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# **Can a Non-Practicing Entity Promote Diffusion of Innovation?**

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## **ABSTRACT**

Entities, that own and enforce patent rights against others, while not practicing patented inventions for themselves, are often called “Patent Trolls” and are hated or feared by established manufacturers and information, communication and telecom (ICT) service providers. However, the author questions whether it is justifiable to view these Non-Practicing Entities (NPEs) as greedy and evil.

The suppliers of patent rights as commodities in the market include ventures that are backed by investors and creditors but unable to succeed in the marketplace, or license to or be acquired by established companies. The demand side includes established companies and ventures that have succeeded in the marketplace. Obviously, both of these supply and demand sides are generally considered as legitimate and fair players in the market. Their activities are not considered unhealthy or antisocial. Therefore, it does not seem appropriate to deem NPEs as evil and greedy players, considering the players intermediated by NPEs are viewed as ordinary players of a healthy market. The author proposes that we study the role of NPEs in the market and society without prejudice, and assess whether they contribute to promoting social welfare.

It is understandable that established companies object to the practices of NPEs. However, NPEs help make the patents held by small or inactive entities visible to established companies through their activities including issuing warnings against alleged infringement, offering patent licenses, filing litigation, etc. Also, it is highly probable that any claims raised by NPEs can be resolved finally by paying them royalties or by purchasing the relevant patents. In this way, NPEs are intermediating the transfer of patent rights and/or the rights to practice the patented inventions from suppliers that have weak sales capabilities (namely, the assignors of patent rights to NPEs) to suppliers that have strong sales capabilities (namely, the possible licensees). Moreover, the author shows that such probability is completely practical through the empirical study of a Japanese venture that is recovering its past investment by means of licensing its patented inventions to multiple companies through NPEs. The author concludes that NPEs are not necessarily evil actors in the market and have considerable potential to promote diffusion of innovation.

## 1. The Role of NPEs in Society

### 1.1 The activities of NPEs

The term, Non-Practicing Entities or NPEs literally means those entities that hold patent rights but do not practice the inventions protected by such rights by means of producing or distributing products or services implementing such inventions. However, not all entities that have patent rights but don't practice the patented inventions are called NPEs. Usually, the term NPEs given to those entities that aggressively exercise their patent rights in order to monetize such rights. Also, the term often implies that the employees of NPEs do not make inventions and their patent rights are generally obtained from other companies.

It is also widely known that NPEs are often referred to in a derogatory manner as "Patent Trolls"<sup>1</sup> or, in a more moderate way, as "Patent Assertion Entities"<sup>2</sup>, while we can find commentaries that take a more fair attitude<sup>3,4</sup>. One can sympathize when a company becomes the defendant in a patent infringement litigation filed by an NPE and is ordered to pay considerable compensation for damages to the NPE as the plaintiff. However, it is questionable whether the actions of NPEs should be subject to such criticism. "Buy-low and sell-high" is a customary and conventional strategy employed by all merchants. NPEs appear to be just following this conventional strategy based on the patent system, which makes the exclusive right to an invention (namely, a patent right) a tradable commodity. The assertion of rights often causes the counterparty a certain degree of inconvenience and detriment. However, it would be fair and reasonable to assess the advantage and disadvantage caused by NPEs to society.

### 1.2. Potential contribution by NPEs to the society<sup>5</sup>

The sale of an asset is the exchange of non-monetary property owned by the seller for money from the purchaser. However, we know empirically that a sale does not automatically occur even if a potential seller has a surplus of property that can be demanded by the potential purchaser who has a surplus of money. This is because there are transaction costs that impede the potential seller and purchaser from entering into a transaction<sup>6</sup>. These include, finding and

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<sup>1</sup> For example, H. Matsuura (2008) is an example of the books that show negative view of NPEs.

<sup>2</sup> PATENT ASSERTION AND U.S. INNOVATION, Executive Office of the President, 2013 (available at [www.whitehouse.gov/sites/default/files/docs/patent\\_report.pdf](http://www.whitehouse.gov/sites/default/files/docs/patent_report.pdf)).

