Apple, Samsung and the battle for patent supremacy

Apple and Samsung have been slugging it out in court in various parts of the world for several years now. An analysis of the two companies' patent portfolios suggests that one has a very strong advantage over the other

By **Mike Pellegrino**

The media hysteria surrounding the rivalry between Apple and Samsung, and their respective patent warring, has been remarkable. What is less remarkable is the depth of the analysis associated with the facts surrounding the relative positions of each company. To quote Sun Tzu: "All warfare is based on deception." The same holds true in many instances of the protracted litigation between Apple and Samsung.

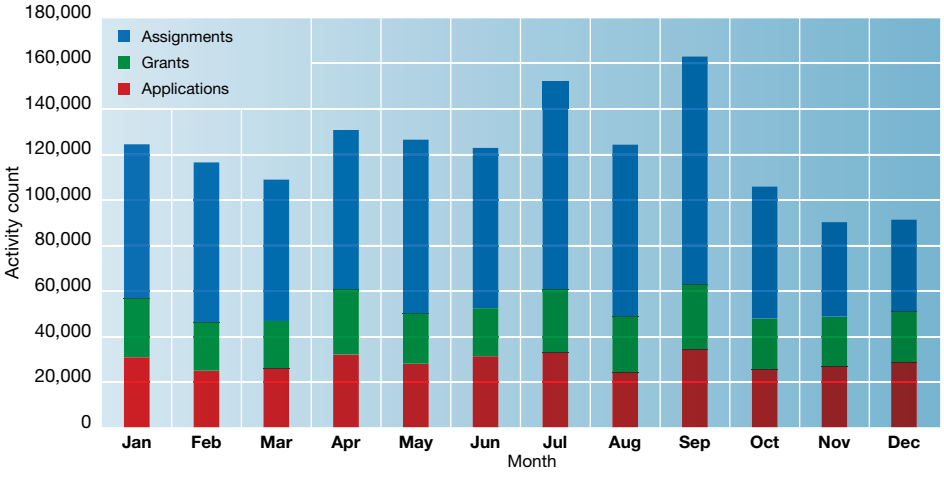
A variety of published articles portray Apple's patent portfolio as very strong. For example, *IEEE Spectrum* ran an article in 2011 claiming that "Apple Has the Most Powerful Patent Portfolio in Consumer Electronics" (Patrick Thomas and Anthony Breitzman, *IEEE Spectrum*, November 2011). While such a claim is rather broad for an industry that comprises a variety of products beyond mobile telephones and portable electronic devices, is there any truth to it or is it merely unsubstantiated rhetoric? Granted, Apple generates significant revenues and profits with its market offerings. However, does this strength relate to Apple's core patent portfolio or to other types of IP, such as its trademark or copyright portfolios? This article puts the claims of Apple's patent portfolio power through several tests, especially in the context of the ongoing litigation with Samsung. The ultimate goal is to evaluate whether the empirically observed macro patent-related actions of Apple and Samsung differ from what is published in the media, as well as the voluminous filings regarding the Apple and Samsung litigation.

The patent data conundrum

To set the context for the analysis presented in this article, it is important to understand the current state of the patent market and the data associated with patents. The availability and quality of patent data are both enablers and limiters for a truly liquid patent marketplace. Companies are generating huge amounts of intellectual property and the rate has increased dramatically over the last few decades. Between 2009 and 2010, the US Patent and Trademark Office (USPTO) generated patents at a rate greater than three times that of the late 1970s. The sheer volume of patents issued annually compounds the difficulties that companies experience in managing their patent portfolios effectively. For example, consider the chart opposite which captures patent grant, application and assignment activities by month for 2012.

As the data suggests, a remarkable number of events occur in any given month: on average, some 24,000 patents grant; some 29,000 patent applications publish; and nearly 70,000 assignments are recorded. The sheer volume of data creates challenges for patent owners and market participants. While there is much focus on patent grants, patent assignments are the most dynamic and can provide the greatest insights into market activity and intention (such insights are the main reason why non-practising entities go to such lengths to hide their ownership of patents). In the case of Samsung and Apple, the

Figure 1. **US patent activity by month**



volume of data makes it difficult to decode what is occurring within each company's patent portfolio easily; decoding Samsung's portfolio is even more challenging because of the company's size and the disparity of its reporting entities. Analysis presented in this article uses data-mining tools developed by the author to help decode both the actions occurring between these two companies and the motivations behind them.

Data sources

This article relies exclusively on data derived from US Patent and Trademark Office (USPTO) sources — specifically, its patent grant database, patent application database and assignment database — as well as the European Telecommunications Standards Institute's (ETSI) disclosure database. There are certain limitations within these sources. First, there are errors in the data that the USPTO and ETSI receive from patent prosecutors and patent owners. Some are benign (eg, a misspelled name), but some are more serious, where a patent grant date actually precedes the application and publication dates. Second, each source stores data differently, so mapping must be carried out to correlate the data from the various sources (eg, until 2007, Apple recorded all of its patents under the name "Apple Computer Inc" instead of "Apple Inc"). While such anomalies increase the noise in the analysis presented in this article, they do not materially alter the conclusions.

