Court File No.: 09-CL-7950

ONTARIO
SUPERIOR COURT OF JUSTICE
(COMMERCIAL LIST)

IN THE MATTER OF THE COMPANIES' CREDITORS ARRANGEMENT ACT, R.S.C. 1985, c. C-36, AS AMENDED

AND IN THE MATTER OF A PLAN OF COMPROMISE OR ARRANGEMENT OF NORTEL NETWORKS CORPORATION, NORTEL NETWORKS LIMITED, NORTEL NETWORKS GLOBAL CORPORATION, NORTEL NETWORKS INTERNATIONAL CORPORATION AND NORTEL NETWORKS TECHNOLOGY CORPORATION

APPLICATION UNDER THE COMPANIES' CREDITORS ARRANGEMENT ACT, R.S.C. 1985, c. C-36, AS AMENDED

- and -

UNITED STATES BANKRUPTCY COURT

FOR THE DISTRICT OF DELAWARE

In re	Chapter 11
NORTEL NETWORKS, INC., *et al.*,[1]	Case No. 09-10138 (KG)
Debtors.	(Jointly Administered)

Expert Report of Coleman Bazelon
On Behalf of Nortel Networks U.K. Pension Claimants

January 24, 2014

[1] The Debtors in these chapter 11 cases, along with the last four digits of each Debtor's tax identification number, are: Nortel Networks Inc. (6332), Nortel Networks Capital Corporation (9620), Nortel Altsystems Inc. (9769), Nortel Altsystems International Inc. (5596), Xros, Inc. (4181), Sonoma Systems (2073), Qtera Corporation (0251), CoreTek, Inc. (5722), Nortel Networks Applications Management Solutions Inc. (2846), Nortel Networks Optical Components Inc. (3545), Nortel Networks HPOCS Inc. (3546), Architel Systems (U.S.) Corporation (3826), Nortel Networks International Inc. (0358), Northern Telecom International Inc. (6286), Nortel Networks Cable Solutions Inc. (0567) and Nortel Networks (CALA) Inc. (4226).

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I. Executive Summary, Assignment, and Qualifications

A. Executive Summary

Various parties to the current allocation proceeding have proposed two fundamentally different allocation approaches for distributing the lockbox funds: 1) a method of allocation that notionally treats the lockbox funds as a single pool against which all creditor claims against Nortel are asserted (a "Pro Rata Distribution Model"); and 2) allocation schemes that require the selection and application of some metric other than creditor claims to allocate the lockbox funds before claims are considered.

As detailed in this Report, the Pro Rata Distribution Model is the most consistent with the economics underlying Nortel's business model. The other methods require strong assumptions that are inconsistent with the operations of Nortel's business. My conclusion in this regard is based on three observations about the economics of Nortel:

First, Nortel operated as a highly integrated, multinational company prior to seeking protection from creditors. Its management and employees, regardless of geographic location or corporate affiliation, treated Nortel as a single company and strove to maximize value to the company's shareholders as a whole, worldwide. Nortel's choice of organizational structure—a matrix across business segments (carrier, enterprise, wireless, *etc.*) and functional areas (finance, human resources, and, during certain periods, sales and research and development ("R&D"))—was aligned with its system of incentives and goal of operating as a multinational, highly integrated, and technology-intensive company. Nortel also had a complex legal organizational structure with over 140 companies worldwide under the Nortel Group.[2] However, these entities were created largely for legal, regulatory and/or tax reasons and had little to no operational impacts. The legal organizational structure never, or at most seldom, played any role in incentivizing management, allocating resources, monitoring performance, or in the decisions to acquire, develop, or maintain intellectual property ("IP").[3]

Second, the assets sold in Nortel's bankruptcy (which are the sources of the lockbox funds) were mostly IP—entirely so in the case of the Rockstar patent portfolio.[4] Nortel's patents are the work of thousands of scientists and engineers across multiple lines of business and jurisdictions over decades. While in principle, each patent could be sold individually; in reality this may not be commercially feasible because of the web of relationships between all the patents. I have analyzed the degree of interconnections and present my findings in **Figure 5**. The complex technologies being developed and used in the telecommunication industry in the 2000s created

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[2] Motion by NNI in the Chapter 11 bankruptcy proceedings, January 14, 2009, ¶ 22.

[3] See Section III.A.

[4] Rockstar refers to the Rockstar Consortium, a consortium that acquired over 4,000 of Nortel's residual patents in June 2011. Members include Apple, Microsoft, Ericsson, RIM, and Sony.

families of interconnected and incremental patents that are essentially a Gordian knot in their totality. Nortel and its industry peers touted hyperconnected or converging technologies as a source of competitive advantage (which is depicted in **Figure 3)**. Nortel's interrelated technologies were developed around the world and the interconnectedness of the patents makes it highly subjective and artificial to disaggregate value as is often done with patents in industries which develop less complex, or more discrete, technologies (see **Figure 4**).[5]

Third, Nortel's intertwined IP assets were created over the course of many years through a highly collaborative R&D process, which was integrated geographically (including the U.K.) and across different technologies (as is depicted in **Figure 7**). The patents forming the basis of value that underlies the lockbox funds were the result of R&D that occurred, and was shared throughout Nortel, in different locations around the world without any contemporaneous recognition of geographic contribution. Any efforts to now disentangle the IP and attribute it to one or more of the estates would necessarily entail making considerable assumptions that may not fully reflect the contributions, ownership interests, and other rights to the IP by the different estates.[6]

Consequently, a Pro Rata Distribution Model is the most appropriate allocation method for the lockbox assets. Such an approach would treat Nortel in bankruptcy as it operated prior to bankruptcy, as an integrated corporation. At a high level, this approach would award each creditor a pro rata share of the combined Nortel's assets.

B. ASSIGNMENT

My assignment concerns the proper allocation of the lockbox funds among the three Nortel estates. Specifically, I was asked by Counsel for the U.K. Pension Claimants[7] to opine on, from an economist's perspective, the most appropriate method for allocating the lockbox funds among the three estates based on Nortel's business model and operations and the nature of the assets that generated those funds.

I have examined the economics underlying Nortel's business model, and have concluded that a Pro Rata Distribution Model based on creditor claims is the most reliable method for allocating the lockbox funds. However, to produce a pro rata distribution on claims, certain adjustments may be required to take into account other cash available to creditors for their respective claims. I understand that there are different legal mechanisms for carrying out such an approach in practice. Because this Report is focused on the economic rationale underlying any allocation of the lockbox funds, I do not address those mechanisms in any detail.

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5 See Sections III.B and III.C.

6 See Section IV.

7 I will use the term "U.K. Pension Claimants" to refer collectively to the Trustee of Nortel Networks U.K. Pension Plan and the Board of the Pension Protection Fund.

With respect to my assignment The Brattle Group is being compensated by the U.K. Pension Claimants at my usual and customary rate of $550 per hour. I am supported by professional staff at Brattle, but all of the views and analysis expressed in this Report are my own. No part of Brattle's compensation depends upon the outcome of this case or any issue in it. I reserve the right to supplement my Report when additional information is made available to me. I may prepare additional exhibits or demonstrative evidence for trial pursuant to the schedule set by the Courts.

C. Personal Experience and Qualification

I am a Principal at The Brattle Group, Inc. ("Brattle"). Brattle is an international consulting firm specializing in economic analysis, litigation support and strategic and advisory consulting. Brattle has offices in the U.S. and in Europe. Brattle clients include Fortune 500 companies, leading law firms, and government agencies throughout the world.

I am an expert in matters pertaining to regulation, strategy, and valuation in the wireless, wireline, and video industry sectors. Much of my practice involves valuation of complex telecommunications assets. I have consulted for and testified on behalf of clients in numerous telecommunications matters, ranging from wireless license auctions, spectrum management, and competition policy, to patent infringement, wireless reselling, and broadband deployment. I have also written on valuation and IP issues. In addition, I frequently advise regulatory and legislative bodies, including the U.S. Federal Communications Commission and the U.S. Congress.

Prior to joining Brattle, I served as a Vice President with Analysis Group, an economic consulting firm. I have also served as a Principal Analyst in the Microeconomic and Financial Studies Division of the Congressional Budget Office ("CBO") where I researched reforms of radio spectrum management, estimated the budgetary and private sector impacts of spectrum-related legislative proposals, and advised on auction design and privatization issues for all research at the CBO.

I received my Ph.D. and M.S. in Agricultural and Resource Economics from the University of California at Berkeley. I also hold a Diploma in Economics from the London School of Economics and Political Science and a B.A. from Wesleyan University.

My curriculum vitae, including all publications that I have authored in the previous 10 years, is attached as **Appendix A**. A list of all other cases in which, during the previous four years, I have testified as an expert at trial or by deposition is included in **Appendix A**. Documents I considered in reaching my conclusions are listed in **Appendix B.**

D. Case Background

Nortel sought bankruptcy protection in January 2009 in three primary jurisdictions—Canada, the U.S., and the U.K. Although each European entity is the subject of its own separate insolvency proceedings, this state of affairs is commonly described as three bankruptcy estates representing

Nortel's three main operational regions: Canada; the U.S.; and, Europe, the Middle East, and Africa ("EMEA").

Nortel started to liquidate its remaining assets shortly after its bankruptcy filing. During 2010 and 2011, Nortel sold various lines of businesses and associated intellectual property for approximately $3.3 billion.[8] In addition, Nortel sold the remaining patents in its portfolio to the Rockstar Consortium in June 2011 for $4.5 billion. Altogether, a total of $7.8 billion was deposited in a bank's "lockbox," pending the distribution of these funds to Nortel's ultimate claimants (notably, its pensioners, bondholders, and trade creditors).

My review of the various sales made by Nortel following its bankruptcy filings indicates that the company's IP assets, primarily patents, represented the majority of the proceeds that Nortel received from these sales; fixed and tangible assets associated with the sales of Nortel's business lines accounted for a relatively small amount of the total proceeds received. As a consequence, most of the analysis in this Report focuses on Nortel's IP assets.

The total proceeds from the sales were about $7.8 billion. A summary of Nortel's asset sales is presented in **Figure 1**.

These funds need ultimately to be distributed to Nortel's claimants. Proceeds were not distributed as received because the various parties to the bankruptcy proceedings voluntarily signed an agreement in June 2009, under which distribution was deferred until an agreement or judicial determination on allocation could be reached.[9] The parties have thus far been unable to reach an agreement.

Claims have been filed in the U.S. and Canada. Parties with large claims against the Canadian estate include bondholders, Canadian pensions, the U.K. pension, and the U.S. estate (for a 2001 – 2005 transfer pricing settlement). Parties with claims against NNI, Nortel's main U.S. subsidiary, include bondholders (because Nortel issued some of its bonds with NNI as the guarantor) as well as NNI's suppliers, customers and former employees. The single largest creditor of NNUK, Nortel's U.K. operating company and a member of the EMEA claimant group, is the U.K. Pension Claimants. In total, claims against Nortel are reported to exceed well over $40 billion,[10] however this amount appears to include inter-estate and duplicative claims.

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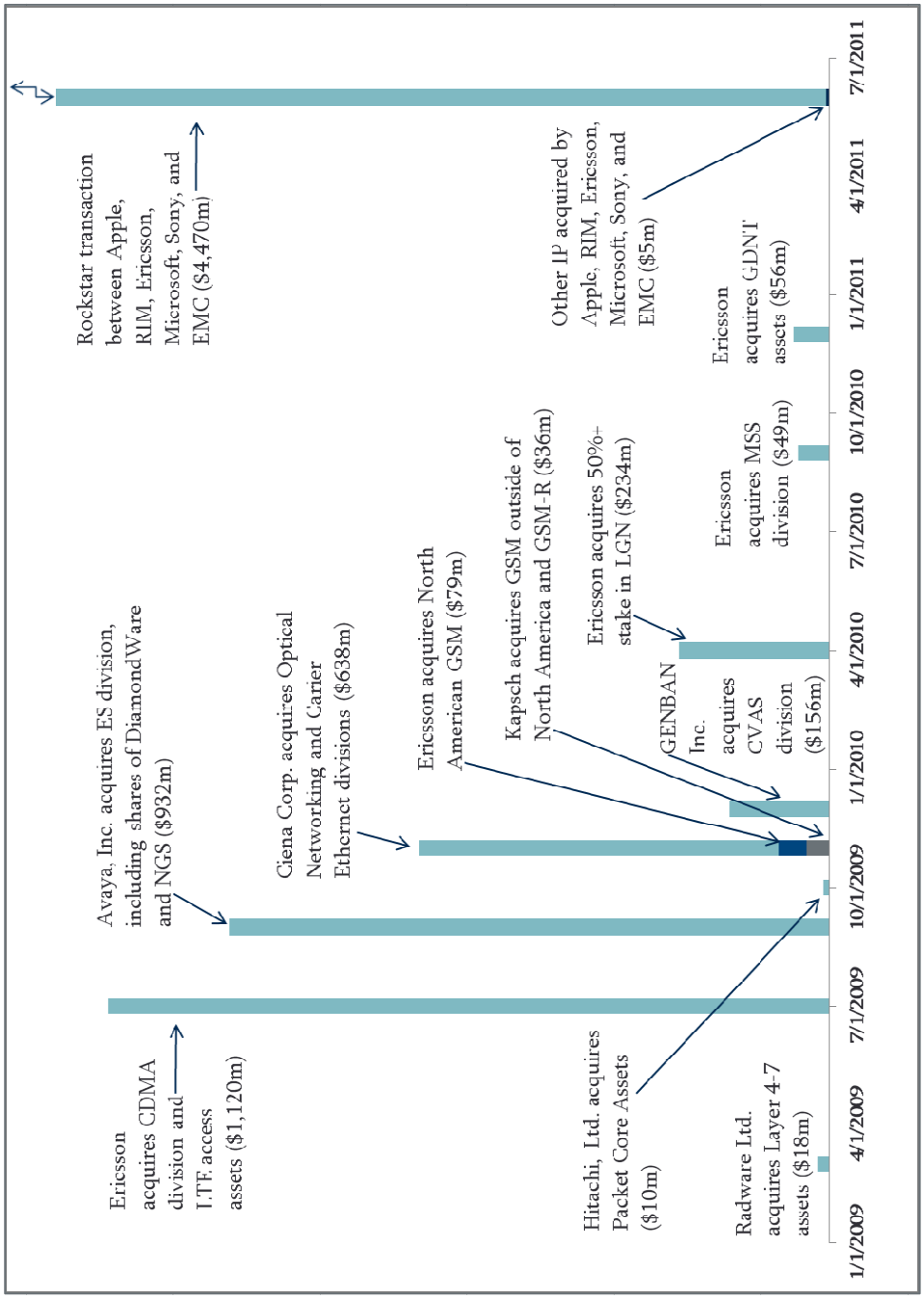
[8] Dollar figures in this Report are given in U.S. Dollars.

[9] Interim Funding and Settlement Agreement, Sec. 11(a), June 9, 2009, available at http://bankrupt.com/misc/NortelInterimFundingAgreement.pdf (last accessed January 24, 2014).