<sup>3</sup> Nishiguchi, H. The defense strategy against patent trolls of Japanese businesses, *Wagakuni no Kigyo no Patent Troll Taisaku* (available at [http://www.jpaa.or.jp/activity/publication/patent/patent-library/patent-lib/201502/jpaapatent201502\\_086-092.pdf](http://www.jpaa.or.jp/activity/publication/patent/patent-library/patent-lib/201502/jpaapatent201502_086-092.pdf)).

<sup>4</sup> United States Government Accountability Office, Assessing Factors That Affect Patent Infringement Litigation Could Help Improve Patent Quality, 2013 (available at <http://www.gao.gov/products/GAO-13-465>).

<sup>5</sup> Concerning an economic analysis of the role of NPEs, see e.g., Ohno, Y. Patent Infringement Litigation, Choice of Technology, and Non Practicing Entity (Tokkyo Shingai Sosho, Gijutsu Sentaku, Non Practicing Entity) 2013 (available at <http://www.rieti.go.jp/jp/publications/dp/13j050.pdf>).

<sup>6</sup> See e.g. Coase (1960).

soliciting possible purchasers, preparing and proposing a selling price and other terms and conditions of the expected sale, negotiating with potential purchasers, the uncertainty of the results of such negotiation, the uncertainty of whether the purchaser observes the agreed terms, and the psychological barrier to commence any of these activities -- all these factors can make the potential seller hesitate to move forward with the potential transaction.

No doubt, the potential purchaser also faces multiple barriers in reaching an agreement with the potential seller. For example, the potential purchaser may face difficulty in finding the potential seller, assessing the reasonableness of the terms of sale, and even assessing the degree of his/her own demand for the commodity that can be sold to him/herself.

Thus, there are considerable transaction costs to realize a transaction, that is the sale and purchase between a potential seller and a potential purchaser. On the other hand, an intermediary actor can promote such transaction by alleviating the burden of both the potential seller and the potential purchaser. In most cases, we depend on commercial or professional intermediaries in order to implement deals - real estate agents, banks, insurance companies, security houses, attorneys, etc.

Moreover, we should note the specific character of patent rights that may make potential purchasers hesitate to actively contact potential buyers of patent rights. A company that is or is considering producing or distributing products or services that possibly conflict with the patent rights of others is likely to become a potential purchaser of a patent right (including a potential licensee of a patented invention). The possible purchaser of a patent right may be able to identify the possible seller, by means of a patent search. However, if the potential purchaser actively contacts the patentee, it is likely to signal the patentee that the potential purchaser is a possible infringer of the relevant patent right. In this way, such activity of the possible purchaser may jeopardize the continuity of its own business. In contrast, if the patentee, who is the possible seller of the patent right, does not notice the existence of such possible purchaser, the risk of the possible purchaser remains only potential, while they still cannot neglect such potential risk.

Presumably, the trade of patents between potential sellers and purchasers can be promoted if commercial intermediaries connect them with each other. Of course, however, both potential sellers and purchasers have to be prepared to pay a commission to the intermediaries in exchange for the alleviation of their respective uncertainties that would have made them hesitate to enter the trade unless the intermediaries connected them.

It is also probable that the inventors and assignors of patent rights to NPEs have no intention of practicing their inventions and create inventions just for the purpose of making profits from the assignment of their patent rights or from granting patent licenses. Even in this case, it should be noted that the activities of NPEs assure the potential practicing entities of these inventions that they are free from the restrictions of the said patent rights once they contract with the NPEs and obtain a license.

## **2. When Do Patent Rights Obstruct the Diffusion of Innovation?**

### **2.1. General Understanding of the Role of Patent Rights**

It is generally understood that patent rights exist to promote technological innovation in industry. In fact, many laws declare that the purpose of protecting technology by means of patents is to promote the development of industry and/or social welfare. For example, Article 1 of the Patent Act of Japan (Act No. 121 of 1959, as amended) states “The purpose of this Act is, through promoting the protection and the utilization of inventions, to encourage inventions, and thereby to contribute to the development of industry.” The United States Constitution states, in Article I, Section 8: “The Congress shall have power: To promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries”.