Analysis methodology

Objective comparative analysis of patent portfolios is a complex and labour-intensive process. This article presents a variety of data analyses. In most cases, the metrics of interest are raw counts of patents prosecuted and awarded to the original assignee at the time of grant. However, some critics eschew patent counts as a comparative metric, asserting that the only true way to understand a portfolio's relative strength is to get in and read each and every patent. This is valid to a certain degree. Not all patents have the same depth or breadth of invention disclosures, and not all have the same significance to the market.

Despite such criticisms, people who make buying and selling decisions do not have the time or budget to perform such in-depth activities. For example, did Google's M&A team read all of Motorola's nearly 24,500 patent grants and pending applications before buying them? At one hour per patent (which may be a low estimate), it would take more than 12 person years to complete that effort. To put that into perspective, Capital IQ data indicates that the average number of days needed to complete a transaction when the value is greater than US$1 billion ranges from between 114 and 150. Thus, if Google spent 114 days on the Motorola acquisition, there may have been about 82 days available for patent reading (excluding weekends, project management overhead, summarising results). If a patent review employee worked eight hours per day, then Google would have needed a dedicated team of 38 people working constantly just to read those patents.

One need only look at the size of the USPTO to put the magnitude of this effort into perspective. According to the USPTO Performance and Accountability Report for the fiscal year ended 2012, last year the office had a payroll of nearly US$1.6 billion and employed 7,935 patent examiners addressing some 565,566 applications (going by these figures, a typical examiner reviews about 71 patents a year). Unfortunately, few companies have the time or money for this — there is just too much data to process. More than 325 new patent grants and applications emerge in any given week in US patent Class 370 alone. If it took an hour to read and evaluate each patent, one would need a team of nine people just to keep up with this weekly flow. Broadening a review to other classes related to mobile phones (eg, 375, 455, 345, D14), a company would need to employ scores of readers to read and interpret claims each week — and this is just for new art that publishes. It would not include the tens of thousands of patents that already exist in those areas. Even companies with large financial reserves, such as Apple or Samsung, have finite resource pools to dedicate to such efforts. Agile companies must reduce the labour effort in order to perform relevant, possibly significant

Table 1. **Key prosecution activity in patent Class 370 between 1st January 2000 and 31st December 2012***

Rank	Company name	Developed patents	% of total
1	Cisco Technology Inc	3,087	5.65%
2	Samsung Electronics Co Ltd	1,546	2.83%
3	Fujitsu Limited	1,466	2.68%
4	International Business Machines Corporation	1,436	2.63%
5	Nortel Networks Limited	1,295	2.37%
6	Intel Corporation	1,185	2.17%
7	QUALCOMM Inc	1,176	2.15%
8	Broadcom Corporation	1,116	2.04%
9	Nokia Corporation	1,080	1.98%
10	NEC Corporation	1,055	1.93%
11	LG Electronics Inc	898	1.64%
12	Telefonaktiebolaget LM Ericsson (publ)	871	1.59%
13	Lucent Technologies Inc	856	1.57%
14	Motorola Inc	731	1.34%
15	Juniper Networks Inc	675	1.24%
16	Alcatel Lucent	628	1.15%
17	Hitachi Ltd	625	1.14%
18	Sony Corporation	624	1.14%
19	Electronics and Telecommunications Research Institute	522	0.96%
20	Huawei Technologies Co Ltd	521	0.95%

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analysis. Measures such as patent counts help to focus areas for further study. An example of such an analysis occurs later in this article.

Next, if one focuses a patent count analysis on active patents only (ie, those maintained to their natural statutory expiration), then patent quality cricitisms fall off quickly as rights holders will typically maintain only patents with ongoing economic value to them. While there are always anomalies and exceptions to this rule, rights holders will deliberately cull unworthy patents from the marketplace, abandoning them at maintenance-fee events. The comparative analysis reports in this article focus on maintained patents, not patents that have expired due to abandonment or because of statutory boundaries.

Leaders in communication technologies

Identifying the relative positions of the portfolios for Apple and Samsung analysis begins with a review of the classes with many patents that might be relevant to mobile phones. The top US patent classes that contain art associated with mobile phones include Classes 370, 375 and 455. There is also much activity in Classes D14 and 345; however, many of the patents in these classes are not essential to operating mobile phones. Thus, in the interests of brevity, the focus here is primarily on communications-related patents.

Table 1 shows an analysis of key prosecution activity by 20 companies in Class 370 between 1st January 2000 and 31st December 2012. The results indicate that Apple does not appear to be a material contributor of patents to Class 370. In our analysis, Apple ranked 93 in the list and received 0.14% of the total patent grants over the 13-year window.

Table 2 shows an analysis of key prosecution activity in patent Class 375 between 1st January 2000 and 31st December 2012. The results indicate that Apple does not appear to be a material contributor of patents to Class 375 either. In our analysis, Apple ranked 51 in the list and received 0.31% of the total patent grants over the 13-year window.

Table 3 shows an analysis of key prosecution activity in Class 455 between 1st January 2000 and 31st December 2012. The results indicate that Apple does not appear to be a material contributor of patents to Class 455 either. In our analysis, Apple ranked 51 in this list too and received 0.35% of the total patent grants over the 13-year window.