[10] The estimated claims against Canada are approximately US$32.7 billion (or CAD$36 billion). See Nortel Networks CCAA Applicants Overall Claims Status, December 5, 2013, available at http://documentcentre.eycan.com/eycm_library/Project%20Copperhead/English/Claims%20Process/CCAA%20Claims%20schedule%20-%20December%205,%202013.pdf (last accessed January 24, 2014). The U.S. claims listed on NNI's bankruptcy docket (via the Epiq Systems website) run over 1,800 pages. The largest 60 claims total well over US$10 billion.

Figure 1. Timeline of Nortel Asset Sales



Source: Nortel's SEC form 10-Q, filed in August 2012.

II. Economics of Allocation

I understand that the matter before the Court is to allocate the funds in the lockbox, which are the proceeds from the sale of Nortel assets, primarily IP assets. The total amounts included in the lockbox (*i.e.*, the prices paid to Nortel for its assets, less administrative costs) have been arrived at through an auction process, and are not at issue in this case. Instead, this case involves the application of an economically rational allocation methodology; valuation related issues are only relevant insofar as they illuminate allocation issues. Economic theory provides some insight into how to address allocation issues, which I briefly discuss below.

A. Common Production Functions

Allocation issues are quite common in business applications. Examples of allocation issues are notable in price regulated industries which share common production functions (i.e., production functions which produce more than one type of output and/or exhibit increasing returns to scale or scope). Similar allocation issues can also arise within unregulated firms, for example when they assign the costs of common business processes or overheads to business units. These cases involve allocating common costs among end users, and have spawned an extensive literature on the economic underpinnings of how to allocate these costs.[11] The current case, however, involves dividing up an essentially indivisible output—proceeds from the sales of Nortel assets, primarily IP assets—from a joint production process. The issue of allocating a single value among indivisible inputs has been addressed before. For example, in situations where the joint production function produced a surplus value (*i.e.*, when the whole is greater than the sum of its parts), economics literature suggests that each contributor should earn returns that are at least as large as what they could earn outside of the joint production process. Another approach, based on the game theory, suggests that the surplus should be divided in proportion to the bargaining strength of each contributor, where the bargaining power may be approximated in proportion to each party's unique contribution to the surplus.[12]

B. Nortel's Jointly Created Assets

This jointly created asset problem is precisely the situation involved in this case. Most of the lockbox funds reflects the value that the acquirers placed upon Nortel's IP assets. Nortel's IP, including patents, represent the company's most valuable assets post-bankruptcy, and are a direct product of the R&D conducted at Nortel.

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[11] See, for example, P. Milgrom, and J. Roberts, *Economics, Organization & Management*, 1992, Prentice Hall, Chapters 3, 4, and 9 in particular.

[12] Economist John Nash won a Nobel Prize in economics for his contributions, among others, on developing the concept of the so-called "Nash Bargaining" model. The idea has recently been introduced to the IP infringement litigation in the U.S.

In theory, each patent can be auctioned off by itself, but this is often not the case in practice. Frequently, transactions involving patents often involve large portfolios consisting of "hundreds or thousands of patents."[13] Furthermore, products and services are covered by dozens or even hundreds of interdependent patents, especially in the telecommunications sector in which Nortel operated. Interdependence reduces the value of *individual* patents because they are only valuable as part of a package of protected patent rights.[14] Thus, Nortel's IP assets are indivisible to their creators in practice.

The way that Nortel operated its business (*i.e.*, production inputs) further complicates the lockbox allocation problem. As will be discussed in detail in the next section of my Report, Nortel ran its entire business in a highly integrated matrix organization; its management and employees worked for one Nortel, and Nortel presented itself and was perceived as such. The processes that were the primary inputs to the creation of IP value—especially its R&D function—were highly intertwined.[15] Allocating value across business units tends to be more direct and simple in industries that are characterized by distinct R&D phases. For example, in the pharmaceutical industry, successful drugs are developed with distinct R&D phases (due, in part, to regulations that require multi-phase clinical trials), and molecules can be sold at different stages of the drug's life cycle.[16] R&D in drug development typically results in a fairly narrowly defined pharmaceutical molecule (or closely related family of molecules). This allows for the developer of a fundamental patent to sell its not-yet-fully-developed drug to a later inventor or a financier.[17]

This is not the case for industries which are characterized by complex technologies, such as the telecommunications industry, in which the R&D function and the resulting patents are highly interconnected. Nortel's R&D function (as well as the resulting patents) was highly intertwined in the sense that R&D in one geographic center often included contributions from another R&D center. Furthermore, the subject R&D was likely leveraged in still another R&D center. Additionally, Nortel's R&D centers were scattered across the globe with overlapping capabilities. Scientists routinely collaborated across geographic borders. All together, the inputs to the production function (*i.e.*, the R&D process) and the outputs of that production function (*i.e.*, the patents) were each intertwined and entangled.

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[13] A. Hagiu and D. B. Yoffie. "The New Patent Intermediaries: Platforms, Defensive Aggregators, and Super-Aggregators." *The Journal of Economic Perspectives* 27.1 (2013): 45–65, p. 45.

[14] This is true unless the individual patent complements the patent portfolio that the buyer already owns. A. Hagiu, and D. B. Yoffie. See *supra* fn. 13, p. 47.

[15] See Section IV.

[16] See, for example, S. C. Myers and C. D. Howe, 1997, "A life-cycle financial model of pharmaceutical R&D," MIT Program on the Pharmaceutical Industry.

[17] See, for example, J. Lerner, H. Shane, and A. Tsai, "Do Equity Financing Cycles Matter?: Evidence from Biotechnology Alliances," *Journal of Financial Economics*, 67 (March 2003), 411–446.

I discuss the intertwined nature of Nortel's input processes and the entangled nature of its outputs throughout the remainder of this report. Specifically, in Section III, I discuss Nortel's matrix approach to organization and the company's integrated approach to developing technological solutions. I also provide an analysis of Nortel's patents that demonstrates that the company's IP assets were entangled across technologies and market segments. I then examine the geographic interconnectedness of Nortel's R&D process and the extent that patents were originated across Nortel's R&D centers in Section IV. In that section, I also provide an analysis of cross-citations of Nortel's patents from a geographic perspective.

III. Nortel's Integrated Organization and Entangled IP Assets

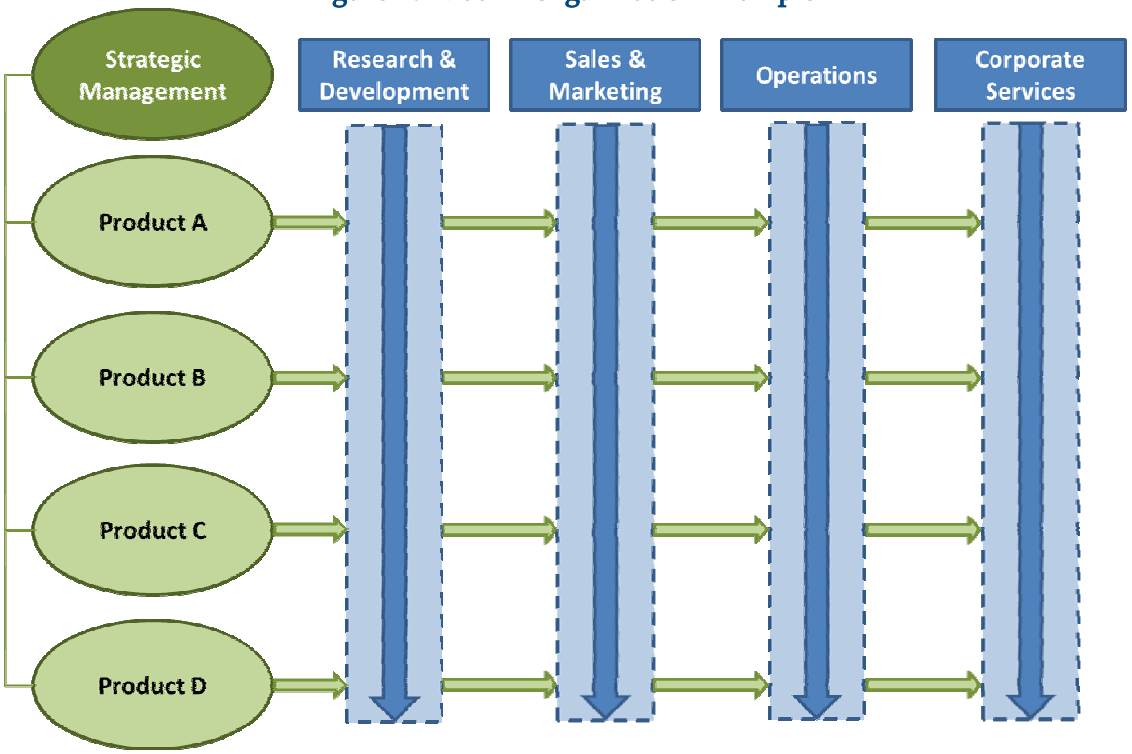
A. Nortel's Matrix Organization

Nortel provided products and services to customers in over 150 countries,[18] and the Nortel Group included over 140 companies. Nortel was a global company that was run on a highly integrated basis. From an operation and management perspective, Nortel was organized along what is referred to as a matrix organization. First, Nortel was organized into product lines (rows in **Figure 2**)—such as Enterprise, Wireless, and Metro Ethernet—that were operated globally. Second, Nortel was composed of shared services (columns in **Figure 2**) which included R&D, sales and marketing, operations, and corporate services that cut across business lines.[19]

[18] Nortel Networks Corporation 2006 Annual Report, p. 2.

[19] Deposition of Khush Dadyburjor, October 3, 2013, pp. 37–39 ("Dadyburjor Deposition"). See also, Deposition of George Riedel, October 10, 2013, p. 82 ("Riedel Deposition").

Figure 2. Matrix Organization Example



Source: Ernst & Young 2008 Transfer Pricing Analysis.[20]

Nortel's matrix organizational form was adopted to enhance operational efficiencies, economies of scope and scale, avoidance of duplication, better strategic deployment and the fostering of collaboration in technological research, marketing and customer service.[21] It was based on Nortel's strong belief that such arrangements provided its best opportunity for success. The role of R&D in Nortel's organization was particularly important. Specifically, Nortel believed that collaborative R&D in a matrix organizational structure was most likely to optimize value and allow the company to be recognized as a leader in providing network solutions in the evolving hyperconnected telecommunications environment. As a former Vice President of Technology Strategy and R&D Effectiveness stated "Nortel Networks is **one corporation** building a suite of differentiated network solutions and applications" (emphasis original).[22]

In addition to the above two dimensions, Nortel was also organized geographically, out of legal and tax necessities operating as different legal entities in each of the jurisdictions in which it did business. However, the geographic divisions played little if any role in the business strategy,

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[20] E&Y Transfer Pricing Method Analysis, included in Exhibit 22077, Nortel Networks Limited and Nortel Networks Inc. Joint Request for U.S.-Canada Bilateral Advance Pricing Agreement/Arrangement 2007–2011 (with rollback to 2006), October 31, 2008, NNC-NNL011359–413.

[21] Exhibit 22077, p. NNC-NNL011395.

[22] Exhibit 21219 and Exhibit 21231, Email from Michael Langlois: Note to R&D Product and business Leaders of Nortel Networks, January 27, 2003, p. NNC-NNL07376660.

R&D budgeting, pension contribution, and customer services. For example, Mr. Ernie Briard worked in Nortel's Canada and U.S. subsidiaries in accounting, sales, and finance areas over the course of his 20-plus year career at Nortel. He testified that statutory entities were "invisible" to him, and Nortel "was being run on a one-Nortel basis with—our profit, motivation, bonus schemes, everything had to do with—a big chunk of it had to do with your total Nortel."[23] In blunt language, Mr. Briard declared that "I worked for Nortel, so everything I did was all around doing it for the better of Nortel in total, never for any particular region that I might have happened to reside in … I never operated like that." In response to the question "And no one ever instructed you to prefer one entity over the other," he responded "Absolutely not."[24]

Given the matrix organizational form across lines of business and functional area, the need to allocate the lockbox funds among the geographies (instead of on the basis of a Pro Rata Distribution Model) is an artifact of Nortel's jurisdictional requirement to maintain separate books on a country-specific or statutory basis. This had little if anything to do with Nortel's actual management and operations.

B. NORTEL'S INTERCONNECTED TECHNOLOGY

The telecommunications industry has evolved dramatically since the 1980s. Most notably, the market has been transformed from segmented markets for products (*i.e.*, voice *vs.* data) and technologies (*i.e.*, wireless *vs.* wireline) into a highly integrated communications market. Specifically, the combination of technological developments and changing customer expectations has led to the convergence of products, as subscribers no longer see a demarcation among voice, data, video and internet access. Customers are also less aware of the technologies underlying how services are delivered, either over wires or wirelessly. This has had important consequences for service providers, who have had to move up- and downstream in order to ensure that they are able to provide customers with a full range of communications services. It has also had consequences for the companies that provide network solutions to telecom carriers and large businesses, or enterprises.

As a provider of network hardware and software solutions, Nortel was keenly aware of developments in the telecom industry. Specifically, it noted that that end-use customers are increasingly expecting seamless connections to networks and to each other at all times, and that the convergence of telecom services has "render[ed] segmentation by mode of communication nearly obsolete."[25] It also saw that service providers were racing to provide customers with access to broadband by deploying network architectures that could seamlessly connect myriad devices to one another (i.e., person-to-person, person-to-machine, and machine-to-machine devices). Throughout its history, Nortel had evolved by responding to evolving telecom demands, largely through the strength of its R&D efforts. Nortel consciously sought to remain a

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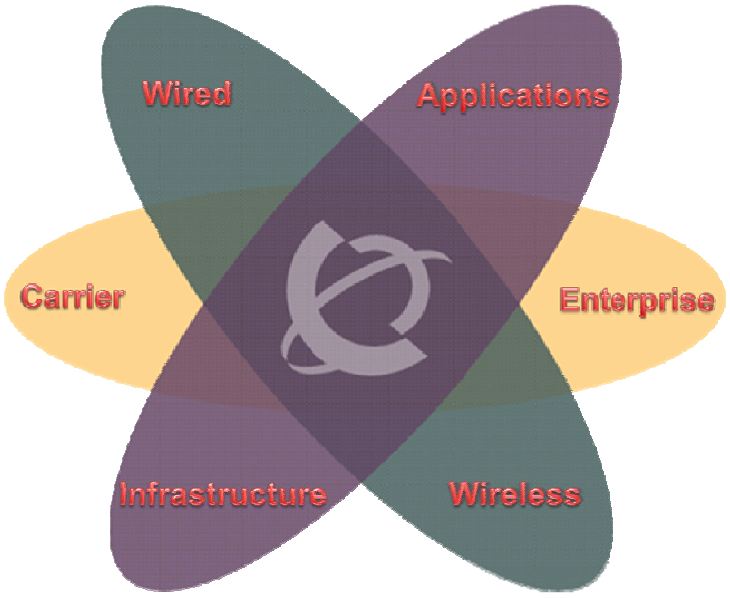
[23] Deposition of Ernie Briard, September 26, 2013, p. 79 ("Briard Deposition").