The said explanation of the role of patent rights can be justified. We can assume that innovation is comprised of creations based on a “new combination” of past innovations or knowledge, the diffusion of the knowledge of such creations<sup>7</sup>, and the diffusion of new products or services that embody such creations. We can easily presume that the wider and quicker diffusion of new products or services is achieved by means of the activities of entrepreneurs who enter the new market for such products or services. However, entrance to new market often requires the entrant to make a considerable investment in commercial design, production, merchandising, and the distribution of products or services. Such possible entrants are likely to face two major uncertainties before they decide to make such investment. One of the two major uncertainties is whether the demand for the new products or services will be satisfactory. Another of the two major uncertainties is whether the new entrant will survive the competition with his/her competitors. However, if the entrepreneur entering the new market has patent rights that protect the new creation embodied in the new products or services, he or she can alleviate the degree of their uncertainty by excluding competitors by exercising their patent rights. This exclusive power of patent rights is likely to encourage the entrepreneur to enter the new market. In this way, patents can help the wider and quicker diffusion of new products or services, and therefore, partly promote innovation.

### **2.2. The Typical Conditions Under which IPRs Obstruct the Diffusion of Innovation**

Patent rights give the patentee the power to exclude competitors from the market of the products and services in which their patented inventions are embodied. As discussed above, this exclusive nature of patent rights encourage the patentee to enter the market by alleviating his/her uncertainty as to whether they will survive the competition in the market. However, it is natural for us to be concerned if such exclusive power obstruct the diffusion of products and services embodying new inventions by reducing the number of production companies and distributors of such products and services. Several authors are critical of patent rights partly because they share this concern<sup>8</sup>.

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<sup>7</sup> See Schumpeter, et al. (1951).

<sup>8</sup> See e.g. Bessen, et al. (2008).

It would be overemphasizing the disadvantage of patents if we concluded that patents always inhibit the diffusion of products or services embodying new inventions. It is not proven that the effect of patents to restrict the number of production companies and distributors that enter the market outweighs the effect of the same patents encouraging the patentee to enter the market. In contrast, the fact that the patent system has survived for so long is likely to support our presumption that it often contributes to the diffusion of products or services embodying new inventions, even though it sometimes inhibits such diffusion. In light of this consideration, it would be reasonable and practical to attempt to predict under what conditions patents are likely to be detrimental to the wider and quicker diffusion of innovation, and to prepare the means to alleviate the negative impact of patents under such conditions.

According to the experiments conducted by the author using a very simple network model<sup>9</sup> it is suggested that patents exercised by a supplier with weak sales capability against a supplier with strong sales capability is likely to impede the diffusion of products or services embodying patented inventions (The experiments, results and suggestions are outlined in the **Appendix A**). If this suggestion derived from experiments is applicable to the actual diffusion of products or services, it is reasonable to consider how we can alleviate the negative impact of patents on the diffusion of products or services under such specific conditions.

### **2.3. Possible Solution to Alleviate the Negative Impact of IPRs**

Assume that multiple suppliers ( $S_p, S_1, S_2, S_3, \dots S_n$ ) are competing with one another in a market where similar products or services embody a specific technology ( $I_p$ ). Also assume that  $S_p$  is the sole owner of the patent rights to protect  $I_p$ .  $S_p$  is able to exclude any of  $S_1, S_2, S_3, \dots S_n$  from producing or distributing the products or services embodying  $I_p$ . If the sales capability of  $S_p$  is substantially weaker than that of each of  $S_1, S_2, S_3, \dots S_n$ , and, nevertheless,  $S_p$  excludes  $S_1, S_2, S_3, \dots S_n$  from the relevant market by exercising its patent rights, the diffusion of the products or services embodying  $I_p$  is likely to be deterred substantially.