Table 4 shows a summary of the combined grants in these classes. It indicates that Apple generated 0.27% of the total patents combined across the three major classes. This data has a signature that raises a significant question. Does Apple, as one of the largest producers of mobile phones in the world, out-innovate other companies in

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Table 2. **Key prosecution activity in patent Class 375 between 1st January 2000 and 31st December 2012***

Rank	Company name	Developed patents	% of total
1	Samsung Electronics Co Ltd	1,058	3.72%
2	Broadcom Corporation	966	3.39%
3	Sony Corporation	881	3.10%
4	Intel Corporation	656	2.30%
5	Texas Instruments Inc	645	2.27%
6	QUALCOMM Inc	619	2.17%
7	Panasonic Corporation	580	2.04%
8	NEC Corporation	571	2.01%
9	LG Electronics Inc	530	1.86%
10	Fujitsu Limited	510	1.79%
11	Matsushita Electric Industrial Co Ltd	477	1.68%
12	Motorola Inc	407	1.43%
13	Kabushiki Kaisha Toshiba	406	1.43%
14	Nokia Corporation	402	1.41%
15	International Business Machines Corporation	362	1.27%
16	Koninklijke Philips Electronics NV	349	1.23%
17	Infineon Technologies AG	330	1.16%
18	InterDigital Technology Corporation	327	1.15%
19	Telefonaktiebolaget LM Ericsson (publ)	313	1.10%
20	Electronics and Telecommunications Research Institute	290	1.02%

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Table 3. **Key prosecution activity in patent Class 455 between 1st January 2000 and 31st December 2012***

Rank	Company name	Developed patents	% of total
1	Nokia Corporation	1,507	3.53%
2	Motorola Inc	1,285	3.01%
3	Samsung Electronics Co Ltd	1,277	2.99%
4	NEC Corporation	1,269	2.97%
5	Broadcom Corporation	1,115	2.61%
6	QUALCOMM Inc	1,047	2.45%
7	Research In Motion Limited	888	2.08%
8	LG Electronics Inc	810	1.90%
9	Telefonaktiebolaget LM Ericsson (publ)	800	1.88%
10	Lucent Technologies Inc	641	1.50%
11	Fujitsu Limited	638	1.50%
12	Sony Corporation	594	1.39%
13	NTT DoCoMo Inc	561	1.31%
14	Samsung Electronics Co Ltd	500	1.17%
15	Matsushita Electric Industrial Co Ltd	500	1.17%
16	Intel Corporation	499	1.17%
17	Ericsson Inc	478	1.12%
18	International Business Machines Corporation	401	0.94%
19	Kabushiki Kaisha Toshiba	401	0.94%
20	Nortel Networks Limited	370	0.87%

Table 4. **Summary of the combined grants in Classes 370, 375 and 455***

Rank	Assignee name	Class 370 grants	Class 375 grants	Class 455 grants	Total patent grants	% of total
1	Samsung Electronics Co Ltd	1,546	1,058	1,277	3,881	3.32%
2	Cisco Technology Inc	3,087	150	324	3,561	3.05%
3	Broadcom Corporation	1,116	966	1,115	3,197	2.73%
4	Nokia Corporation	1,080	402	1,507	2,989	2.56%
5	NEC Corporation	1,055	571	1,269	2,895	2.48%
6	QUALCOMM Inc	1,176	619	1,047	2,842	2.43%
7	Fujitsu Limited	1,466	510	638	2,614	2.24%
8	Motorola Inc	731	407	1,285	2,423	2.07%
9	Intel Corporation	1,185	656	499	2,340	2.00%
10	LG Electronics Inc	898	530	810	2,238	1.91%
11	International Business Machines Corporation	1,436	362	401	2,199	1.88%
12	Sony Corporation	624	881	594	2,099	1.80%
13	Telefonaktiebolaget LM Ericsson (publ)	871	313	800	1,984	1.70%
14	Nortel Networks Limited	1,295	168	370	1,833	1.57%
15	Lucent Technologies Inc	856	271	641	1,768	1.51%
16	Panasonic Corporation	468	580	346	1,394	1.19%
17	Matsushita Electric Industrial Co Ltd	305	477	500	1,282	1.10%
18	Research In Motion Limited	266	80	888	1,234	1.06%
19	Texas Instruments Inc	346	645	223	1,214	1.04%
20	Kabushiki Kaisha Toshiba	388	406	401	1,195	1.02%

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mobile communications-based technologies? If one looks at the ratio of communications patent grants (or applications) where Apple is the original assignee, the answer is a resounding 'No'. In fact, Apple is a market follower with regard to wireless communications (although it has produced significantly more patents within the last few years in these classes).

Moreover, an analysis of the composition of Apple's patent portfolio reinforces this conclusion. Table 5 captures the composition of Apple's patent portfolio between 1st January 2000 and 31st December 2012 where "Apple Inc" is the original assignee. As this data suggests, the top class for Apple is D14, which contains design patents and was where the key patents that were the subject of Apple's first round of litigation with Samsung were found. There are wireless communications technologies in Apple's core prosecution activities (and its prosecution growth in these areas has exceeded other art areas in recent years). However, the greatest emphasis in Apple's portfolio emerges from design patents from about a dozen key people in Apple's industrial design group. This data demonstrates that Apple is brilliant at industrial design, form and integration (and branding and marketing — but such value contribution is not relevant in this analysis). However, the basic science behind advanced features and functions that integrate into an iPhone emerge from other companies.