[24] Briard Deposition, p. 80.

[25] Exhibit 22077, p. NNC-NNL011366.

thought leader in the telecommunications technology space by developing world class research and development facilities. As recognized by Nortel, "[u]ltimately Nortel's success or failure is driven by the outcome of its continuing R&D investments."[26] In order to compete in "a volatile industry space" and to remain a player, it was necessary for Nortel to "maintain a relatively high investment in product R&D."[27] **Figure 3** depicts Nortel's view of the converged technology environment.

Figure 3. Technology Convergence at Nortel



The "atom chart," reproduced above, was used by Nortel in a variety of presentations, including in Nortel's 2008 request for a US-Canada bilateral Advance Pricing Agreement / Arrangement.[28] The illustration serves to depict Nortel's view of technology integration, or convergence.

C. The Interconnectedness Of Nortel's Patents

An examination of the cross-citations among a company's patent portfolio is instructive in assessing the uniqueness or interconnectedness of its R&D efforts and products (*i.e.*, patents).[29]

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[26] Exhibit 31355, Functional Analysis for the years ending December 31, 2000–2004, EMEAPROD2189880–90060, p. EMEAPROD2189887.

[27] Exhibit 11352, Nortel Networks Inc. (APA-148919-02) Proposed U.S.-Canada Bilateral APA, April 6, 2006, NNI_01534866–73, p. NNI_01534867.

[28] Exhibit 22078, Joint Request for U.S.-Canada Bilateral Advance Pricing Agreement/Arrangement 2007-2011 (with rollback to 2006), October 31, 2008, PC0184853–5061, pp. PC0184861, 925.

[29] Economists have long studied patenting and patent citations as indicators of technological progress. See, for example, Z. Griliches, "Patent Statistics as Economic Indicators: A Survey," *Journal of Economic Literature*, Vol. XXVIII (1990): 1661 – 1707; and A.B. Jaffe, and M. Trajtenberg, *Patents, Citations and Innovations: A Window on the Knowledge Economy*, MIT Press, 2002.

High levels of cross-references tend to be indicative of collaborative R&D processes. Cross-references to patents granted to the company (i.e., its employees) can be forward or backwards. "Backward" citations indicate how a patent has built upon other patents that were previously developed by the company (i.e., patent x builds upon the work incorporated into previously filed patent y). "Forward" citations indicate the influence a patent has on future patents filed by the company (*i.e.*, patent z references the work developed in previously filed patent x).

The extent of patent cross-citations is typically related to the type of industry and technologies to which the patents are applied. Patents reflecting fundamental, or basic, research (i.e., research that may be utilized in multiple products and platforms) tend to have more forward citations than do patents that are associated with product-specific applications.[30] Forward citations tend to be particularly strong in industries characterized by discrete technologies. For example, forward citations are prevalent in patents associated with the pharmaceutical industry, where patent citations tend to be cross-cited within the same therapeutic area. Furthermore, patents in discrete technology industries tend to be cross-cited within the same firm, which effectively retains the value created and minimizes spillovers across firms.

The development of forward citations in an industry characterized by discrete technologies is illustrated in the left panel of **Figure 4**. Each node in the figure represents a down-stream or forwardly cited patent. The lines between patents that concern fundamental research and the patents that built upon them are relatively direct and simple to follow for the discrete technology industries depicted in the left panel of **Figure 4**. This is in contrast to the pattern of patents depicted on the right side of **Figure 4,** which depict patents associated with an industry characterized by its use of complex technologies.[31] In such industries, of which telecommunications and semiconductors are prime examples, the cross-referencing of patents is more pronounced and complicated. (Note, for example, the prevalence in the telecommunications industry of technology standards; each standard may incorporate "hundreds or thousands of patents."[32]) This presents a risk to the developers of fundamental research—that they will not be able to reap the reward associated from downstream applications. That is, some

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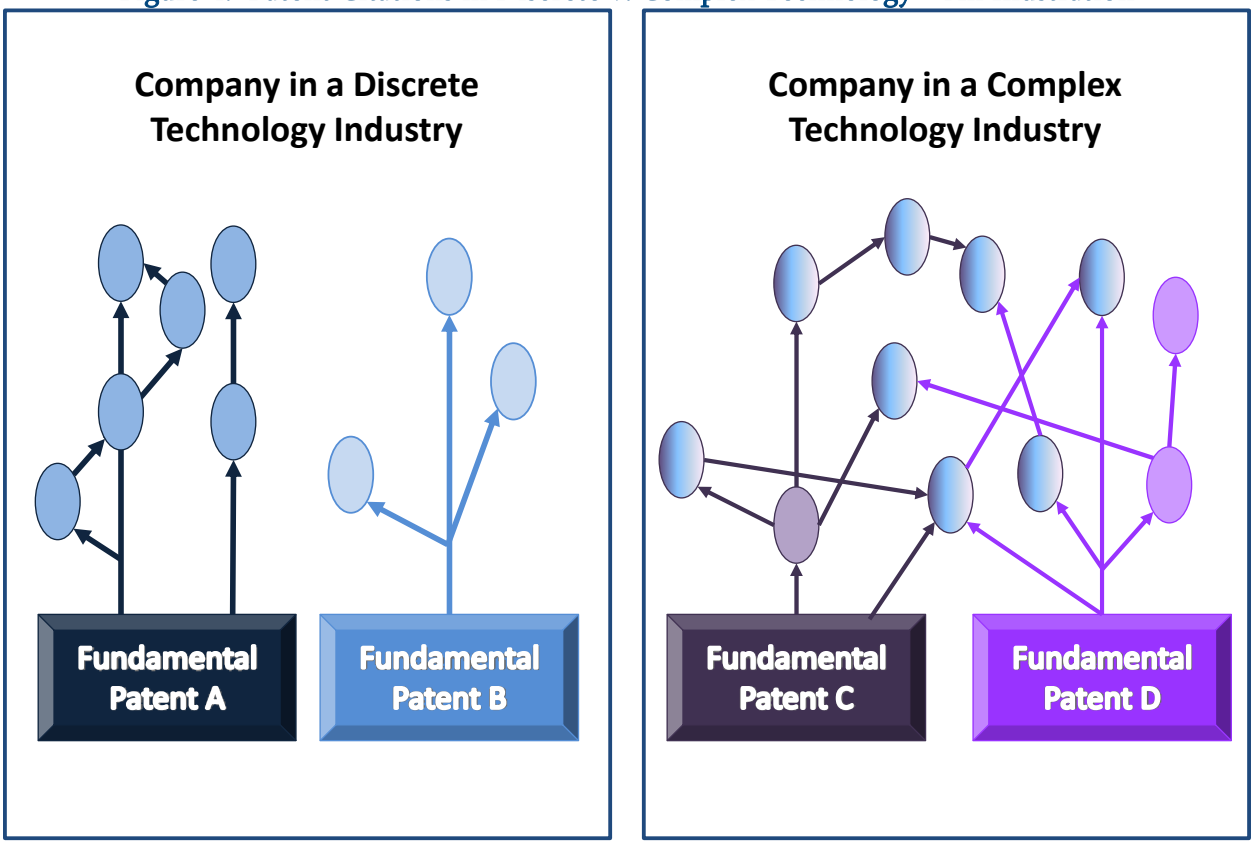
30 B.H. Hall, A. Jaffe, and M. Trajtenberg, "Market value and patent citations," *RAND Journal of Economics* (2005): 16–38.

31 Academic and conventional wisdom refers to "complex technologies" as complex product industries where any particular product may rely on various technologies embodied in several patents (as opposed to "discrete technologies" where patents serve their traditional role of exclusion). For example, industries such as pharmaceuticals and chemicals have been described as "discrete product industries" whereas telecommunications and semiconductors have been described as a "complex product industries". See W.M. Cohen, R.R. Nelson, J.P. Walsh, "Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (or Not)," NBER Working Paper 7552 (2000). Researchers also distinguish cumulative technology areas (*e.g.*, telecommunications) from discrete technology industries (*e.g.*, pharmaceuticals). See S. Belenzon, "Cumulative Innovation and Market Value: Evidence from Patent Citations," *The Economic Journal* 122 (March 2012), 265–285, p. 268.

32 See *supra* fn. 13, p. 45.

or even much of the value may spill over and be realized by other firms. Thus, there is an economic incentive for developers of complex technologies to organize their R&D functions so that spillovers are internalized (i.e., patents are cross-referenced to other patents created by the firm) and rewards are maximized.[33]

Figure 4. Patent Citations in Discrete v. Complex Technology – An Illustration



I examined Nortel's portfolio of patents that it sold to the Rockstar Consortium to determine the extent and pattern of patent cross-citations across Nortel's technologies and market segments. I depict these cross-citations in **Figure 5**.[34]

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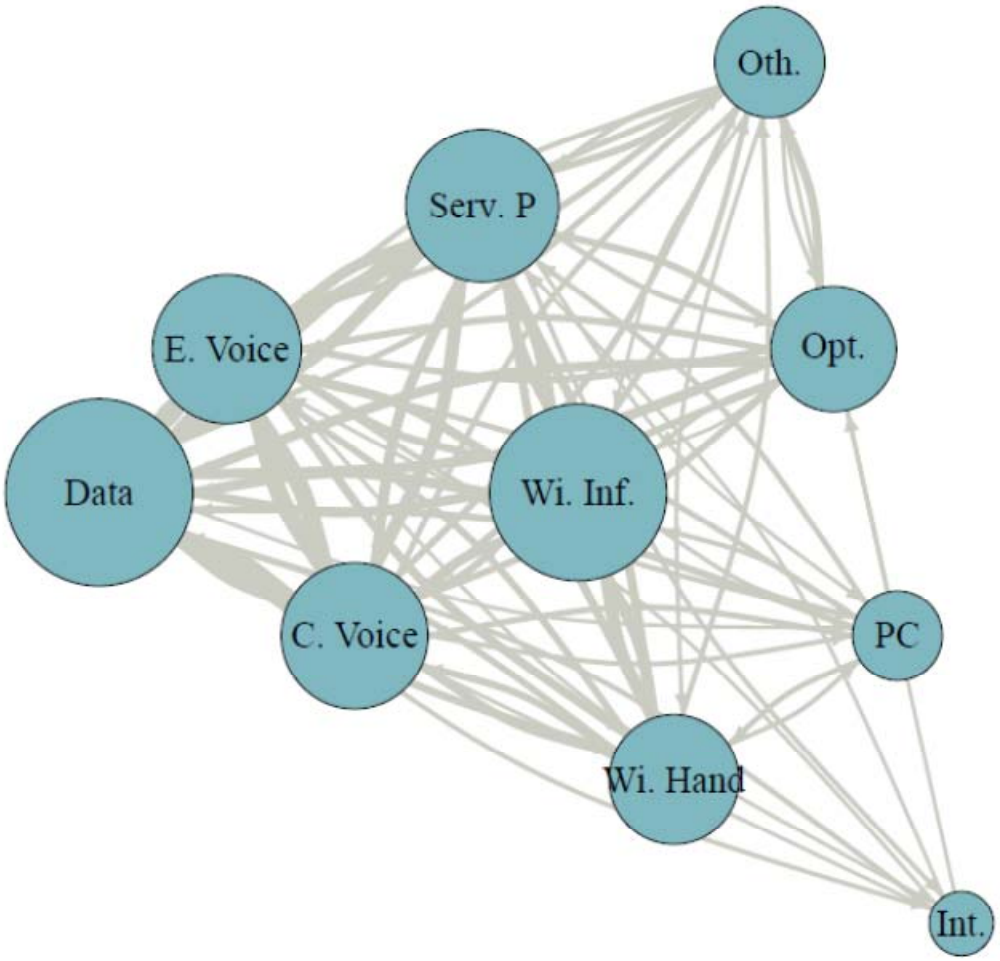
[33] Indeed, recent academic literature notes that the ability of a firm to build upon improvements that *other firms* made to its earlier patents is a strong predictor of firm value. This effect is particularly strong in the telecommunications industry, where "cumulative innovation is especially high" as opposed to discrete technology industries such as pharmaceuticals. See S. Belenzon, "Cumulative Innovation and Market Value: Evidence from Patent Citations," *The Economic Journal* 122 (March 2012), 265-285, pp. 281–282.

[34] The size of each node (vertex or bubble) is proportional to the square root of the number of unique patents classified by that node. The width of each edge (arrow) is proportional to the square root of the number of citations connecting two nodes. The direction the edge points goes from the citing node to the cited node. A more detailed description of how the figure was constructed is provided in Appendix C.

Figure 5. Interconnectedness of Nortel's Rockstar Patents by Franchise



Notes: The Figure is based on the 2,684 U.S. granted Rockstar patents and their market assignments (EMEAPROD2214888, tab "Assets") and on publicly available data on patent citations from the USPTO.

The figure displays the U.S. patents that Nortel sold to the Rockstar Consortium that were granted in the U.S. in terms of Nortel "franchises" (i.e., market segments centered on technologies or grouping of customers).[35] Each franchise is represented by a circle in the figure. The size of the circles indicates the number of patents that fall in that franchise, and directed arrows link patents in one franchise (the citing) to patents in another franchise (the cited), with the thickness of the arrow indicating the number of backward citations. The location of each circle in the figure from left to right is based on the relative number of forward citations that

[35] I selected this sub-set of Rockstar patents because all of the data I needed for this analysis, including the location of the inventors, is included in a patent data base maintained by the U.S. Patent and Trademark Office ("USPTO") and to be consistent with the later value related analysis. Because the USPTO data did not include information on pending patents or patents which were only filed outside of the U.S., it was necessary to restrict my sample to only U.S. granted patents and their associated foreign filings.

patents in a particular franchise received, the left-most circle denoting the franchise that received the most citations.

As expected, the figure confirms that Nortel's patents cite each other extensively across franchises, displaying the characteristics of patent development processes exhibited by companies that develop complex technologies.[36] By design, Nortel's R&D crossed technologies and products, making it very difficult to assign values to specific technologies and specific patents. This entanglement is complicated further by Nortel's international approach to R&D, which I will discuss further below.

IV. The Geographic Entanglement of Nortel's IP Creation Process

A. Nortel's Research Facilities

The atom chart (**Figure 3**) shown in Section III to illustrate technology convergence also serves to represent Nortel's view of its R&D process. That is, the company integrated the talents and focus of R&D centers around the world to develop the converged technologies demanded by service providers and their customers. The integration of Nortel's R&D function was a business imperative; capturing the scale of its R&D centers around the world and building upon prior work was the only way that the company could hope to compete in a highly competitive environment. In a September 2003 response to the U.S., Canadian, and U.K. taxing authorities' inquiries, Nortel stated that "[m]uch of Nortel's R&D is interrelated, and one specific project may be developed based upon older R&D projects or platforms."[37] Thus, even if all the inventors on a particular patent were from a single geographic region, it is likely that research from other regions performing basic research in other areas contributed to the technological advance.