From the perspective that emphasizes the social benefit of a wider and quicker diffusion of innovation by means of the distribution of products and services embodying new inventions, the exercise of patent rights by  $S_p$  would be deemed detrimental to social welfare or even abusive. However, from the perspective of  $S_p$ , it would be deemed unreasonable to restrict the exercise of its patent rights. Some of the reasons are itemized below:

i) At the time when  $S_p$  acquires the patent rights to  $I_p$ , nobody knows  $S_p$ 's future sales capability to distribute the products and services embodying  $I_p$ . Rather, it is natural for  $S_p$  to hope it will be successful in the market. Therefore, there is no reason to blame  $S_p$  just because it acquired patent rights, irrespective of whether or not  $S_p$  will be successful.

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<sup>9</sup> See Teramoto (2015)

ii)  $S_p$  has no reason to hold back on exercising its own patent rights to recover its past investment made to design, produce, market and distribute the products and services embodying  $I_p$ .

iii) Patent rights are given to inventors or their employers irrespective of whether they are successful in the relevant market or even whether they have an intention to enter such market. It is difficult to find a reason why we should differentiate the value and enforceability of patent rights depending on the attributes of the patentee.

iv) Moreover, if the exercise of patent rights by weaker suppliers in a market like  $S_p$  is restricted, the role of patent rights to encourage entrepreneurs to develop a new market is likely to be diminished, because the majority of them will not be successful in the market.

In light of these considerations, it is not advisable to restrict the exercise of patent rights by  $S_p$ , even though such exercise of patent rights is likely to hinder the diffusion of innovation through the production and distribution of products and services embodying  $I_p$ . Then, how can we find a solution to alleviate such negative impact of patent rights, while giving  $S_p$  a satisfactory advantage through patent rights? How can we have  $S_p$  fully exploit the potential economic value of its patent rights, while allowing one or more of  $S_1, S_2, S_3, \dots S_n$  to continue playing a role in the market (namely, producing and distributing products and services embodying  $I_p$ ) free from the possible threat of  $S_p$  enforcing its patent rights? In order to achieve these conditions, it is essential to encourage  $S_p$  and one or more of  $S_1, S_2, S_3, \dots S_n$  to negotiate over and close patent deals that allow the latter to continuously practice the patented invention ( $I_p$ ) or which transfers the patent rights to the latter, both in exchange for reasonable economic consideration payable by one or more of  $S_1, S_2, S_3, \dots S_n$  to  $S_p$ . However, as pointed out in section 2.2, above, both parties are likely to face serious difficulties before they decide to commence such a deal.

One of the ideas that easily comes to mind is to find a potential intermediary ( $M$ ) and let him/her intermediate a deal between  $S_p$  and its potential counterparties  $S_1, S_2, S_3, \dots S_n$ . Also, from the perspective of  $M$ , he/she can reasonably expect to be remunerated for connecting the parties to a potential deal.

The next hurdle to overcome is how to make both of  $S_p$  and  $S_1, S_2, S_3, \dots S_n$  recognize the existence, role and usefulness of  $M$ . Presumably, in order to encourage  $S_p$  to employ  $M$  as its agent, a customary tactics is to show the track record of  $M$  (or, its peers in the same business) in successfully closing patent deals, although the true pioneer in this business cannot employ these tactics for his/her first potential client. Then, what means can be employed by  $M$  to have any of  $S_1, S_2, S_3, \dots S_n$  recognize his/her existence and role, as well as the advantage of dealing with  $M$ ?

As pointed out in section B, above, each of  $S_1, S_2, S_3, \dots S_n$  has its own reason to hesitate to commence a deal with  $S_p$  (or, its agent). Accordingly,  $M$  has to prepare specific conditions that make  $S_1, S_2, S_3, \dots S_n$  consider that to commence a deal is more advantageous

(economically and/or psychologically) to themselves compared with not commencing a deal. The table below roughly outlines the advantages and disadvantages from the perspective of  $S_1$ ,  $S_2$ ,  $S_3$ , ...  $S_n$  each, when it decides whether or not to deal with  $S_p$ .