Samsung portfolio composition

Our analysis turns next to Samsung. The raw counts of maintained patents suggest that Samsung has one of the biggest portfolios in the world with respect to size. The company's greatest development areas include semiconductors, communications and display technologies, as Table 6 demonstrates.

The composition of Samsung's portfolio is quite different from Apple's. Samsung's patent portfolio composition instructs the observer that much more basic research — considered fundamental to today's smartphone operation — occurs in the company's facilities as opposed to Apple's. Empirical market evidence supports this observation. Analysts estimate that Apple purchased upwards of US$8 billion in parts from Samsung for its products in 2012 (Poornima Gupta, Miyoung Kim and

Table 5. **Composition of Apple's patent portfolio between 1st January 2000 and 31st December 2012 where "Apple Inc" is the original assignee***

Rank	Class	Grant count	Published application count
1	D14 – Recording, communication, or information retrieval equipment	522	0
2	345 – Computer graphics processing and selective visual display systems	358	426
3	715 – Data processing: presentation processing of document, operator interface processing, and screen saver display processing	304	336
4	707 – Data processing: database and file management or data structures	168	126
5	455 – Telecommunications	151	168
6	709 – Electrical computers and digital processing systems: multicomputer data transferring	137	102
7	710 – Electrical computers and digital data processing systems: input/output	135	76
8	361 – Electricity: electrical systems and devices	134	151
9	713 – Electrical computers and digital processing systems: support	130	128
10	375 – Pulse or digital communications	89	68
11	382 – Image analysis	83	64
12	439 – Electrical connectors	82	92
13	370 – Multiplex communications	75	37
14	711 – Electrical computers and digital processing systems: memory	72	69
15	343 – Communications: radio wave antennas	60	7
16	348 – Television	53	137
17	381 – Electrical audio signal processing systems and devices	52	74
18	704 – Data processing: speech signal processing, linguistics, language translation, and audio compression/decompression	47	43
19	365 – Static information storage and retrieval	46	21
20	717 – Data processing: software development, installation, and management	44	45

*Note that design patents do not go through a publication process like utility patents do; thus, Class D14 will show no published applications

Table 6. **Inside the Samsung US patent portfolio**

Class	Grant count	Published application count
438 – Semiconductor device manufacturing: process	2,951	1,968
257 – Active solid-state devices (eg, transistors, solid-state diodes)	2,677	3,021
D14 – Recording, communication, or information retrieval equipment	2,563	0
365 – Static information storage and retrieval	2,387	1,710
370 – Multiplex communications	1,471	3,050
349 – Liquid crystal cells, elements and systems	1,331	1,088
345 – Computer graphics processing and selective visual display systems	1,244	2,450
455 – Telecommunications	1,206	3,158
375 – Pulse or digital communications	997	1,755
369 – Dynamic information storage or retrieval	951	1,431
399 – Electrophotography	891	1,047
348 – Television	759	1,667
714 – Error detection/correction and fault detection/recovery	631	660
382 – Image analysis	574	1,015
360 – Dynamic magnetic information storage or retrieval	562	586
327 – Miscellaneous active electrical nonlinear devices, circuits, and systems	507	351
430 – Radiation imagery chemistry: process, composition, or product thereof	444	572
347 – Incremental printing of symbolic information	421	578
359 – Optical: systems and elements	376	445
361 – Electricity: electrical systems and devices	330	376

Table 7. **Apple and Samsung portfolio overlap**

Main class	Apple overlap count	Portfolio %	Samsung overlap count	Portfolio %	Patent difference
D14 – Recording, communication, or information retrieval equipment	470	12.65%	1,478	3.63%	-1,008
370 – Multiplex communications	67	1.80%	825	2.03%	-758
365 – Static information storage and retrieval	43	1.16%	824	2.02%	-781
455 – Telecommunications	135	3.63%	647	1.59%	-512
345 – Computer graphics processing and selective visual display systems	310	8.34%	559	1.37%	-249
375 – Pulse or digital communications	86	2.31%	519	1.27%	-433
349 – Liquid crystal cells, elements and systems	16	0.43%	313	0.77%	-297
382 – Image analysis	77	2.07%	290	0.71%	-213
714 – Error detection/correction and fault detection/recovery	35	0.94%	205	0.50%	-170
713 – Electrical computers and digital processing systems: support	116	3.12%	193	0.47%	-77
711 – Electrical computers and digital processing systems: memory	59	1.59%	186	0.46%	-127
709 – Electrical computers and digital processing systems: multicomputer data transferring	132	3.55%	163	0.40%	-31
257 – Active solid-state devices (eg, transistors, solid-state diodes)	7	0.19%	134	0.33%	-127
710 – Electrical computers and digital data processing systems: input/output	122	3.28%	118	0.29%	4
361 – Electricity: electrical systems and devices	94	2.53%	110	0.27%	-16
348 – Television	37	1%	92	0.23%	-55
327 – Miscellaneous active electrical nonlinear devices, circuits, and systems	8	0.22%	86	0.21%	-78
343 – Communications: radio wave antennas	57	1.53%	69	0.17%	-12
341 – Coded data generation or conversion	16	0.43%	68	0.17%	-52
707 – Data processing: database and file management or data structures	85	2.29%	64	0.16%	21

Dan Levine, "Insight: Apple and Samsung, frenemies for life", Reuters, 10th February 2013). We found no evidence of a supplier relationship where Apple supplies Samsung any parts in material quantities. This creates an interesting dynamic where fierce competitors are also supply-chain partners to an economic degree that rivals a Fortune 500 company. This dynamic also raises the stakes for Apple in all-out battles with Samsung. While Apple is remarkably cash rich, it is relatively patent poor compared to Samsung.