The entanglement of Nortel's R&D process was not an accidental outcome; it was a direct result of Nortel's matrix organizational structure and collaborative R&D process. Throughout the 1990s and 2000s, Nortel employed roughly 10,000 full-time R&D staff; even after successive rounds of restructuring, its R&D staff totaled 12,000 in 2008, about 40 percent of its global headcount. The company's R&D team was distributed across the globe, with the main R&D offices located in Canada, U.S., France, U.K. and Ireland.[38] These research facilities were the result of either organic growth (Canada's Ottawa campus being the prime example), strategic acquisitions (U.K.'s

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[36] The patents that were "predominantly" associated with a single line of business were sold with that business. See Deposition of Gillian McColgan, November 8, 2013, pp. 124–125, 183–184 ("McColgan Deposition"). Although this suggests that the remaining patents in the portfolio sold to Rockstar were more entangled in their uses and value, all of Nortel's patents were entangled in their production.

[37] Exhibit 11169, Advanced Pricing Arrangement Responses to Questions Posed by Inland Revenue, Internal Revenue Services, Canada Customs and Revenue Agency, September 2007, NNC-NNL002707, p. 8.

[38] Exhibit 22078, p. PC0184926.

Maidenhead and Harlow sites), and/or strategic decisions (China and India research centers were established to lower cost).

R&D was managed along business units rather than geographic or legal-entity lines. R&D budgets were determined by business units and their sub-units, which ultimately determined the activities at various Nortel sites around the globe.[39] Local managers affiliated with the various business lines had input into the budgeting process,[40] but sites ultimately did not have independent authority to determine what they worked on.[41] Particularly during John Roese's tenure as chief technology officer ("CTO") of Nortel, the central CTO office had input into the overall R&D spending strategy.[42]

I note three key observations about Nortel's R&D function. First, Nortel sought to be recognized as a thought leader in the telecommunications technology space, which it saw as a necessity in order to remain competitive. Nortel firmly believed that its "R&D function [was] a global undertaking aligned with its business strategy of technology leadership. Engineers in each of Nortel's geographic markets work[ed] to develop next generation products. Researchers and engineers in Nortel's facilities and partner locations around the globe collaborate[d] to develop new, best in class products for which the Company [was] known."[43] The company also participated in approximately 100 global, regional, and national standards organizations, forums, and consortia.[44]

Second, Nortel saw that R&D in an industry as complex as telecommunications required a concerted and collaborative effort from a range of participants in order to remain competitive—especially in the converging telecommunications environment in which technologies "may migrate from segment to segment and from location to location."[45] Thus, Nortel's R&D activities were "highly distributed but executed in a coordinated fashion."[46] It could either distribute R&D assignments to individual R&D centers or deploy multiple centers to work on the same technology. [47] In that way, Nortel was able to realize R&D strength that was greater than the sum of its parts.

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[39] Briard Deposition, pp. 19, 37, and 41. See also, Deposition of Graham Richardson, October 28, 2013, pp. 81, 89–90 ("Richardson Deposition").

[40] Briard Deposition, pp. 60–63.

[41] Richardson Deposition, p. 92.

[42] Briard Deposition, pp. 48–49.

[43] Exhibit 11352, p. NNI_01534867.

[44] Exhibit 22078, pp. PC0184927–28.

[45] Exhibit 11352, p. NNI_01534868.

[46] Exhibit 22078, p. PC0184940.

[47] For example, optical R&D had been done in Ottawa, Harlow, and Paignton (supported by Montreal). Exhibit 11074, Email from David J. Canale: Responses to Questions, May 6, 2005, NNC-NNL016069–97, p. NNC-NNL016070.

Third, Nortel saw the results of its R&D—namely commercially exploitable products and intellectual capital—as its life blood. Nortel saw the creation of intellectual property rights as "fundamental,"[48] and used its intellectual property rights to "protect [its] investments in R&D activities, strengthen leadership positions, protect [its] good name, promote [its] brand name recognition, enhance competitiveness and otherwise support business goals."[49] Conducting R&D effectively and efficiently was therefore of the utmost importance to Nortel.

Nortel viewed its R&D activities and the resulting patents to be of vital importance. However, it also viewed the filing of patents as an expense that needed to be managed. This became increasingly the case following the deterioration of Nortel's financial condition,[50] when the IP law group's foreign filing budget was constrained.[51] Accordingly, Nortel filed patents in the U.S. first, and frequently only in the U.S.,[52] because the U.S. was a large market with a system of patent enforcement in place.[53] Nortel was very selective in its filing of patents outside of the U.S.[54]

Nortel's patent filings were not at all aligned with the locations where patents were developed.[55] It is likely that there would have been many more non-U.S. patent filings if Nortel's filing strategy reflected the full breadth of Nortel's R&D.[56] Nortel's decisions concerning where to file patents made sense, within the constraints of a limited budget for patent filings, for the company as a whole if and only if the participants to the R&D process were considered to be partners within the larger Nortel entity and would be party to the rewards that the company might realize.

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48 Nortel Networks Corporation, Form 10-K for the fiscal year ended December 31, 2007.

49 *Ibid.*

50 The fees for all patent filings came out of Nortel's law department budget, the cost for which was in turn allocated to the company's business lines. Deposition of Christopher James Cianciolo, October 15, 2013, p. 182. See also, Deposition of Angela de Wilton, November 20, 2013, pp. 58–60 ("de Wilton Deposition").

51 de Wilton Deposition, p. 63.

52 de Wilton Deposition, p. 167. See also, McColgan Deposition, p. 101; and Exhibit 21448, Foreign filing budget recommendations,), US_Canada_PRIV_00088792.

53 Deposition of Angela Anderson, October 31, 2013, p. 29 ("Anderson Deposition").

54 Exhibit 31304, Email from Angela de Wilton attaching foreign filing practice note, December 12, 2000, NNC-NNL06521384–85.

55 Anderson Deposition, p. 27–28; Exhibit. 11169, p. 7 ("However, it should be stressed that the choice of locations to file a patent application is often based upon the patent protection laws and therefore bears no correlation to where the efforts where undertaken to develop the invention.").

56 Deposition of John P. Veschi, November 7, 2013, pp. 256–58 ("Veschi Deposition").

B. Cross-Geography Patent Originations

The global nature of Nortel's R&D operations can be seen in statistics concerning origination of Nortel's patents. First, I examined valuable patents in Nortel's portfolio by the country origin of their inventors.[57] For patents with more than one inventor, the patent is split in proportion to the number of investors. For example, if a patent had three U.K. inventors and one U.S. inventor, then 75% of the patent is attributable to U.K. and 25% of the patent is attributable to U.S. Under this weighting method, **Table 1** shows that the majority of Nortel's top patents originated in Canada, with U.S. and U.K. inventors contributing 28% and 14%, respectively.

Table 1. "Top" Nortel Patents by Inventor Locations

	# of Patents	% of Total
U.S.	59	28%
Canada	115	54%
U.K.	29	14%
France	7	3%
Ireland	0	0%
Rest of World	3	1%
Total	**213**	**100%**

Sources: Nortel spreadsheets of top patent lists (NNI_01456049, US_EMEA_CANADA_PRIV_00185520, NNC-NNL06615574), and the USPTO.

I further examined the breakdown by inventor location of the U.S. granted patents and their associated foreign filings which were considered to be of "high value" among the patents that Nortel sold to Rockstar.[58] Using the same fractional inventor count method, I show a similar pattern in **Table 2:** Canada contributed 45%, U.S. 35%, and U.K. 14% of all of the high value Rockstar patents (last column of the table).

[57] Nortel's portfolio of patents was reviewed on several occasions. Reviews in 2002, 2006, and then again in 2010 identified the top patents that were in Nortel's portfolio at the time. A more detailed description of the data is provided in Appendix C.

[58] The spreadsheet listing of the Rockstar patents used for the analysis included a "high value" indicator variable which assigned one or two-star rankings to 1,439 of the patents Nortel sold to Rockstar. Related non-U.S. patents are U.S. patents filed overseas for which the data provided by Nortel indicates the patent numbers of the foreign filings. See Appendix C for more details.

Table 2. Rockstar High-Value Patents by Inventor Locations

	U.S. Granted				Non-U.S. Granted				Total Granted	
	Two Stars		One Star		Two Stars		One Star			
	#	%	#	%	#	%	#	%	#	%
U.S.	162	39%	425	41%	66	17%	134	32%	788	**35%**
Canada	191	46%	425	41%	215	54%	182	43%	1,013	**45%**
U.K.	43	10%	146	14%	64	16%	72	17%	325	**14%**
France	9	2%	23	2%	33	8%	18	4%	83	**4%**
Ireland	1	0%	7	1%	3	1%	8	2%	19	**1%**
Rest of World	6	1%	14	1%	18	4%	7	2%	44	**2%**
Total	**412**	**100%**	**1,040**	**100%**	**399**	**100%**	**421**	**100%**	**2,272**	**100%**

Sources and Notes: EMEAPROD2214888, tab "Assets", and the USPTO.

This includes three patents which were pending at the time but are now granted (U.S. patent numbers 7,738,437, 8,626,241, and 8,179,864), and one patent that was never filed in the U.S. (Nortel disclosure number 13961FR).

Percentages may not appear to sum to 100% due to rounding.

Finally, I examined the entire portfolio of U.S. granted patents that were included in the Rockstar transaction and their associated foreign filings (**Table 3**). The similar pattern seen in **Table 1** and **Table 2** remains.

Table 3. Total Rockstar Patents by Inventor Location

	U.S. Granted	Non-U.S. Granted*	Total Granted	% of Total Granted
U.S.	934	244	**1,179**	**31%**
Canada	1,250	554	**1,804**	**47%**
U.K.	376	211	**587**	**15%**
France	75	74	**148**	**4%**
Ireland	14	11	**25**	**1%**
Rest of World	36	33	**69**	**2%**
Total	**2,684**	**1,127**	**3,811**	**100%**
U.K. % of Total	**14%**	**19%**	**15%**	

Sources and Notes: EMEAPROD2214888, tab "Assets", and the USPTO.

*This excludes non-U.S. granted patents which were never granted in the U.S.

Tables 1, 2 and **3** reinforce the view that Nortel's patents originated from collaborations among Nortel's R&D centers around the world, and that the contribution made by a Nortel R&D center may be different from what a simple percentage of R&D spending statistic alone may indicate. For example, based on the number of patents produced, the value provided by inventors in the U.K. appears to be more than its relative spending on R&D would suggest (*i.e.*, the U.K. accounted for 3.6% of Nortel's total spending on R&D in 2001 through 2005 but accounted for a much larger share of patents produced).[59] Put another way, a country like the U.K. apparently "fought above its weight" in terms of R&D productivity and added more value per dollar of R&D.

It should also be noted that the U.K. inventors' higher percentage involvement in the non-U.S. granted patents (column headed "Non-U.S. Granted") suggests that U.K. contributed more to the higher value patents, because only more valuable patents were filed outside the U.S. For example, an internal Nortel email from August 2005 states that "Although it is not commonly known, for strategic reasons, Nortel files patent applications to protect its intellectual property rights ('IPR') first in the United States and then, one year later, it files equivalents of those applications deemed most important (*i.e.*, approximately the 'top 12%') in strategically selected countries outside the United States (such as Canada, UK, France, Germany, China, India, Brazil, Mexico, and Japan) on a case-by-case basis."[60]

C. Cross-Geography Patent Citations

The impact of Nortel's integrated management of R&D process can be seen from the cross-citation analysis across geography, that is, that the R&D effort was highly collaborative and was cross-cited across technologies and across geographies. To illustrate this, I analyzed Nortel's portfolio of patents to assess the degree of international R&D collaboration (similar to the way that I analyzed the Nortel patents to determine the degree of citations across technologies and market segments above). The results of my analysis are depicted in **Figure 6**, in which I show patents by their association with their country of origin. Each country is represented by a circle. The size of the circles reflects the number of patents to which the country contributed, and directed arrows link patents from one country (i.e., the citing) to patents in another country (the cited), with the thickness of the arrow reflecting the number of citations.[61]

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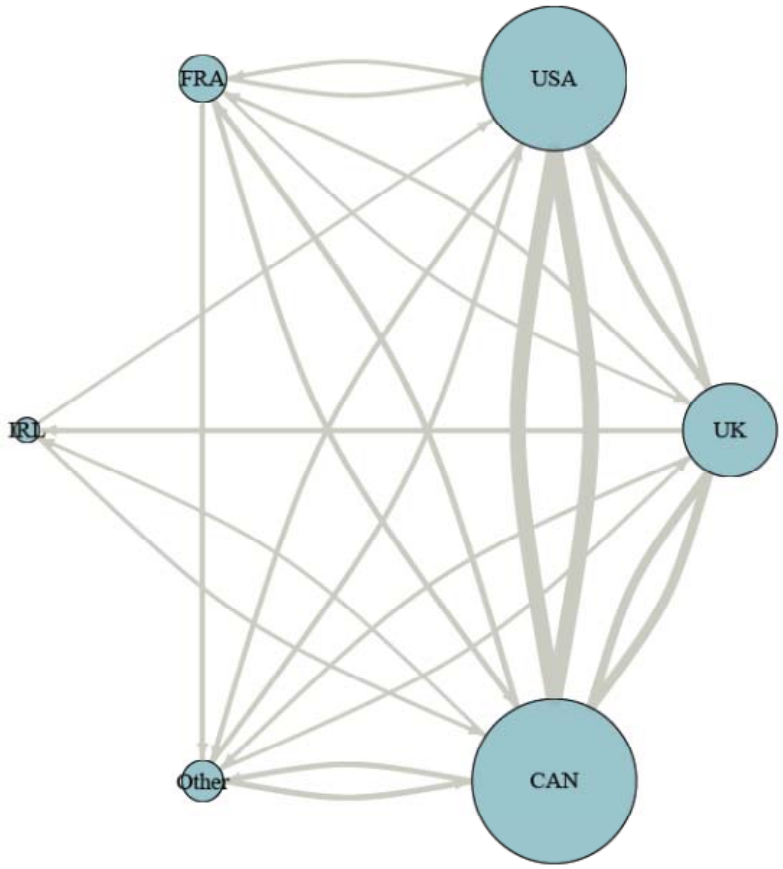
[59] Nortel transfer pricing model, Q4 2008 calculation, NOR_53648048.

[60] Exhibit 21190, Email from John Crane: Quarterly "Further Filing" Meeting August 24, 2005, August 17, 2005, NNC-NNL06904417 (emphasis original).

[61] Similarly to Figure 5, in Figure 6 the size of each node (vertex or bubble) is proportional to the square root of the number of unique patents classified by that node. The width of each edge (arrow) is proportional to the square root of the number of citations connecting two nodes. The direction the edge (arrow) points goes from the citing node to the cited node). A more detailed description of how the figure was constructed is provided in Appendix C.