Decision	Advantages	Disadvantages
To deal with $S_p$	(I) Eliminates the threat of an injunction demanding it cease production and distribution.	(II) Creates an obligation to pay a royalty or other type of payment to $S_p$ , the amount of which is uncertain until the deal is closed.
Not to deal with $S_p$ (until $S_p$ exercises its patent rights)	(III) No substantial expenditure is required.	(IV) Potential threat of $S_p$ 's enforcement of its patent rights continues until the rights expire.
Not to deal with $S_p$ (after $S_p$ exercises its patent rights)	(V) Shows that $S_p$ has a tough business attitude.	(VI) Court may order that production and distribution be ceased, as well as payment of compensation for damages. In any event, substantial legal costs may be incurred.

Understandably, It is not easy to decide which of the combinations of (I) and (II), or (III) and (IV) is more advantageous overall. Even when the combination of (I) and (II) is compared with the combination of (V) and (VI), it is not obvious whether the former is better than the latter, because there is a certain degree of probability that the court will reject  $S_p$ 's demand or order only a comparatively limited scope of injunction and/or a small amount of compensation for damages. However, there is a good probability that the management of one or more of  $S_1$ ,  $S_2$ ,  $S_3$ , ...  $S_n$  will try to avoid a potentially disastrous result even though its probability is comparatively low<sup>10</sup>, or in order to avoid uncertainty. If they choose the combination of (I) and (II), they can greatly alleviate the uncertainty as to whether they can continue production and distribution, while avoiding a disastrous result such as an injunction ordering cessation of production or distribution, or the payment of substantial compensation for damages. In light of this, it may be advisable for  $M$  to commence patent infringement litigation against one or more of  $S_1$ ,  $S_2$ ,  $S_3$ , ...  $S_n$  to impress on them the disastrous result that might be caused by the combination of (V) and (VI), and finally encourage them to deal with  $M$  to ensure they continue production and distribution.

If we observe the behavior of NPEs, we can presume that they are acting as  $M$  in a very reasonable way to encourage  $S_p$  and  $S_1$ ,  $S_2$ ,  $S_3$ , ...  $S_n$  to reach a deal on patent rights, in spite of the superficial greediness of NPEs. In this way, we can expect that NPEs can alleviate the negative impact of patent rights held by those with weak sales capability.

<sup>10</sup> See Kahneman (2012) at 137-145



### 3. An Empirical Study of a Technology Venture Employing NPEs

This chapter 3 follows and describes the activities of Duaxes Corporation<sup>11</sup> and NPEs employed by Duaxes, as well as the consequences of their activities. By doing so, the author intends to clarify the role of NPEs, although, it should be noted that the activities and behavior of ventures and NPEs employed by ventures can greatly vary and this is only one examples.

#### 3.1. Duaxes' Patent Applications

Duaxes Corporation was established in 2000 in Tokyo by Mr. Mitsugu Nagoya. Duaxes raised almost 1,200,000,000 Japanese Yen (assuming US\$10 million at US\$1 = JY120) through 4 rounds of funding, in which newly issued shares were mainly issued to venture capitalists.

Mr. Nagoya centralized his and his colleagues' research and development activities to achieve a telecommunication system based on a hard-wired circuit free from software. They sought to realize a very secure but practical telecom system by excluding the use of software, which is often vulnerable to attacks from outside. This strategy was employed because attacks on telecom services and personal devices are increasing, while the Internet already constitutes a major part of the telecommunication infrastructure. Moreover, since the trend is for voice calls to be made through the Internet protocol, more attacks on voice phone calls and exchangers are predicted, while these systems must be very robust because emergency calls (such as 110, for police, and 119, for ambulance and fire, in Japan, or 911 in the U.S.) are made through voice phone calls.

