removed all such errors we found, but the “family member” field in our data is still subject to possible undiscovered anomalies. The most confusing aspect of our use of “patent family” data occurs with certain families – fortunately very infrequently – in which the different members are apparently technologically unrelated except that they arise from a common priority application which has been continued and divided for years. Our review process is almost guaranteed to find an essential patent in such a family, but other “family” members covering different inventions may not be found. Since there have been only a handful of such patents, we believe they have a negligible effect on the validity of our results. There was one family with 32 members in the 2009 study. No other family had more than 11 members.

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⁴³ www.delphion.com

⁴⁴ www.espacenet.com