Figure 6. Interconnectedness of Nortel's Rockstar Patents by Inventor Country

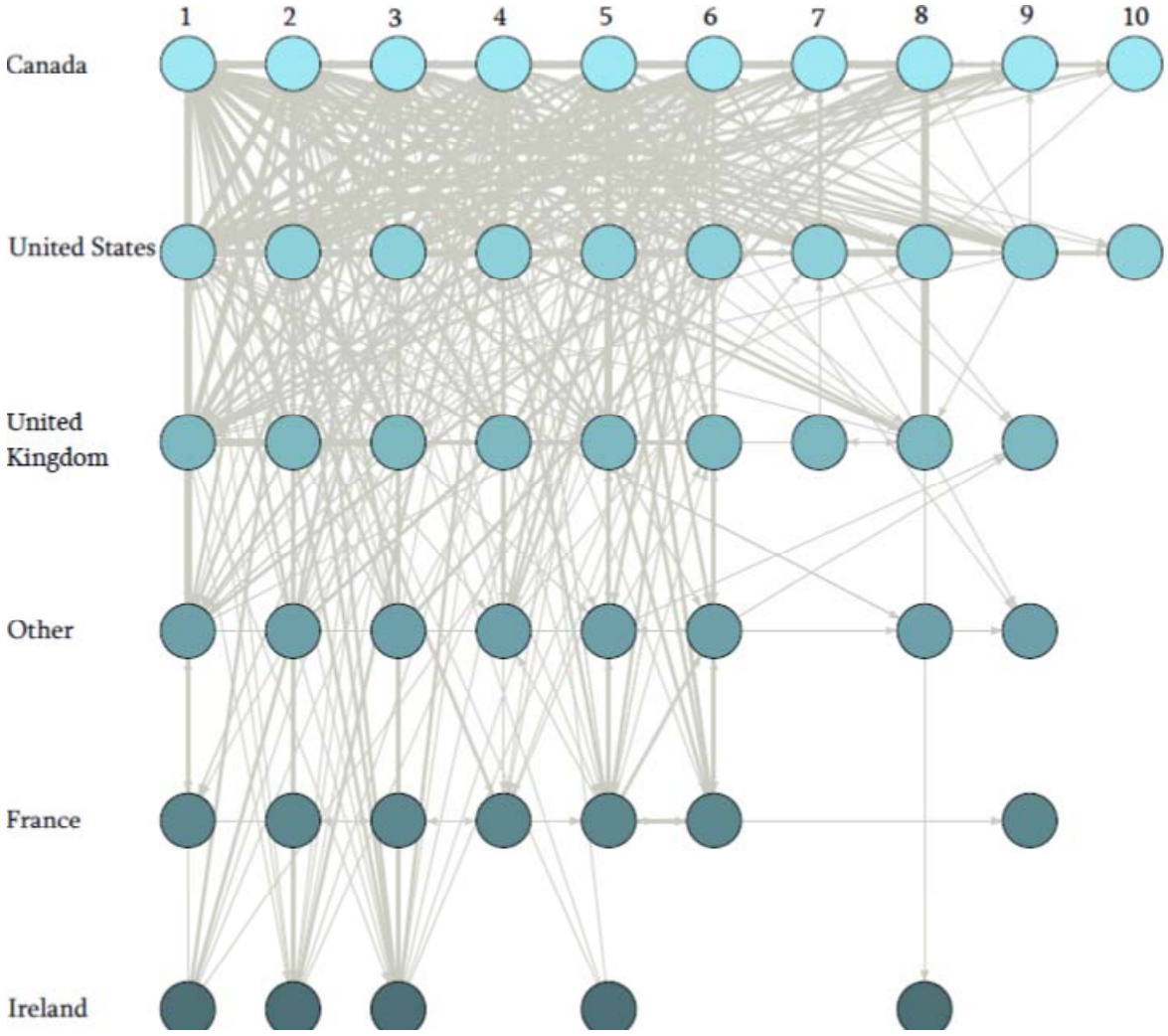


Notes: The Figure is based on the 2,684 U.S. granted Rockstar patents (EMEAPROD2214888, tab "Assets") and on publicly available data inventor location from the USPTO.

The citation patterns shown in **Figure 6** indicate that connections were significant across Nortel's R&D centers, particularly among the U.S., Canada, and the U.K.

An examination of Nortel's cross country-franchise patent citations further demonstrate the two levels of technological and geographical interrelatedness of Nortel's R&D creation process. In **Figure 7**, I show patents by their association with their country of origin and by franchise with which they are associated. Each country-franchise combination is represented by a circle. The color of the circle represents the country, and circles for a given country (category) are displayed along the rows (columns). Directed arrows from one country-category (the cited) to another (the citing) indicate forward citations, and the thickness of the arrow is proportional to the number of citations. As I did for the interconnectedness of patents by franchise, I order Nortel franchises from left to right based on the relative number of forward citations, the left-most franchise denoting the franchise that received the most citations. Similarly, I order Nortel subsidiaries from top to bottom based on the relative number of forward citations, the upper-most country being the one that received the most citations.

Figure 7. Interconnectedness of Nortel's Rockstar Patents by Franchise and Inventor Country



Notes: The Figure is based on the 2,684 U.S. granted Rockstar patents (EMEAPROD2214888, tab "Assets") and on publicly available data on patent citations and inventor locations from the USPTO. The ten categories from left to right represent Data (1), Enterprise Voice (2), Carrier Voice (3), Service Provider (4), Wireless Infrastructure (5), Wireless Handset (6), Other (7), Optical (8), PC (9) and Internet (10).

Figure 7 shows a complex web of citation links from and to inventor locations and franchises. The interconnections among Nortel's geographic locations and franchises are representative of flows of the company's R&D capital. As indicated in the diagram, these flows are particularly pronounced within and across the Canadian, U.S., and U.K. estates. The distinct network of diagonal connections between franchises and countries indicates a high degree of collaboration across Nortel's R&D centers. If Nortel's R&D efforts were isolated on an intra-franchise level, one would see thick directed arrows concentrated along the columns. Likewise, if the company's R&D efforts were contained within countries, one would see thick directed arrows concentrated along the rows. Neither of these patterns dominates. Instead, we see both vertical, horizontal, and a very interconnected web of diagonal lines indicating

that Nortel's R&D efforts were highly integrated and collaborative—as the company had represented and as I referenced earlier in my Report.

It should also be noted that, although my analyses above are exclusively based on patents and patent citations, the interconnectedness of Nortel's R&D process and outputs goes beyond the more readily observable patents. For one thing, many basic research innovations are simply not "patentable" and hence excluded from my analyses above, but there is no denial that basic scientific research was also conducted across geographies.[62] Moreover, human interaction and knowledge spillover within and across various research labs existed at a more fundamental and deeper level. Also, to the extent that the Nortel brand represented world class R&D, it was not for country specific R&D, but rather for its international, integrated R&D platform.

D. Pro Rata Distribution Model

To sum up, it is my opinion that the Pro Rata Distribution Model is an economically rational method of allocating the contents of the lockbox. I reviewed Nortel's management and organizational structure and its R&D process from deposition evidence at some length, and I analyzed a large sub-set of Nortel patents in order to empirically determine the extent of inter-relationships among the company's IP assets. These analyses clearly demonstrate that Nortel was viewed as and operated as a single highly integrated entity, and that the company's legal organizational structure never, or at most seldom, played any role in incentivizing management, allocating resources, monitoring performance, or in the decisions to acquire or maintain intellectual property.

Nortel's level of integration in its operations and its R&D indicates that it is challenging at best to separate the inputs involved in its IP value creation process. Furthermore, and of significant impact, the outputs of this process (*i.e.*, its IP assets) were entangled amongst each other; cross-citations that cross technologies and geographies were the norm, not the exception.

The Pro Rata Distribution Model is more in line with the way that Nortel actually ran its business than are the alternate allocation methodologies (which I briefly discuss below in Section V). The Pro Rata Distribution Model does not require, for example, estimation of the relative bargaining strengths of the estates in order to address, hypothetically, Nortel's jointly produced and jointly owned IP rights. Using such an approach allows the courts to avoid complicated, contentious, and unnecessary issues of how to allocate common assets in the lockbox.[63]

I understand that there are different legal mechanisms for carrying out a pro-rata approach in practice. I have not been asked to opine upon the specific legal mechanics for carrying out the

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[62] Exhibit 11169, p. 8.

[63] Although as a legal matter the lockbox proceeds will be allocated to the estates, the proposed basis for calculating the amount dispensed to each estate is simply the amount needed to make a Pro Rata Distribution Model work.

allocation or to calculate the amounts to be allocated, and offer no opinion on the matter at this time.

V. Alternative Allocation Methodologies

As alternatives to the Pro Rata Distribution Model, the bankruptcy estates have proposed different methodologies for allocating proceeds from the lockbox. Each of the three estate-based allocation proposals is based upon an interpretation of Nortel's Master Research and Development Agreement ("MRDA"), which was part of Nortel's transfer pricing arrangement.

- *R&D Contribution Approach*: This approach was proposed by the EMEA estate based on the allocation of Nortel's operating profits (or losses) under the MRDA to certain participants (referred to as Residual Profit Entities or RPE's). This approach assumes a certain relation between R&D spending and the value of the IP assets that ultimately were monetized through the sale of Nortel's assets. It also requires consideration of the effective life of R&D and possibly intra-company funding of R&D as well.

- *Revenue or "Fair Market Value" Allocation*: This approach was proposed by the U.S. debtor and bondholders as represented by Unofficial Creditors Committee (UCC). It is based on an interpretation of the MRDA which grants each RPE the exclusive right to sell Nortel products and services in its own territory plus a non-exclusive right for sales in the countries not covered by the RPEs. This approach relies on certain assumptions including about the relative revenues that would have been generated by each RPE's nonexclusive and exclusive rights.

- *Legal Title Approach: This approach was proposed by the Canadian estate, based on the* position that the MRDA (and its predecessor document) conferred the legal title of all the Nortel patents to NNL, the Canadian company, although the remaining RPEs enjoyed rights to Nortel's IP. This approach relies on certain assumptions, including concerning the ownership interests of NNL as compared to those of the RPEs.

The transfer pricing model, its associated APA application, and the MRDA were all developed to ensure that the company was in compliance with tax requirements.[64] The transfer pricing arrangement also accomplished the company's goal to move cash to Canada, a relatively low tax rate jurisdiction, thereby lowering Nortel's worldwide effective tax rate to the benefit of the entire company. It is important to recognize, however, that Nortel's transfer arrangements and results had no bearing on the way the company managed and incentivized its staff nor did it have any effect on the way the company operated. In fact many of Nortel's senior managers were only barely aware of the existence of the MRDA, let alone the detailed transfer pricing

[64] See, for example, Deposition of Walter Henderson, October 4, 2013, pp. 201–202. See also, Deposition of Karina O, November 9, 2013, pp. 43–45, 49–52; Deposition of James Gatley, November 7, 2013, p. 56.

arrangements it contained.[1] Additionally, Nortel explicitly declared to the taxing authorities that "decisions on R&D spending are made by Nortel's business unit leaders. Input is not sought from the taxation department in determining where to perform R&D activities."[2]

I understand that the other parties will present their own descriptions of their proposed allocation methodologies in the current proceeding, and I reserve the right to review and offer my opinions on those proposals when their details are presented. However, it is apparent that each of these alternative methodologies necessarily relies on certain assumptions about the nature of the IP assets sold by Nortel and the rights of the parties under the MRDA. In addition to comporting with the manner in which Nortel actually conducted its business—namely as a single integrated firm—the Pro Rata Distribution Model does not suffer from this drawback.

Dated: January 24, 2014

Coleman Bazelon

[1] See, for example, Veschi Deposition, pp. 237–238. See also, Deposition of Brian McFadden, October 21, 2013, p. 201; and Deposition of Gregory Mumford, October 24, 2013, pp. 214-215.

[2] Exhibit 21031, Nortel Networks Multilateral APA Responses to IRS Information and Document Request, April 26, 2004, NNC-NNL000073-91, p. NNC-NNL000083.

APPENDIX A

Curriculum Vitae

Dr. Coleman Bazelon is a principal in the Washington, DC office of *The Brattle Group*. He is an expert in regulation and strategy in the wireless, wireline, and video sectors. He has consulted and testified on behalf of clients in numerous telecommunications matters, ranging from wireless license auctions, spectrum management, and competition policy, to patent infringement, business valuation, and broadband deployment.

Dr. Bazelon frequently advises regulatory and legislative bodies, including the U.S. Federal Communications Commission and the U.S. Congress. He also has expertise in the federal government's use of discount rates for policy and regulatory analysis, intellectual property valuation, economic impact analysis, and antitrust and damages analysis.

Throughout his career, Dr. Bazelon has had extensive experience with spectrum license auctions. He advises on and evaluates numerous auction designs and regularly serves as an auction advisor for bidders in spectrum license auctions.

Prior to joining *Brattle*, Dr. Bazelon was a vice president with Analysis Group, an economic and strategy consulting firm. During that time, he expanded the firm's telecommunications practice area. He also served as a principal analyst in the Microeconomic and Financial Studies Division of the Congressional Budget Office where he researched reforms of radio spectrum management; estimated the budgetary and private sector impacts of spectrum-related legislative proposals; and advised on auction design and privatization issues for all research at the CBO.

SELECTED CONSULTING PROJECTS

Litigation

- Evaluated damages from allegations of reputational harm.
- Evaluated damages from non-working wireless network equipment.
- Assessed Domestic Industry requirement in ITC 337 case involving wireless equipment patents.
- Assessed commercial viability of full text searching of books business model.
- Assessed Domestic Industry requirement in ITC 337 case involving portable storage device patents.
- Estimated value of satellite assets in bankruptcy.
- Estimated damages from denial of pole attachments.
- Provided written testimony evaluating the performance of a numbering resource administrator.
- Provided written testimony on the ability to estimate damages for a class of satellite phone users.

- Provided written testimony on the economic value of Rights-of-Ways in Massachusetts.
- Estimated damages for a broadcast tower permit revocation.
- Provided oral testimony on the proprietary nature of specific information contained in a statewide public safety network bid.
- Provided written testimony on economic value associated with items provided in a labor neutrality agreement.
- Estimated damages associated with USF and other telephone taxes paid by a calling card reseller.
- Assessed the damages associated with the infringement of patents related to VoIP technology and the likely impact of a permanent injunction.
- Estimated recoverable data costs for two pesticides.
- Estimated cost of delay in granting local cable franchise.
- Analyzed the economic underpinnings of an exclusivity clause of a mobile phone affiliation agreement.
- Assessed commonality issues of physicians for class certification of RICO action against a set of health insurance companies.
- Estimated "Loss of Use" damages for a severed fibre optic cable.
- Provided written testimony estimating the value of a surety bond in a contract dispute involving toll free phone numbers used in an enhanced service application.
- Assessed damages associated with infringement of patents used to provide Voice over Internet Protocol (VoIP).
- Assessed basis for guidance of a large telecommunications firm in a 10-b securities litigation.
- Valued digital television radio spectrum in St. Louis in the pre-litigation phase of a breach of contract dispute.
- Estimated damages in a breach of contract case involving the sale of a fibre optic network.
- Researched the basis for generally optimistic forecasts of broadband deployment in the later 1990s and early 2000s in an anti-trust litigation.
- Researched the basis for generally optimistic beliefs about the telecommunications sector .in the late 1990s in a 10-b securities litigation.
- Assessed the market for Competitive Local Exchange Carriers in an SEC fraud case.
- Assessed a bankruptcy sale proposal for a national tier 1 broadband backbone provider.
- Examined the business case asserted for a small wireless reseller in a breach of contract litigation.
- Assessed damages associated with infringement of patents used in DNA fingerprinting applications.
- Assessed changes in contributions to the Cable Royalty Fund on behalf of Sports Claimants in a Copyright Arbitration Royalty Panel (CARP) proceeding.