Along with building prototypes of secure telecommunication system and marketing to potential customers, Duaxes filed a series of patent applications at the JPO, USPTO and several other patent offices by means of the PCT (Patent Cooperation Treaty) route to protect their inventions derived from the said R&D activities. Duaxes filed 309 patent applications at the JPO and their families at the foreign patent offices during 3 years from 2006 to 2009. The patent applications at the JPO are listed in **Appendix B** attached hereto. In addition, patented inventions in Japan and the U.S. are indicated by showing their patent numbers. This shows that Duaxes filed a considerable number of patent applications focusing on a specialized area of an industrial field (*i.e.*, secure digital telecommunication).

In the respective items of inventions, not only basic inventions, but also multiple inventions that contain the elements of the basic inventions applied to advanced or value-added apparatus or methods, are made for the subject of patent applications.

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<sup>11</sup> A Japanese information technology venture that developed a series of secure communication technologies, (available at <http://www.duaxes.co.jp/english/index.html>).

### **3.2. Employment of NPEs and the Results**

The ongoing activities of the NPEs employed by Duaxes are outlined chronologically in **Appendix C**. No doubt, the proceeds to be gained through the employment of NPEs would be much below the proceeds to be gained through the public offering of shares if Duaxes had been able to go public. However, realizing proceeds of over US\$150,000 by means of only one US patent within six months may be sufficient to make the founder of Duaxes, Mr. Nagoya, believe that his investment of financial and human resources to develop secure telecommunication technologies was not a wasted effort. Such partial recoupment of investment in an unsuccessful technology venture may encourage entrepreneurs to enter new enterprises. Mr. Nagoya has also embarked on a new business plan to design a new power supply network combining electric power and hydrogen and to disseminate his plan through society.

From the perspective of the licensees of patents, it would seem to be reasonable to pay US\$50,000 to ensure its practice of a patented invention. Their quick agreement to reach a settlement after the filing of litigation by NPEs supports this presumption. Also, it should be noted that the grant of licenses with almost the same and with simple terms and conditions to multiple licensees with a lump sum royalty of US\$50,000 or less are similar to the so-called FRAND (Fair, Reasonable, and Non-discriminatory) license terms. What is most inspiring is that the current negotiations over the patent licenses are conducted between an NPE employed by Duaxes and another NPE employed by the potential licensees of Duaxes' patented inventions, most of whom are established electronics or software companies. This shows that this pair of NPEs are playing the role of intermediating between the patentee and the potential licensees.

## **4. Discussion and Suggestions from the Study**

Undoubtedly, it is too early to reach any conclusion by simply looking at one (still on-going) case. However, at least to date, it seems that the activities of Duaxes and NPEs employed by Duaxes generally accord to the presumption discussed in chapter 2, above, namely, the conduct of NPEs shows little glimpses of an evil and greedy troll.

Nevertheless, there are several issues that cause inefficiency from the perspectives of the respective related parties:

- 1) It is difficult for the potential clients of NPEs to assess the track records and estimate the performance of potential NPE candidates. As suggested in chapter 2, above, the disclosure in detail of the track records of NPEs is likely to be very helpful for their potential clients to assess appropriate NPEs to do business with. However, such detailed information is likely to also be disseminated through the potential licensees of the patented inventions of the potential clients of NPEs. However, the availability of good NPE records means that it will be able to quickly reach an agreement with the licensees after filing patent litigation against them. Ironically, this means that patent litigations initiated by an NPE with a high performance track record are not a serious threat to defendants, because the defendants can

expect that they quickly contract with the plaintiff NPE and be granted patent licenses with reasonable royalties and other conditions. It is hard to predict whether this encourages the licensee to neglect the demands from NPEs or to quickly negotiate with them to reach final license agreements.

2) The goal of NPEs and their patent assignors is to exchange patent rights for money. They don't have to exclude those who practice the patented inventions from the market. What they seek is to obtain royalties from potential licensees, irrespective of whether they actually practice the patented inventions. Therefore, there is a good reason for NPEs to minimize their expenditure in preparing patent infringement actions. It is natural for NPEs to avoid incurring the cost of finding out who is actually practicing the patented inventions. Therefore, NPEs are likely to file proceedings against a wide pool of possible users, many of which may not actually be practicing the patented inventions. This means that an unnecessarily large number of defendants may face uncertainty while these proceedings are pending.