Benchmarking Samsung's and Apple's portfolios

Now that we have a reasonable understanding of Apple and Samsung's patent portfolios, it is time to benchmark them against each other. While this is a good way of identifying both the strengths and weaknesses of each company's portfolio, it can be labour intensive — especially for Samsung. Samsung's portfolio is so large and so diverse that it would take countless hours to identify the areas where it may have the greatest advantage. The practical solution is to partition the portfolio using macro-statistics.

At the class level, we find that Apple and Samsung have portfolio overlap at the grant level (ie, patent grants in each respective class). Between 1st January 2000 and 31st December 2012 68.7% of Apple's portfolio overlapped with 19.08% of Samsung's. This ratio tells an interesting story. First, Apple has greater concentration of its portfolio in key areas where Samsung competes. Second, Samsung has much greater diversification in its patent portfolio and product lines than Apple.

Table 7 drills into the comparisons at the class level and the data suggests that the greatest overlap (ie, the greatest frequency of common patent grant activity) between each respective portfolio is in Class D14, followed by Class 345. However, more relevant statistics emerge where one company is relatively strong and the other relatively weak. In the case of Apple and Samsung, it is clear that Samsung is outgunning Apple by a margin of 10:1 or more in certain key classes where essential art relating to mobile phones resides. For example, in our sample, Samsung owns 825 patents in Class 370; Apple owns 67. Table 8 shows the results when you drill into the data further and suggests that within Class

370, specific sub-classes with a remarkable disparity include 329, 338, 331 and 328. In these sub-classes, Samsung is outgunning Apple by a margin of 20:1 or more.

So what does this mean? Let us go back to Sun Tzu: "Attack him where he is unprepared, appear where you are not expected." Suppose that Samsung is sitting on the receiving end of a monster damages claim of perhaps US$1 billion. If it wanted to neutralise the effects of that litigation with cross-licensing, it might look at essential art areas where Apple has vulnerabilities at the portfolio level and where Samsung has disproportionate strength.

In this example, Samsung might look for vulnerabilities in Apple's portfolio as they relate to Class 370. From there, Samsung might look at its holdings in Class 370 and find that in sub-class 329 (relating to channel assignment) Samsung has a 12:1 advantage against Apple. Sun Tzu would say of this condition: "It is the rule in war, if our forces are 10 to the enemy's one, to surround him; if five to one, to attack him; if twice as numerous, to divide our army into two."

Given that channel assignment technologies cover important features in the efficient allocation of scarce bandwidth among many users, Samsung may reason that the odds of finding possible infringement are high in this art area. At that time, Samsung might then put its engineering and legal teams to work reading claims in a very narrow, targeted list of patents in an attempt to map those claims against Apple's products. As an aside, we found that until recently, Samsung had no prior role as a plaintiff against Apple even though it may have outnumbered Apple 10:1 in a variety of patent areas where the likelihood of infringement may be high. That Samsung has recently initiated actions against Apple in a variety of venues, covering a variety of Apple products, is coincidental to say the least.

Of course, Apple benefits from this type of analysis as well. It may learn quickly where it has vulnerabilities and develop sufficient strategies to address these. Moreover, Apple can use similar data to its advantage, identifying areas where it is relatively strong and Samsung is weak. For example, Apple outguns Samsung nearly 3:1 in Class 345.173, which deals specifically with touch panels. Apple has a remarkable amount of patents covering multi-touch and gesture-based inventions. Moreover, these patents gave Apple a key point of differentiation in the smartphone marketplace in 2007, where top-end phones include the Palm Treo and the

Table 8. **Apple and Samsung portfolio overlap in Class 370**

Subclass	Apple overlap count	Portfolio %	Samsung overlap count	Portfolio %	Patent difference
329000 – Channel assignment	8	0.22%	101	0.25%	-93
338000 – Contiguous regions interconnected by a local area network	4	0.11%	85	0.21%	-81
331000 – Hand-off control	4	0.11%	75	0.18%	-71
328000 – Having a plurality of contiguous regions served by respective fixed stations	1	0.03%	62	0.15%	-61
252000 – Determination of communication parameters	1	0.03%	51	0.13%	-50
342000 – Combining or distributing information via code word channels using multiple access techniques (eg, Cdma)	1	0.03%	41	0.10%	-40
352000 – Combined circuit switching and packet switching	1	0.03%	38	0.09%	-37
311000 – Signaling for performing battery saving	1	0.03%	31	0.08%	-30
208000 – Particular set of orthogonal functions	3	0.08%	29	0.07%	-26
392000 – Processing of address header for routing, per se	4	0.11%	29	0.07%	-25
401000 – Bridge or gateway between networks	1	0.03%	26	0.06%	-25
230000 – Control of data admission to the network	1	0.03%	23	0.06%	-22
310000 – Communication over free space	1	0.03%	23	0.06%	-22
254000 – Network configuration determination	2	0.05%	23	0.06%	-21
235000 – Flow control of data transmission through a network	3	0.08%	20	0.05%	-17
315000 – Repeater	1	0.03%	19	0.05%	-18
332000 – Based upon a particular signal quality measurement	1	0.03%	16	0.04%	-15
312000 – Message addressed to multiple destinations	1	0.03%	13	0.03%	-12
336000 – Combining or distributing information via time channels	1	0.03%	12	0.03%	-11
350000 – Synchronization	2	0.05%	11	0.03%	-9