- Assessed the capital adequacy of the U.S. branch of a foreign bank.

Regulatory Proceedings

- Provided testimony in prison phone rate proceeding.
- Estimated economic impact of LNP on RLECs.
- Assessed relevance of U.S. UNE-L experience for New Zealand benchmarking proceeding.
- Authored analysis of harm from revoking LightSquared's ATC authorization .
- Estimated value of pairing Upper 700 MHz A Block with public safety.
- Estimated impact of increased regulatory uncertainty on spectrum value.
- Estimated value of government provision of GPS service to private industry.
- Coauthored analysis of feasibility of reallocating broadcast television through the use of incentive auctions.
- Analyzed impact on spectrum value of pairing AWS III spectrum.
- Coauthored analysis of the merits of licensed versus unlicensed allocation of the TV White Spaces.
- Estimated the value of TV White Spaces.
- Provided written testimony on the economic harm of using proprietary information in retention marketing.
- Provided written testimony on the economics of pole attachment rates.
- Estimated the value of the PCS H-Block spectrum band.
- Estimated the economic impact of ITC Exclusion Order on cell phone handsets.
- Authored several reports on the 700 MHz auction rules.
- Analyzed the relationship between the size of cable systems and the economics of the programming market.
- Presented analysis on pricing differentials in overlapping cable markets.
- Assessed proposed regulation of mobile phone roaming rates.
- Analyzed impact of local franchise requirements on competition in the video marketplace.
- Developed and assessed Indian spectrum management proposals.
- Analyzed economic ramifications of à la carte cable channel pricing on consumers and the cable and television programming industries.
- Examined the relative merits of licensed versus unlicensed radio spectrum and the effects of "underlay" licenses on existing commercial licensees.
- Examined federalism issues related to mobile telephony regulation.
- Examined and refuted arguments suggesting that the California Telecommunications Consumer Bill of Rights was an appropriate response to market failures.
- Assessed the impact on consumers of California's Telecommunications Consumer Bill of Rights proposal.
- Provided written testimony refuting analysis purporting to show a positive relationship between UNE-P and telecom network investment.
- Provided written testimony examining the effects of unbundling regulations on capital spending in the telecommunications sector.

- Estimated the adjustment to the TELRIC pricing formula to account for irreversible investment in the local telephone network.
- Examined the impact of irreversible investments in the local telephone network on the TELRIC pricing methodology.
- Assessed the degree of market overlap of two food service firms for purposes of merger review.
- Provided written testimony that assessed the validity of an analysis of the costs of a DTV tuner mandate.
- Provided written testimony of a forecast of toll free number demand for the toll free number administrator, SMS/800, in a rate case proceeding.

Other

- Evaluated performance of TV stations when repacked in an Incentive Auction.
- Analyzed differences in U.S. and European wireless markets.
- Assessed business case and value of HF license holder.
- Analyzed likely auction outcomes for TV broadcaster participating in incentive auction.
- Assessed value of commercial mobile spectrum bands.
- Analyzed economic impacts of the commercial casino industry.
- Evaluated impact of digitization on copyright industries.
- Analyzed economic and employment effects of Dutch gas hub.
- Advised bidder in Indian 3G spectrum license auction.
- Estimated economic and employment effects of network neutrality regulation.
- Analyzed relative costs of wireless and wireline deployments in rural areas.
- Analyzed potential harms from Internet gambling.
- Estimated economic value of reallocating TV spectrum for wireless broadband.
- Estimated economic and employment effects of electric power transmission construction in support of new wind generation facilities.
- Estimated economic and employment effects of broadband stimulus grant applications.
- Estimated employment effects of an ATC-mobile satellite network deployment.
- Analyzed the impact of reducing international mobile phone roaming charges.
- Developed an auction platform for an electricity procurement auction.
- Analyzed the economic impacts of reduced mobile phone taxes in Africa and the Middle East.
- Evaluated the impact of reducing ethanol requirements on gasoline prices.
- Analyzed FRAND licensing requirements for intellectual property in the DTV standard.
- Advised bidder in Canadian AWS spectrum license auction.
- Advised bidder in FCC 700 MHz spectrum license auction.
- Evaluated a business plan for proposed dam removals.
- Assessed a business plan involving the WiMAX market.
- Estimated the value of a portfolio of spectrum licenses.
- Assessed the budgetary impacts of legislation to license TV white spaces.

- Analyzed the economics of the military's build versus buy decision for broadband satellite communications capacity.
- Advised bidder in FCC AWS spectrum license auction.
- Provided framework to estimate impact of the effect of designation of TV white spaces as unlicensed on 700 MHz auction receipts.
- Analyzed Universal Service Fund expenditures.
- Analyzed cable franchising requirements.
- Valued proposals to re-band the Upper 700 MHz Band of radio spectrum.
- Analyzed proposed accelerated digital television transition impacts on society and the federal budget.
- Coauthored a report on the value of a portfolio of patents used to provide Voice over Internet Protocol (VoIP).
- Coauthored a report to the U.S. Chamber of Commerce on the economic effects of telecommunications deregulation.
- Assessed the business cases for IRU swaps of a large international fibre optic network owner.
- Examined the effects of unbundling regulations on broadband penetration internationally.

TESTIMONY AND DECLARATIONS

"Expert Report of Coleman Bazelon, Ph.D.," In the Matter of Sky Angel U.S., LLC, against Discovery Communications, LLC, Animal Planet, LLC, United States District Court for the District of Maryland, Case No. 8:13-cv-00031-DKC, December 6, 2013.

"Expert Report of Coleman Bazelon, Ph.D. and Armando Levy, Ph.D," In the Matter of LT Game International Ltd., against Shuffle Master, Inc., United States District Court for the District of Nevada, Case No. 2:12-cv-01216-JAD-GWF, October 4, 2013.

"Expert Report of Coleman Bazelon, Ph.D.," In the Matter of Certain Electronic Devices, Including Wireless Communications Devices, Tablet Computers, Media Players, and Televisions, and Components Thereof, United States International Trade Commission, Investigation No. 337-TA-862 (Judge Shaw), July 5, 2013.

"Declaration of Coleman Bazelon" In the Matter of PTA-FLA, Inc, Daredevil, Inc., NTCH-WEST TENN., Inc., NTCH-WA, Inc., and Eric Steinmann against ZTE Corporation, and ZTE USA, Inc. Florida Arbitration, Case No.: 50-494-T-00665-11, February 26, 2013.

"Rebuttal Testimony of Coleman Bazelon," In re: Petition for Suspension or Modification of Application of the Requirements of 47 U.S.C. § 251(b) and (c), pursuant to 47 U.S.C. § 251(f)(2) regarding Time Warner Cable Information Services (Maine) LLC's Request, State of Maine Public

Utilities Commission, Docket No. 2012-198, Docket No. 2012-218, Docket No. 2012-219, Docket No. 2012-220, Docket No. 2012-221, October 12, 2012.

"Testimony of Coleman Bazelon, Ph.D.," In re: Petition for Suspension or Modification of Application of the Requirements of 47 U.S.C. § 251(b) and (c), pursuant to 47 U.S.C. § 251(f)(2) regarding Time Warner Cable Information Services (Maine) LLC's Request, State of Maine Public Utilities Commission, Docket No. 2012-198, Docket No. 2012-218, Docket No. 2012-219, Docket No. 2012-220, Docket No. 2012-221, August 20, 2012.

"Expert Report of Dr. Coleman Bazelon," *Salsgiver Communications, Inc., Salsgiver Telecom, Inc., and Salsgiver Inc. v. Consolidated Communications Holdings, Inc., North Pittsburgh Systems, Inc., and North Pittsburgh Telephone Company, Inc.,* Court of Common Pleas, Allegheny County, Pennsylvania, Civil Division, No. GD 08-7616, May 10, 2012.

"Oral Testimony of Coleman Bazelon, The Brattle Group, Inc. before the U.S. House of Representatives, Committee on Energy and Commerce Subcommittee on Communication and Technology," April 12, 2011. (spectrum)

"Testimony of Coleman Bazelon, Principal, *The Brattle Group*, before the U.S. House of Representatives, Committee on Energy and Commerce, Subcommittee on Communications, Technology, and the Internet," June 17, 2010 (spectrum valuation).

"Supplemental Expert Report of Coleman Bazelon," *Gemalto PTE LTD and Gemplus S.A. v. Telecommunications Industry Association*, United States District Court for the Eastern District of Virginia, Alexandria Division, Case 1:08-cv-00776-LMB-TRJ, December 16, 2008.

"Expert Report of Coleman Bazelon," *Gemalto PTE LTD and Gemplus S.A. v. Telecommunications Industry Association*, United States District Court for the Eastern District of Virginia, Alexandria Division, Case 1:08-cv-00776-LMB-TRJ, November 6, 2008.

"Prefiled Rebuttal Testimony of Coleman D. Bazelon," In re: Complaint and Request for Emergency Relief Against Verizon Florida LLC for anticompetitive behavior in violation of Sections 364.01(4), 364.3381, and 364.10, F.S., and for failure to facilitate transfer of customers' numbers to Bright House Networks Information Services (Florida) LLC, and its affiliate, Bright House Networks, LLC, Florida Public Service Commission, Docket No. 070691-TP, July 25, 2008.

"Prefiled Direct Testimony of Coleman D. Bazelon," In re: Complaint and Request for Emergency Relief Against Verizon Florida LLC for anticompetitive behavior in violation of Sections 364.01(4), 364.3381, and 364.10, F.S., and for failure to facilitate transfer of customers' numbers to Bright House Networks Information Services (Florida) LLC, and its affiliate, Bright House Networks, LLC, Florida Public Service Commission, Docket No. 070691-TP, May 30, 2008.

"Declaration of Coleman Bazelon in Support of Plaintiffs' Motion for Class Certification," *Kenneth Stickrath, et al v. Globalstar, Inc.*, United States District Court for the Northern District of California, San Francisco Division, Case No. 07-CV-01941 TEH, April 25, 2008.

"Testimony of Coleman Bazelon, Principal, *The Brattle Group*, before the U.S. House of Representatives, Committee on Energy and Commerce, Subcommittee on Telecommunications and the Internet," April 15,2008 (reviewing the 700 MHz auction).

"Concerning the Meaning of 'Fair and Reasonable Compensation' in Section 253(c) of the Telecommunications Act of 1996 and the Comparability of the Rights-of-Way Fees Paid by Level 3 in Massachusetts and Elsewhere," *The Massachusetts Turnpike Authority v. Level 3 Communications, LLC, et al.,* The United States District Court for the District of Massachusetts, Civ. Act. No. 06-11816, December 17, 2007.

"Concerning the Effects of the Fixed Rent Charged for Access to the Massachusetts Turnpike," *The Massachusetts Turnpike Authority v. Level 3 Communications, LLC, et al.,* The United States District Court for the District of Massachusetts, Civ. Act. No. 06-11816, November 12, 2007.

"Affidavit of Dr. Coleman Bazelon," *Gulfside Casino Partnership v. Mississippi Riverboat Council, et al.*, United States District Court for the Southern District of Mississippi, Southern Division, Cause No. 1:07-CV-110-LG-JMR, May 4, 2007.

"Rebuttal Report of Dr. Coleman Bazelon," *Level 3 Communications, LLC, v. City of St. Louis, Missouri*, United States District Court for the Eastern District of Missouri, Eastern Division, Consolidated Case No. 4:04-CV-871 CAS, June 17, 2005.

"Affidavit of Dr. Coleman Bazelon," *Informed Communications Systems, Inc. v. Intelogistics Corp., d/b/a Prosodie Interactive*, United States District Court, Southern District of Florida, Miami Division, Case No.: 04-61245 CIV Huck/Turnoff (October 12, 2004).

EXPERT DESIGNATIONS

- *Touch America, Inc. v. Qwest Communications International, Inc.*
    - Designated as an expert in Arbitration (June 2003)
- *Informed Communications Systems, Inc. v. Intelogistics Corp., d/b/a Prosodie Interactive*, United States District Court, Southern District of Florida, Miami Division, Case No.: 04-61245 CIV Huck/Turnoff
    - Filed affidavit (October 12, 2004)
- *Level 3 Communications, LLC v. City of St. Louis, Missouri*, United States District Court for the Eastern District of Missouri, Eastern Division, Consolidated Case No. 4:04-CV-871 CAS
    - Filed Rebuttal Report (June 17, 2005)

- Deposition (July 14, 2005)

- Cable Merger before the FTC
  - Presented analysis to FTC staff (March 20, 2007)
- *Gulfside Casino Partnership v. Mississippi Riverboat Council, et al.*, United States District Court for the Southern District of Mississippi, Southern Division, Cause No. 1:07-CV-110-LG-JMR
  - Filed affidavit (May 4, 2007)
- *Motorola, Inc. v. State of Mississippi Department of Information Technology Services and M/ACom, Inc.*, Chancery Court of Hinds County, Mississippi, Cause No. G2006-2179 S/2
  - Testified (May 23, 2007)
- *American Towers, Inc. v. Jackson & Campbell, P.C., et al.*, DC Superior Court, No. 003277-06
  - Deposition (March 19, 2009)
  - Filed Affidavit (May 22, 2009)
- *The Massachusetts Turnpike Authority v. Level 3 Communications, LLC, et al.,* The United States District Court for the District of Massachusetts, Civ. Act. No. 06-11816
  - Filed Expert Report (November 12, 2007)
  - Filed Rebuttal Report (December 17, 2007)
  - Deposition (January 21, 2008)
- *Kenneth Stickrath, et al v. Globalstar, Inc.,* United States District Court for the Northern District of California, San Francisco Division, Case No. 07-CV-01941 THE
  - Filed Declaration (April 25, 2008)
  - Deposition (June 11, 2008)
- In re: Complaint and request for emergency relief against Verizon Florida LLC for anticompetitive behavior in violation of Sections 364.01(4), 364.3381, and 364.10, F.S., and for failure to facilitate transfer of customers' numbers to Bright House Networks Information Services (Florida) LLC, and its affiliate, Bright House Networks, LLC, Florida Public Service Commission, Docket No. 070691-TP
  - Filed Direct Testimony (May 30, 2008)
  - Filed Rebuttal Testimony (July 25, 2008)
  - Deposition (August 13, 2008)