3) The feint aggressiveness of NPEs in enforcing patent rights seems necessary in light of the current conditions pointed out in chapter 2, above. However, such aggressiveness is very costly both to NPEs and potential licensees. Presumably, NPEs will gradually employ more moderate behavior as society begins to recognize the sometimes beneficial role of NPEs. If this presumption is applicable, it would be helpful for those who are concerned with the patent trade to analyze and understand the advantages and disadvantages of making use of NPEs as intermediaries in the patent market. The advent of NPEs representing the interests of potential licensees suggests that such licensees have developed an understanding of the intermediary role of NPEs, while they seek to alleviate the uncertainty to which they would be subject to if they had to deal with or defend themselves individually in patent litigation against NPEs, without an alliance with their potential licensee peers.

At the present time, all the parties to patent deals (including, NPEs themselves) bear the burden of excessive transaction costs. However, it is likely that, in the course of time, the patentees, NPEs, and potential licensees may reach an equilibrium as the result of repeated interactions and, as with real estate, a market for patents will be established, even though a formal systematic exchange market for patents (such as a stock exchange market) is unlikely to be established.

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## Appendix A An Experimental Discussion on the Role of Intellectual Property Rights Using a Network Model

### 1. The design of the model

#### *Step 1: Preparing the Market*

The model used here (hereinafter, the “*Model*”) is designed to assess the viability of IP rights in promoting the diffusion of products and services embodying newly created inventions. If IP rights to protect such inventions are given to a supplier, it gains the power to exclude its competitors from the relevant market. Naturally, the *Model* is modeled on such a market (hereinafter, the “*Market*”). A market is usually comprised of potentially competing suppliers and consumers (including potential consumers). The suppliers distribute products and services embodying new inventions initially transmitted by the inventors. Each of these actors (*i.e.*, suppliers, consumers, and inventors) can be deemed actors belonging to a certain social network. In order to denote these conditions of a market, a *Market* is defined as a network comprised of a certain number (“*size*”) of nodes (or, a “*size x size*” matrix).

#### *Step 2: Prearranging the Default Conditions of the Market*

Empirically, we know that the potential consumers, suppliers and the inventors have a certain degree of mutual relationships with one another. Such network possibly affects the diffusion of products and services distributed by the suppliers. Such network may have a great variety of forms. However, for the purpose of simplicity, the *Model* starts from a regular graph. The default condition of the *Market* is defined by (a) *size*; (b) the degree of the regular graph (“*vRegular*”); and (c) one node arbitrarily chosen from all the nodes (“*Origin*”), which represents the inventor. A regular graph is also convenient in order to denote the conditions in which nodes are directly or indirectly connected with each other, and the distances between respective nodes and *Origin* have a wide variety of disparity. For the purpose of simplicity, the *Model* does not implement the dynamic development of a consumers network, except for the establishment and cut-off of the edges connecting respective suppliers and consumers.

#### *Step 3: Nominating the First and Second Suppliers*

The *Model* nominates only two mutually competing suppliers - the first moving supplier (hereinafter, “ $S_f$ ”), and the following supplier (hereinafter, “ $S_s$ ”)) that sell their products or services implementing the *Origin*’s invention to consumers. It is easily presumed that such suppliers come from a location closer to the *Origin* compared to the majority of potential consumers. For the purpose of simplicity, the *Model* chooses two nodes arbitrarily from among the nodes adjacent to *Origin*, and nominates one of them as  $S_f$  and the other as  $S_s$  (*Figure 1*).