Table 9. **The top 20 companies that received patent grants that mention LTE between 1st January 2000 and 31st December 2012 in their specifications***

Original assignee	Patent grant count	% of Total
LG Electronics Inc	298	9.62%
QUALCOMM Inc	227	7.32%
Nokia Corporation	158	5.10%
Telefonaktiebolaget LM Ericsson (publ)	123	3.97%
Intel Corporation	116	3.74%
Telefonaktiebolaget L M Ericsson (Publ)	107	3.45%
NTT DoCoMo Inc	106	3.42%
Sprint Communications Company LP	97	3.13%
Samsung Electronics Co Ltd	95	3.07%
Research In Motion Limited	94	3.03%
Samsung Electronics Co Ltd	71	2.29%
Huawei Technologies Co Ltd	70	2.26%
Broadcom Corporation	66	2.13%
Alcatel Lucent	58	1.87%
Motorola Mobility Inc	58	1.87%
Panasonic Corporation	56	1.81%
Texas Instruments Inc	54	1.74%
InterDigital Technology Corporation	49	1.58%
Fujitsu Limited	46	1.48%
AT&T Mobility II LLC	40	1.29%

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BlackBerry 8703 employed wheels, keyboards and a stylus.

Apple portfolio risk

According to Apple's annual report for the fiscal year ended 29th September 2012, it generated US$80.477 billion in revenue from iPhone sales. That sum comprises about 52% of Apple's total revenues. The analysis results presented within this article suggest significant litigation risk areas within Apple's portfolio from Samsung, as well as many other market players. Now Apple may have indemnification from suppliers for certain patent risk (eg, Samsung might indemnify Apple for patent infringement actions related to the flash memory that it supplies to Apple). However, after such considerations, Apple may still have significant portfolio risk. For example, an analysis of Release 8 of the 3rd Generation Partnership Project, more colloquially known as long-term evolution (LTE), highlights this risk.

The analysis begins with a basic keyword search of patent grant specifications that mention LTE. Table 9 captures the top 20 companies that received patent grants mentioning LTE between 1st January 2000 and 31st December 2012 in their specifications.

The top 20 companies produced about 64% of the 3,099 total patent grants that mention LTE in our sample. Apple was number 28 in the ranking, receiving about 0.87% of the total patent grants that mention LTE in the patent specification. Apple's ranking for ongoing patent applications that mention LTE is worse. Table 10 captures the top 20 companies that filed applications mentioning LTE between 1st January 2000 and 31st December 2012. The top 20 companies produced about 66% of the 13,987 total patent applications that mention LTE in our sample. Apple was ranked number 60, contributing about 0.19% of the total applications that mention LTE in the patent specification. In short, Apple may have an LTE patent-related problem. In fact, Samsung has already initiated action against Apple in this area, especially for the iPhone5 (Joanna Stern, "Apple v. Samsung Battle Goes On: Galaxy Tab Ban Lifted AS Samsung Pushed for iPhone 5 Ban", ABC News, 2nd October 2012).

Apple's buying spree

As discussed previously, gaps between the Apple and Samsung patent portfolios and a relative lack of fundamental development of patents key to innovative communications technologies essential to future phone developments create risk for Apple – not only with Samsung, but also with many other competitors. Without the deep bench of communications experts maintained by pure-play companies, such as Nokia, Research In Motion, Qualcomm or InterDigital (recall that a significant portion of Apple's IP portfolio emerges in art classes outside

*In some of the tables in this article certain companies may appear more than once, notably Ericsson and its name variants. There are hundreds of different name permutations in the raw data for companies listed in the tables. This is because there is no standardisation of entity names within the core data sources. This problem compounds when cross-referenced against the ETSI and other external data sources. We did not consolidate the data into single entities because the results would require remarkable labour to validate and would not materially alter the conclusions of the analysis.