- *Gemalto PTE LTD and Gemplus S.A. v. Telecommunications Industry Association,* United States District Court for the Eastern District of Virginia, Alexandria Division, Case 1:08-cv-00776- LMB-TRJ
    - Filed Expert Report (November 6, 2008)
    - Deposition (December 2, 2008)
    - Filed Supplemental Expert Report (December 16, 2008)
- *Salsgiver Communications, Inc., Salsgiver Telecom, Inc., and Salsgiver Inc. v. Consolidated Communications Holdings, Inc., North Pittsburgh Systems, Inc., and North Pittsburgh Telephone Company, Inc.*, Court of Common Pleas, Allegheny County, Pennsylvania, Civil Division, No. GD 08-7616
    - Filed Damages Analysis (February 27, 2009)
    - Deposition (April 3, 2012)
    - Filed Expert Report (May 10, 2012)
- *Certain Products Containing Interactive Program Guide and Parental Control Technology* United States International Trade Commission, Investigation No. 337-TA-820
    - Designated as an expert (June 8, 2012)
- In re: Petition for Suspension or Modification of Application of the Requirements of 47 U.S.C. § 251(b) and (c), pursuant to 47 U.S.C. § 251(f)(2) regarding Time Warner Cable Information Services (Maine) LLC's Request, State of Maine Public Utilities Commission, Docket No. 2012-198, Docket No. 2012-218, Docket No. 2012-219, Docket No. 2012-220, Docket No. 2012-221
    - Filed Direct Testimony (August 20, 2012)
    - Filed Rebuttal Testimony (October 12, 2012)
    - Testified (October 23, 2012)
- In the matter of PTA-FLA, Inc , Daredevil, Inc., NTCH-WEST TENN., Inc., NTCH-WA, Inc., and Eric Steinmann against ZTE Corporation, and ZTE USA, Inc. Florida Arbitration, Case No.: 50-494-T-00665-11
    - Filed Expert Report (February 26, 2013)
    - Deposed (March 15, 2013)
    - Testified (August 30, 2013)
- *Certain Electronic Devices, Including Wireless Communications Devices, Tablet Computers, Media Players, and Televisions, and Components Thereof*, United States International Trade Commission, Investigation No. 337-TA-862 (Judge Shaw)
    - Filed Rebuttal Testimony (July 5, 2013)

- In the matter of LT Game International Ltd., against Shuffle Master, Inc., United States District Court for the District of Nevada, Case No. 2:12-cv-01216-JAD-GWF
    - Filed Expert Report (October 4, 2013)
- In the Matter of Sky Angel U.S., LLC, against Discovery Communications, LLC, Animal Planet, LLC, United States District Court for the District of Maryland, Case No. 8:13-cv-00031-DKC
    - Filed Expert Report (December 6, 2013)

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John Jarosz, Robin Heider, Coleman Bazelon, Christine Bieri and Peter Hess, "Patent Auctions: How Far Have We Come?" *les Nouvelles*, March 2010, pp. 11-30.

"Too Many Goals: Problems with the 700 MHz Auction," *Information Economics and Policy*, June 2009, pp. 115-127.

"Licensed or Unlicensed: The Economic Considerations in Incremental Spectrum Allocations," *IEEE Communications Magazine*, March 2009, pp. 110-116.

Michael H. Rothkopf and Coleman Bazelon, "Interlicense Competition: Spectrum Deregulation Without Confiscation or Giveaways," OBTAINING THE BEST FROM REGULATION AND COMPETITION, Michael A. Crew and Menahem Spiegel, eds., Kluwer Academic Publishers (2005), pp. 135-159.

"Next Generation Frequency Coordinator," *Telecommunications Policy* 27 (2003), pp. 517-525.

Coleman Bazelon and Kent Smetters, "Discounting in the Long Term," *Loyola of Los Angeles Law Review*, Vol. 35, Issue 1, November 2002.

Coleman Bazelon and Kent Smetters, "Discounting Inside the Washington DC Beltway," *Journal of Economic Perspectives*, Fall 1999.

"The Movement of Markets," *Wesleyan Economic Journal*, Spring 1986.

"Is the Psychogenic Theory of History Scientific?" *Journal of Psychohistory*, Fall 1985.

White Papers, Reports, Studies, and Reviews

Coleman Bazelon and Giulia McHenry, "The Economics of Spectrum Sharing," Telecommunications Policy Research Conference, 2013.

Coleman Bazelon and Giulia McHenry, "Violating Your Privacy: An Economic Perspective," Telecommunications Policy Research Conference, September 24, 2013.

Coleman Bazelon and Giulia McHenry, "The Economics of Spectrum Sharing," *Global Media and Communications Quarterly*, Autumn 2013, pp. 47-51.

Robert Shapiro, Douglas Holtz-Eakin and Coleman Bazelon, "The Economic Implications of Restricting Spectrum Purchases in the Incentive Auctions," Georgetown University Center for Business & Public Policy, April 2013.

Lisa Cameron and Coleman Bazelon, "The Impact of Digitization on Business Models in Copyright-Driven Industries: A Review of the Economic Issues," National Research Council (NRC) Committee on the Impact of Copyright Policy on Innovation in the Digital Era, February 26, 2013.

Robert A. Rogowsky, Pallavi Seth, and Coleman D. Bazelon, "An Economic View Of ITC 337 Cases and the Public Interest," *Law360*, November 21, 2012.

Coleman Bazelon and Giulia McHenry, "Spectrum Value," Telecommunications Policy Research Conference, 2012.

Robert A. Rogowsky, Pallavi Seth, and Coleman D. Bazelon, "An Economic View Of The ITC's Domestic Industry," *Law360*, June 18, 2012.

Coleman Bazelon and Greg Duncan, "The Status of UNE-L in the United States," Prepared for the Commerce Commission of New Zealand, April 12, 2012.

"Implications of Regulatory Inefficiency for Innovative Wireless Investments," Sponsored by LightSquared, March 15, 2012.

Coleman Bazelon, Kevin Neels and Pallavi Seth, "Beyond the Casino Floor: Economic Impacts of the Commercial Casino Industry," sponsored by the American Gaming Association, 2012.

Coleman Bazelon, Charles Jackson and Giulia McHenry, "An Engineering and Economic Analysis of the Prospects of Reallocating Radio Spectrum from the Broadcast Band through the Use of Voluntary Incentive Auctions," Telecommunications Policy Research Conference, 2011.

"Cost of Regulatory Risk for Wireless Spectrum Values," sponsored by LightSquared, August 23, 2011.

"Expected Receipts from Proposed Spectrum Auctions," sponsored by the Wireless Broadband Coalition, July 28, 2011.

"GPS Interference: Implicit Subsidy to the GPS Industry and Cost to LightSquared of Accommodation," sponsored by LightSquared, June 22, 2011.

Lisa Cameron and Coleman Bazelon, "The Impact of Digitization on Business Models in Copyright-Driven Industries: A Review of the Economic Issues," National Research Council (NRC) Committee on the Impact of Copyright Policy on Innovation in the Digital Era, June 7, 2011.

"The Economic Basis of Spectrum Value: Pairing AWS-3 with the 1755 MHz Band is More Valuable than Pairing it with Frequencies from the 1690 MHz Band," sponsored by T-Mobile and CTIA, April 11, 2011.

"Economists Letter to Obama Regarding Incentive Auctions," April 6, 2011.

"The Indian 3G and BWA Auctions," Telecommunications Policy Research Conference, 2010.

"Economic Impact of the Dutch Gas Hub Strategy on the Netherlands," by Dan Harris, Coleman D. Bazelon, Brad Humphreys, and Penelope Dickson, *Netherlands Ministry of Economic Affairs, Agriculture and Innovation*, September 2010.

"The Employment and Economic Impacts of Network Neutrality Regulation: An Empirical Analysis," sponsored by Mobile Future, 2010.

"The Benefits of Wireless Broadband for Rural Deployments," sponsored by Qualcomm, Inc, 2010.

Malcolm K. Sparrow, Coleman Bazelon and Charles Jackson, "Can Internet Gambling Be Effectively Regulated? Managing the Risks," sponsored by Wired Safety, 2009.

"The Need for Additional Spectrum for Wireless Broadband: The Economic Benefits and Costs of Reallocations," sponsored by Consumer Electronics Association, 2009.

Coleman Bazelon and William Zarakas, "Measuring Concentration in Radio Spectrum License Holdings," Telecommunications Policy Research Conference, 2009.

"Licensed or Unlicensed: The Economic Considerations in Incremental Spectrum Allocations," in *New Frontiers in Dynamic Spectrum Access Networks, 2008*, DySPAN 2008.

"Overreaching: The Policy Failures of the 700 MHz Auction," Telecommunications Policy Research Conference, 2008.

"Cream Skimming," Telecommunications Policy Research Conference, 2007.

Thomas W. Hazlett and Coleman Bazelon, "Market Allocation for Radio Spectrum," prepared for the International Telecommunications Union Workshop on Market Mechanisms for Spectrum Management, Geneva, Switzerland, January, 2007.

"Licensed or Unlicensed: The Economics of Incremental Spectrum Allocations," Telecommunications Policy Research Conference, 2006.

"Analysis of an Accelerated Digital Television Transition," sponsored by Intel Corporation, 2005.

Thomas W. Hazlett and Coleman Bazelon, "Regulated Unbundling of Telecommunications Networks: A Stepping Stone to Facilities-Based Competition?" Telecommunications Policy Research Conference, 2005.

Thomas W. Hazlett, Coleman Bazelon, John Rutledge, and Deborah Allen Hewitt, Sending the Right Signals: Promoting Competition Through Telecommunications Reform: A Report to the U.S. Chamber of Commerce, September 22, 2004.

Thomas W. Hazlett, Arthur M. Havenner, and Coleman Bazelon, "Regulation and Investment in Local Telecommunications Networks," Working Paper, January 2004.

Michael H. Rothkopf and Coleman Bazelon, "Interlicense Competition: Spectrum Deregulation Without Confiscation or Giveaways," New America Foundation, Spectrum Series Working Paper #8, August, 2003.

"Review of Discounting and Intergenerational Equity," by Paul Portney and John Weyant, Resources for the Future (1999), in the Society of Government Economists Newsletter, Volume 34, No. 10, November 2002.

"Completing the Transition to Digital Television," Congressional Budget Office, September 1999.*

"Two Approaches for Increasing Spectrum Fees," Congressional Budget Office, November 1998 (Coauthored with David Moore*).

"Where Do We Go From Here? The FCC Auctions and the Future of Radio Spectrum Management," Congressional Budget Office, April 1997 (Coauthored with Perry Beider and David Moore*).

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Federal Communications Commission Filings

"Declaration of Coleman Bazelon," Comments of Martha Wright, et. al., Exhibit C, WC Docket No. 12-375, March 25, 2013 (prison payphone rates).

"Unlicensed Use of the TV White Spaces: Wasteful and Harmful," FCC Filling, with Charles L. Jackson and Dorothy Robyn, *Ex Parte* Comments, ET Docket No. 04-186, ET Docket No. 02-380, August 20, 2008 (benefits of licensed over unlicensed allocation of the TV White Spaces).

"Comments of Charles L. Jackson, Dorothy Robyn and Coleman Bazelon," Comments, WC Docket No. 06-150, PS Docket No. 06-229, June 20, 2008 (value of TV White Spaces).

"Comments of Coleman Bazelon," Comments, WC Docket No. 06-150, PS Docket No. 06-229, WT Docket No. 96-86, June 20, 2008 (700 MHz D Block).

"Declaration of Coleman Bazelon," Reply Comments, WC Docket No. 07-245, April 22, 2008 (economics of pole attachment rates).

"Why the Exclusive Use of Large Licenses in the Upper or Lower 700 MHz Bands Would Reduce the Efficiency of the 700 MHz Auction," Comments, WT Docket No. 06-150, April 20, 2007.

"Principles for Choosing 700 MHz Block License Sizes," *Ex Parte* Comments, WT Docket No. 06-150, March 6, 2007.

"The Economics of License Sizes in the FCC's 700 MHz Band Auction," *Ex Parte* Comments, WT Docket No. 06-150, January 2007.

"Declaration of Thomas W. Hazlett, Ph.D., Prof. Arthur M. Havenner, and Coleman Bazelon, Ph.D.," Comments, WC Docket No. 03-173, December 16, 2003. (Wireline investment, UNE-P)

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"Spectrum Deregulation Without Confiscation or Giveaways," with Michael Rothkopf, Comment, ET Docket No. 02-135, January 9, 2003.

Thomas W. Hazlett, Coleman Bazelon and Arthur Havenner, "Forecast of Toll Free Number Demand: 2002-2004," Attachment A, SMS/800 Transmittal No. 22, F.C.C. Tariff No. 1, November 15, 2002.

"Comments of Coleman D. Bazelon and T. Christopher Borek Relating to Arthur D. Little, Inc.'s Assessment of the Impact of DTV on the Cost of Consumer Television Receivers," *Ex Parte* Comments MM Docket 00-39, August 1, 2002.

"Use Administrative Law Judges to Adjudicate Interference Disputes Between Licensees," Comment, ET Docket No. 02-135, July 8, 2002.

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Other Recent and Planned Spectrum Auctions: What They Portend for the Future: Economic Perspectives on the Auctions, Law Seminars International, Washington, D.C., July 22, 2013.

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Annual College of Social Studies Spring Banquet/ the Underwood Memorial Lecture and Hoggendorn lecture for the Economic Department, Wesleyan University, Middletown, CT, April 17 – 18, 2013.

SNL Knowledge Center Webinar: "*FCC Incentive Auction Rules: Estimating Clearing Prices and Policy Impacts*", February 27, 2013.

Reverse Auction Design: Dynamic or Sealed, Algorithmic Issues, Market Power, Reserves, Reference Prices, Conference on the FCC Incentive Auction, Stanford Institute for Economic Policy Research, Stanford, CA, February 26, 2013.

Mobile Impact on Economic Growth and Job Creation, Consumer Electronics Show, LIT Program Innovation Policy Summit, Las Vegas, NV, January 8, 2013.

Incentive Auctions: What Broadcasters Need to Know, Crossfire Media Webinar, December 19, 2012.

Spectrum Value, 40th Annual Telecommunications Policy Research Conference (TPRC), Arlington, VA, September 22, 2012.

FCBA Seminar: Getting from Here to There: The Road Ahead for Spectrum Auctions, Washington, DC, June 6, 2012.

Incentive Auctions, 39th Annual Telecommunications Policy Research Conference (TPRC), Arlington, VA, September 24, 2011.

Competition in the Wireless Environment: How to Get More Handsets or More Networks, Broadband Breakfast Club, Washington, DC, February 15, 2011.

Introducing TV White Spaces, Spectrum Bridge webinar, October 28, 2010.

The Indian 3G and BWA Auctions, 38th Annual Telecommunications Policy Research Conference (TPRC), Arlington, VA, October 2, 2010.