Table 10. **The top 20 companies that filed applications that mentioned LTE between 1st January 2000 and 31st December 2012***

Original assignee	Patent grant count	% of total
QUALCOMM Inc	2,307	16.49%
Nokia Corporation	1,304	9.32%
LG Electronics Inc	597	4.27%
NTT DoCoMo Inc	529	3.78%
Samsung Electronics Co Ltd	467	3.34%
Telefonaktiebolaget LM Ericsson (publ)	411	2.94%
Research In Motion Limited	345	2.47%
InterDigital Patent Holdings Inc	342	2.45%
Fujitsu Limited	341	2.44%
ZTE Corporation	303	2.17%
Telefonaktiebolaget L M Ericsson (Publ)	303	2.17%
Panasonic Corporation	281	2.01%
Huawei Technologies Co Ltd	277	1.98%
Motorola Inc	257	1.84%
Samsung Electronics Co Ltd	238	1.70%
NEC Corporation	211	1.51%
Electronics and Telecommunications Research Institute	210	1.50%
InterDigital Technology Corporation	192	1.37%
Broadcom Corporation	178	1.27%
Nokia Siemens Networks Oy	164	1.17%

Table 11. **The top 10 Apple inbound assignments from 1st January 2000 to 21st December 2012**

Assignor to Apple Inc	Patent count
Rockstar Bidco LP	727
Freescale Semiconductor Inc	182
Object Technology Licensing Corporation	178
CPTN Holdings LLC	123
Intrinsity Inc	78
PA SEMI INC	64
Anobit Technologies Ltd	44
CVON Innovations Limited	35
Fingerworks Inc	20
Mitsubishi Electric Corporation	20

Table 12. **The top 10 classes in which Apple has purchased patents**

Class	Patent count
455 – Telecommunications	318
370 – Multiplex communications	277
375 – Pulse or digital communications	157
395 – Information system processing organization	138
345 – Computer graphics processing and selective visual display systems	90
707 – Data processing: database and file management or data structures	80
709 – Electrical computers and digital processing systems: multicomputer data transferring	79
715 – Data processing: presentation processing of document, operator interface processing, and screen saver display processing	56
714 – Error detection/correction and fault detection/recovery	52
D14 – Recording, communication, or information retrieval equipment	49

of communications), Apple must acquire patents on the open market to bolster its portfolio and create a sufficient defensive deterrent to its competitors. An analysis of Apple's inbound assignments in the USPTO assignment database between 1st January 2000 and 21st December 2012 for Apple Inc shows that Apple has gone to great lengths to backfill its portfolio. Table 11 captures the top 10 Apple deals over that date range.

An analysis of the composition of the acquisitions gives an insight into Apple's motivations. Table 12 captures an arrangement of the top 10 classes where Apple purchased patents. Recall that Apple had significant portfolio gaps with Samsung in key art areas, especially in Classes 455, 370, and 375. Table 12 shows that Apple was filling gaps in its portfolio.

Apple's rate of patent acquisition activity is not the mark of a company content with its internal innovation rate in key technology areas necessary to drive US$80 billion-plus in revenues per year. Rather, Apple's acquisition rate telegraphs a message to the market of a company concerned about litigation risk across a variety of areas of art where it has no historical core competency. Apparently, Samsung has no such worries. Over the same period, we did not find that Samsung acquired any patents from companies in the open market to fill any disparities between the respective portfolios.

The standards-essential patent front

Standards-essential patents receive a lot of attention in the press. These include patents deemed necessary to fulfil a particular industry-accepted standard. Conventional thinking is that companies that own many standards-essential patents may have a more valuable patent portfolio. With regard to this article, the focus is on standards-essential patents that relate to telecommunications technologies. The benefit for a rights holder is a near-guaranteed rate of return on its investment in the patent. The downside is that the rights holder cannot charge as high a royalty for a standards-essential patent as opposed to one that is not standards essential.

We analysed the standards-essential data disclosures listed at the ETSI (www.ipr.etsi.org) in order to try to determine whether Apple or Samsung had the patent advantage with regard to standards-essential patents. Before discussing this analysis, it is important to state that ETSI does not validate claims of standards essentiality submitted by patent owners. It provides no investigation or other searches to confirm

Table 13. **High-level patent data set, segregated by ETSI project**

ETSI project	Disclosure count
GSM	617,738
3GPP-radio	195,288
3GPP-UTRAN	174,466
3GPP-SA	143,556
3GPP-Release-8	114,095
3GPP-Release-6	103,631
3GPP-Release-10	42,372
3GPP-GERAN	26,939
3GPP-EUTRAN	24,886
3GPP-Release-5	21,651
3GPP-Release-1999	19,268
3GPP-Release-4	13,954
3GPP-Release-7	12,690
3GPP-Release-9	12,238
3GPP-CN	11,846
3GPP-Release-12	3,362
3GPP-T	2,145
3GPP-Release-1998	139
3GPP-Release-1997	34
3GPP-CT	1

Table 14. **The top 20 companies that have disclosed standards-essential patents with ETSI within the US market***

Companies	Total disclosures	Unique patents	Average disclosures/unique patent
Qualcomm Inc	589,262	14,399	40
InterDigital Technology Corporation	225,010	1,787	125
NOKIA Corporation	148,353	6,937	21
LG Electronics Inc	119,635	3,658	32
Motorola Mobility Inc	83,716	838	99
MOTOROLA Inc	53,228	1,000	53
Apple Inc	42,830	761	56
Samsung Electronics Co	41,433	3,945	10
Siemens AG	39,681	1,265	31
Ericsson	36,202	3,177	11
Nokia Siemens Networks	20,406	823	24
Coding Technologies AB	19,350	99	195
Tantivy Communications Inc	11,139	142	78
NEC Corporation	9,505	1,200	7
Alcatel	7,718	279	27
NOKIA MOBILE PHONES	6,808	306	22
Nortel Networks Ltd	6,411	405	15
Sharp Corporation	6,353	603	10
NTT DOCOMO	6,088	666	9
Mitsubishi Electric Corp	5,397	271	19