How Smart Public Policies Can Drive the Mobile Broadband Transformation, Information Technology and Innovation Foundation's The Emerging Mobile Broadband Economy and its New Business Models, Washington, DC, September 14, 2010.

Community Broadband-A Blessing or Curse?, K&L Gates LLP Municipal Broadband Webcast, July 29, 2010.

Towards A Sustainable Spectrum Policy: Rethinking Federal Spectrum, Public Knowledge, Washington, DC, June 3, 2010.

Unraveling Net Neutrality: Should the FCC Regulate Broadband, Independence Institute, Denver, CO, May 26, 2010.

CQ-Roll Call Policy Breakfast on the Future of Wireless Broadband, Washington, DC, May 20, 2010.

Congressional Staff Briefings on "The Need for Additional Spectrum for Wireless Broadband: The Economic Benefit and Costs of Reallocations," Washington, DC, December 8, 2009.

The Progress and Freedom Foundation's "Let's Make a Deal: Broadcasters, Mobile Broadband, and a Market in Spectrum," Washington, DC, December 1, 2009.

FCBA's Intellectual Property Practice Committee Brown Bag Lunch, Washington, DC, November 30, 2009.

FCC Broadband Spectrum Workshop, Washington, DC, September 17, 2009.

Measuring Concentration in Radio Spectrum License Holdings, 37th Annual Telecommunications Policy Research Conference (TPRC), Arlington, VA, September 26, 2009.

Broadband Stimulus Plan, 2009 FLATOA-FCBA Conference, Tampa, FL, June 26, 2009.

Leveraging the Broadband Stimulus and Licensed Spectrum, Webinar, April 29, 2009.

Keynote Address, Enterprise Wireless08, Scottsdale, AZ, November 6, 2008.

Licensed or Unlicensed: The Economic Considerations in Incremental Spectrum Allocations, DySPAN, Chicago, IL, October 16, 2008.

Overreaching: The Policy Failures of the 700 MHz Auction, 36th Annual Telecommunications Policy Research Conference (TPRC), Arlington, VA, September 27, 2008.

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Market Allocation for Radio Spectrum, International Telecommunications Union Workshop on Market Mechanisms for Spectrum Management, Geneva, Switzerland, January 2007.

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Spectrum Policy Task Force Interference Recommendations, Manhattan Institute Conference, Washington, DC, February 13, 2002.

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Regulatory Forbearance, Powerline Communications Conference, Washington, DC, December 13, 2001. *Spectrum License Valuations*, CTIA Wireless Agenda 2001, Dallas, TX, May 2001.

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APPENDIX C
Nortel Patent Analysis

The goals of the analyses of Nortel's patent portfolio, and in particular of the patents Nortel sold to the Rockstar Consortium, were to identify and characterize the global nature of Nortel's R&D operations (the patent analysis in **Section IV.A**, **Tables 1**, **2** and **3**), and to determine the extent to which Nortel's intellectual property was geographically and technologically entangled and interconnected (the patent citation analysis in **Section III.C**, **Figure 5**, and **Section IV.B**, **Figures 6** and **7**). The analyses relied on three main data sources: a spreadsheet listing the Rockstar patents, a set of spreadsheets of "top" patents in Nortel's portfolio, and publicly available data from the United States Patent and Trademark Office ("USPTO").

The first data source is a spreadsheet of patents sold to Rockstar provided by Nortel, containing detailed patent information including technology classifications and market assignments, an indicator whether the patent is considered to be high value, and data on forward citations (file "EMEAPROD2214888," tab "Assets").[67] The "Assets" tab of EMEAPROD2214888 contained some of the variables I relied on for the analyses. The Global IP Law Group ("GIPLG") market assignments formed the basis for splitting patents into the 8 main franchises of Nortel: "Carrier Voice," "Enterprise Voice," "Data," "Internet," "Optical," "PC," "Wireless Handsets," and "Wireless Infrastructure," plus the categories "Service Provider," "Other." A few U.S. patents did not have a GIPLG market assignment.[68]

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[67] This spreadsheet was likely created in mid-2010. The most recent patent U.S. application date on the "Assets" tab is March 12, 2010, and the "Changes Summary" tab indicates that the spreadsheet was updated as of June 15, 2010.

[68] Note that the spreadsheet contained more than the 11 GIPLG market assignments listed above, so I made some assumptions to group the markets into these 11. In particular, I included "PC", "PC/Wireless Handset", and "Semiconductors" in the "PC" category, "Carrier Voice" and "Voice" in the "Carrier Voice" category, "Carrier/Enterprise Voice" and "Enterprise/Carrier Voice" in both the "Carrier Voice" and the "Enterprise Voice" categories. Finally, "Internet" includes "Internet Advertising," "Data" includes "Data Networking," "Carrier Data" and "Enterprise Data," and "Other" includes "Other" and "Consumer Electronics."

The high value indicator variable assigned one- or two-star rankings to 1,453 unique patents sold to Rockstar which Nortel (or possibly the Global IP Law Group) considered to be "high value." The "Introduction" tab of the spreadsheet states that one star identifies "high value" patents and two stars identify "highest value" patents.

The second data source is a set of three spreadsheets of top patents provided by Nortel (NNI_01456049, NNC_NNL06615574, and US_EMEA_CANADA_PRIV_00185520). Nortel reviewed its portfolio of patents on several occasions. Reviews in 2002, 2006, and then again in 2010 identified the top patents and trademarks in Nortel's portfolio at the time—the three files identify the top Nortel patents at the time of three reviews. Specifically, NNI_01456049 indicates the top 100 patents and trademarks in April 2002, NNC_NNL06615574 indicates the top 100 patents and trademarks in May 2006, and US_EMEA_CANADA_PRIV_00185520 indicates the top 40 and the top 100 patents in May 2010.

The third data source is publicly available data from the USPTO "Patent Full-Text and Image Database" containing detailed inventor location and citations data. I used the USPTO data to retrieve both the inventors' locations and the full set of backward citations for each of the patents sold to Rockstar which were granted in the U.S.[69]

PATENT ANALYSIS

In performing the analysis of the Nortel's patents in **Tables 1**, **2** and **3** of the report I used the USPTO patent level information on inventor locations, the spreadsheets of Nortel's top patents, and Nortel's spreadsheet of Rockstar patents along with its high value indicator. I assigned patent locations by weighting the individual countries' contributions. Specifically, I assigned a country's contribution to the patent equal to the percentage of inventors for that country who contributed to the patent. I then used the weights to construct the count of top

[69] http://patft.uspto.gov/netahtml/PTO/index.html. As the USPTO data used the same abbreviation of "CA" for Canada and California, and in a few instances the city was present in both of those places, I used online resources and the original patent filing to determine whether the inventor was located in Canada or California.

patents by location (**Table 1**), the count of Rockstar top value patents by location distinguishing between those granted in the U.S. and their non-U.S. relatives (**Table 2**), and the overall count of Rockstar patents by location, distinguishing between those granted in the U.S. and their non-U.S. relatives (**Table 3**).

Table 1 examines the number of patents Nortel considered to be their "top" patents by country of origin. The three spreadsheets used to construct the dataset identify 79 top patents among the Nortel portfolio in April 2002, 82 top patents in May 2006 and the 100 top patents in May 2010.[70] Some patents were included in the top patent lists up to three times (*i.e.*, if the patent was identified as a top patent in more than one review), resulting in 213 unique top patents.

Table 2 further examines the breakdown of the patents sold to Rockstar Nortel considered to be of high value. There were 1,040 one-star patents and 413 two-star patents in the raw data.[71] The Nortel spreadsheet of patents sold to Rockstar data indicated for each of the U.S. granted patents their related non-U.S. granted patents. This information allowed me to translate the patent's inventor location and high value indicator from the U.S. patent to all related non-U.S. patents.[72]

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[70] The files also contained and 21 top trademarks for April 2002 and 22 top trademarks in May 2006 which I excluded from the analysis. File NNC_NNL06615574 for May 2006 also contained a data field with the entries "add" and "remove." I decided to ignore this field because of the lack of any additional information.

[71] The two star patents included 409 U.S. granted patents, three pending patents (which later became U.S. granted), and one non-U.S. patent which was never filed in the U.S. Due to the patent which was never filed in the U.S., the U.S. granted patent total for two stars is 412 (one less than the 413 patents which appear in the spreadsheet) because the non-U.S. granted patent is included in the non-U.S. category. I identified the inventor locations of the pending patents by searching the USPTO database by title. I found the inventor location of the non-U.S. patent which was never filed in the U.S. by searching for one of its European patent numbers on the European Patent Office ("EPO") website.

[72] Related non-U.S. patents are U.S. patents filed overseas for which the Nortel spreadsheet of Rockstar patents (EMEAPROD2214888) indicates the patent numbers of the foreign filings. U.S. patents could have between zero and fourteen associated foreign patents, which I have viewed as "duplicates", i.e. any high value indicators, inventor locations, or technology buckets associated with the U.S. filed patent are transferred to related foreign filings.

Table 3 examines the entire portfolio of patents that were included in the Rockstar transaction. Because the USPTO data did not include information on pending patents or patents which were only granted outside of the U.S., I restricted my attention to patents that were granted in the U.S. and their associated foreign filings. **Table 3** reports the counts of patents by inventor location for both the 2,684 U.S. granted patents in the Rockstar data and their related 1,127 non-U.S. grants.

PATENT CITATION ANALYSIS

To perform my patent citation analysis I used the USPTO patent level information on a patent's backward citations to construct the number of cross or self-citations, (e.g. internal to Nortel's Rockstar patents) from/to patents within a particular class to another. In order to do so, I first cross-referenced the Rockstar patents to construct a square citation matrix in which each column and each row represented one of the Rockstar patents.[73] I then merged the citation matrix to the USPTO inventors' locations and Nortel's GIPLG assignments. With this information I was able to count the number of citations from/to a country to another, from/to a category to another, and from/to a country-category to another, In particular, for each class—whether a country, a category, or a country-category pair—I was able to construct the number citations made to patents falling in each of the other classes (backward citations) and the number of citations received from patents falling in each of the other classes (forward citations). These interactions were then plotted as directed graphs in **Figures 5**, **6**, and **7** of the report.[74]

Figure 5 presents the degree of entanglement and interconnectedness among Nortel's technologies and market segments. It displays the U.S. granted patents acquired by Rockstar

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[73] The citation matrix is a square matrix of zeros and ones where each column and each row represent a patent, and an entry equal to one in row I-column J would indicate that patent I was cited by J.

[74] Note that the patent citation analysis embedded in Figures 5 through 7 measures the number of *links* across classes, and therefore does not use the proportional weights used in the analysis of the Rockstar patents. Unlike the latter analysis the patent citations analysis is aimed at measuring the degree of interrelatedness of Nortel's intellectual property generating process.

in terms of their GIPLG market assignments. In the Figure each vertex or node represents one of the GIPLG market assignments. The *size* of each node reflects the number of unique patents classified by that node and was set proportional to the square root of such number to improve the readability of the graph. The *location* of each node reflects the creation process of IP among Nortel's patents by ordering from left to right GIPLG market assignments in decreasing order of forward citations received. The level of interconnectedness across technologies (i.e. nodes) is represented by directed arrows linking the citing technology class to the cited nodes. To improve how the strength of these links are represented, I set the thickness of the arrows proportional to the square root of the number of citations connecting one technology to another.

Figure 6 represents the degree of geographic entanglement and interconnectedness among Nortel's patents by their association with their country of origin of their inventors. Similarly to **Figure 5**, in **Figure 6** each country is represented by a node, and the size of each node (vertex or bubble) is proportional to the square root of the number of unique patents which received contributions from inventors based in that country. The level of interconnectedness across countries (i.e. nodes) is represented by directed arrows linking the citing country to the cited, and the thickness of the arrows proportional to the square root of the number of citations connecting one country to another to represent graphically the strength of such links. Unlike **Figure 5**, in **Figure 6** the location of the nodes has no particular meaning, but rather a location on a circle maximizes the readability of the graph.

Figure 7 brings together in a unique graphical representation the two levels of geographic and technological entanglement of Nortel's IP creation process. In **Figure 7** I classify and show patents by their association with both a country of origin and a GIPLG market assignment. Each node represents a country-franchise pair. There are 60 such pairs, of which 54 contain at least one patent—giving rise to a maximum of 2,862 connections—and 49 are related to another by at least one link. Unlike **Figures 5** and **6**, all nodes have the same size for readability purposes. Similarly to **Figure 5**, I order Nortel franchises from left to

right based on the relative number of forward citations, the left-most franchise denoting the franchise that received the most citations, and order the countries from top to bottom based on the relative number of forward citations, the upper-most country being the one that received the most citations. The level of geographic and technological interconnectedness across country-franchise pair (*i.e.* nodes) is represented by directed arrows which link the citing node to the cited node. To improve the readability of the graph while at the same time representing the strength of the links I set the thickness of the arrows in three classes depending on the number of citations.[75] Out of a maximum of 2,862 there are 597 non-empty connections (i.e. the number of arrows in the graph) with a number of citations ranging from 1 to 151. This analysis demonstrates a high level of interconnectedness, as the number of patents in such narrowly defined classes (i.e. country-franchise pairs) can be very small—the median number of patents is in fact 27, and the distribution is very skewed ranging between 1 and 448 patents—and the probability that an individual patent cites another individual patent is very small.

[75] Specifically the thickness proportions are 1:3:6 for a number of citations respectively 1) equal to 1, 2) greater than 1 and up to 10, and 3) greater than 10.

E.CA

FORM 53

Courts of Justice Act

ACKNOWLEDGMENT OF EXPERT'S DUTY

(General heading)

ACKNOWLEDGMENT OF EXPERT'S DUTY

1. My name is ...Coleman Bazelon..... *(name)*. I live at ..Glenelg.... *(city)*, in the ...state..... *(province/state)* of .....Maryland..... *(name of province/state)*.

2. I have been engaged by or on behalf of ... Nortel UK Pension Claimants... *(name of party/parties)* to provide evidence in relation to the above-noted court proceeding.

3. I acknowledge that it is my duty to provide evidence in relation to this proceeding as follows:

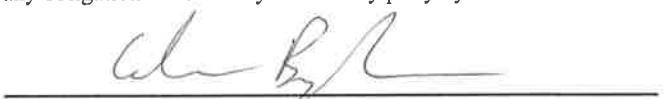
   (a) to provide opinion evidence that is fair, objective and non-partisan;

   (b) to provide opinion evidence that is related only to matters that are within my area of expertise; and

   (c) to provide such additional assistance as the court may reasonably require, to determine a matter in issue.

4. I acknowledge that the duty referred to above prevails over any obligation which I may owe to any party by whom or on whose behalf I am engaged.

Date ..... Jan 24, 2014 .....



Signature

NOTE: This form must be attached to any report signed by the expert and provided for the purposes of subrule 53.03(1) or (2) of the *Rules of Civil Procedure*.

RCP-E 53 (November 1, 2008)