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Table 15. **High-level analysis of activities within US patent Class 348 relating to both Apple and Samsung**

Year	Apple patent applications	Apple patent grants	Apple patent acquisitions	Samsung patent applications	Samsung patent grants	Samsung patent acquisitions
2007	0	0	32	145	48	0
2008	10	1	15	171	46	0
2009	4	3	31	127	59	0
2010	26	12	24	172	92	0
2011	39	9	5	284	112	0
2012	58	28	1	277	193	0

or deny that patents or patent applications submitted to it are indeed standards essential. This creates an interesting possibility where a rights holder over-discloses the standard essentiality of patents that are not actually standards essential.

Table 13 captures the high-level data set that we used in this article, segregated by ETSI project. In the ETSI projects sampled, 92 companies comprise the total pool that has made disclosures across all patent offices contained in the ETSI data (ie, the USPTO and the European Patent Office).

Table 14 captures the top 20 companies that have disclosed standards-essential patents with ETSI within the US market.

In this data set, Samsung sits comfortably in eighth position, with Apple at seventh. This data signature raises some questions. First, does Apple out-innovate Samsung in standards-essential cellular communications-based technologies? If one looks at the ratio of ETSI disclosures to patent grants, then the answer may be 'Yes'. At the very least, Apple gets much more disclosure bang for every patent buck

it spends and has a disclosure rate that is nearly six times greater than Samsung's. However, the data may indicate other explanations for this disparity. Recall that Apple does not prosecute most of the patents today that contain significant mention of LTE or other similar keywords in the patent specifications (though Apple did acquire many patents from others in the market). Recall further that Apple is also not one of the top producers of communications patents in general. The fact that it is creating proportionally fewer patents than Samsung yet is a higher claimant for standards-essential patents is dissonant, unless Apple's telecommunications engineers are five times better than Samsung's.

As a background, the ETSI disclosure process is a voluntary one. As such, there may be several reasons for the significant disparity in the ratio between Apple's patent-producing engine and its ETSI disclosures compared to the broader market. Given that the ETSI disclosure process is voluntary, it is possible that the broader industry lags behind Apple in disclosing standards-essential patents to ETSI. Further, as ETSI does not validate the claims of standards essentiality for patents submitted to it, it may also be possible that Apple is claiming standards essentiality with the broadest possible brush compared to others in the market. There is certainly an element of intimidation to this. As it stands today, competitors such as Samsung may find themselves forced to expend significant resources to verify every standards-essential claim by Apple to avoid a possible willing infringement conclusion in some future litigation. That said, Apple's disclosures per unique patent are lower than some others in the marketplace.

Television – the next major frontier

The balance of initial litigation between Apple and Samsung continues and will eventually wind down. The smartphone patent wars will shift to new fronts. One where Apple and Samsung appear yet again to be set on a collision course is televisions. While there have been hints of Apple television products in the press for several years, and rumours have emerged from time to time that Apple may buy a television manufacturer, the company has not yet launched a product into the market. Samsung has been in the television market for some time and has a remarkable presence in televisions.

Table 15 captures a high-level analysis of activities within Class 348 relating to both Apple and Samsung. As the data shows, Apple has a growing interest in television-related patents. In fact, it has developed and acquired a small arsenal of television-related patents. However, empirical evidence also suggests that Samsung has a significant lead in this area, outgunning Apple by a margin of nearly 10:1. Without a change in strategy between the two competitors, we will likely be reading much about ongoing patent litigation between Apple and Samsung relating to televisions in the near future.

Advantage Samsung

A macro-analysis of the Apple and Samsung portfolios shows that the Korean company has both a depth and breadth advantage over Apple. While Samsung has not historically preferred to go to battle in the courtroom, its actions as a plaintiff have changed dramatically over recent times.

The conflict between Apple and Samsung has opened a fissure that is likely to take years to play out. Contrary to what many market analysts may claim, the mathematical probability of success tends to favour Samsung. Apple, weak in several key technologies related to current and future mobile phone development, has had to take dramatic market actions to backfill relative gaps in its portfolio. *iam*

Action plan

When considering patent litigation against a well-heeled adversary:

- There is a sea of data and monstrous new volumes emerge each week. No reasonable workforce of any appreciable size can keep up with this. Recognise that you cannot boil the ocean. You need targeted information to identify offensive and defensive opportunities. From there, perform the deep, manually intensive analysis.
- Patent counts are not necessarily evil, and in fact represent a practical, pre-filtered and continually validated metric for comparative analysis at a macro level for large portfolios.
- Understand where you excel relative to your competitors from a patent perspective so that you know where to strike for possible litigation.
- Understand where you are weak relative to your competitors from a patent perspective. Without this knowledge, you will be unable to anticipate counterclaims.
- Stay abreast of all inbound assignments to your adversary, for your adversary may acquire many defensive patents in the open market that are difficult to trace.
- Consider data from a variety of sources when performing any portfolio analysis. No single data source will complete the information mosaic.

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