In the *Model*, a successful sale of one unit of products or services by  $S_f$  (or,  $S_s$ ) to a consumer is represented by the establishment of an edge between the node denoting  $S_f$  (or,  $S_s$ ) and another node denoting the said consumer. If  $S_f$  (or,  $S_s$ ) sells  $n$  units of products or services to one consumer, the number of edges connecting the node denoting  $S_f$  (or,  $S_s$ ) and another node denoting the said consumer becomes  $n$ .

#### *Step 4: Prearranging the Sales Capabilities of Suppliers*

It is generally understood that a shorter distance between the transmitter and the receiver of information is likely to facilitate a better quality of communication (See e.g., Bavelas (1950) and Borgatti (2005)). In order to implement the said relationship between the probability of successful sales and distance in the simplest as practicable and convenient manner, the *Model* employs the concept of a time constant ( $\tau$ ) as follows:

- $t$ : the distance between two nodes, one of which denotes the relevant potential consumer, and the other is the *Origin*.
- $\tau$ : a variable prefixed for each of the suppliers that is greater than 0.
- $P = e^{-\frac{t}{\tau}}$ : the probability that an edge is established between the said node denoting the relevant potential consumer and the node denoting the relevant supplier.

In order to implement the said impact of the accessibility to consumers of the relevant information in a simplified manner, the *Model* assumes that the probability of the successful sale of products or services by a supplier to a consumer gradually decreases according to the increase in the distance between the *Origin* and the node denoting the relevant consumer. These parameters for the *Model* approximately represent the relationship between the probability of a successful sale and the accessibility to consumers of the relevant information, even though the reality is certainly more complex. Moreover, the larger  $\tau$  can represent the stronger sales capabilities, and the smaller  $\tau$  can represent the weaker sales capabilities (Figure 2). The *Model*<sub>1</sub> prefixes certain values of  $\tau$  (“ $f\tau$ ” and “ $s\tau$ ”) to represent the sales capabilities of  $S_f$  and  $S_s$  respectively. The *Model* assumes that one consumer may purchase multiple products or services of the same kind. Accordingly, the *Model*<sub>1</sub> permits multiple edges to be established between any combination of one node denoting a supplier and any of the other nodes. However, for the purpose of simplicity, the simulation assumes that a supplier can send only one edge to each of the other nodes during each trial as explained in Step 6, below.

#### *Step 5: Prefixing the Strength of the IP rights*

The IP rights given to a supplier give it the power to exclude the other suppliers from selling competing products or services to consumers. The *Model*<sub>1</sub> represents the successful enforcement of  $S_f$ 's (or,  $S_s$ 's) IP rights by the cut-off of the edges connecting  $S_s$  (or,  $S_f$ ) and other nodes. For the purpose of simplicity, the *Model*<sub>1</sub> assumes that a successful enforcement of  $S_f$ 's (or,  $S_s$ 's) IP rights against  $S_s$ 's (or,  $S_f$ 's) sales of products or services to a certain consumer cuts off every edge connecting  $S_s$  (or,  $S_f$ ) and the node denoting such consumer. The *Model* represents the strength of the IP rights given to a supplier by the probability (“ $fForce$ ” for  $S_f$ , and “ $sForce$ ” for  $S_s$ ) that the edge(s) connecting the competing supplier and each of the other nodes are cut off.

#### *Step 6: The Trials*

At the respective trials, each of  $S_f$  and  $S_s$  tries to send edges to other nodes. The probability of the successful establishment of edges is regulated by the prearranged sales capabilities of the respective suppliers set forth in Step 4 above. If IP rights are given to either of the suppliers, such supplier tries to cut off the edge connecting its competing supplier and other nodes at each of the second and following trials. The probability that the edge(s) connecting  $S_s$  (or,  $S_f$ )

and each of the other nodes are cut off is regulated by  $fForce$  (or,  $sForce$ ), which denotes the strength of IP rights given to  $S_f$  (or,  $S_s$ ).

## 2. Parameters to Assess the Results of Experiments on the *Model*

The purpose of conducting experiments on the *Model*<sub>1</sub> is to assess the viability of IP rights in promoting the diffusion of the *new creation* embodied in products or services distributed by suppliers. The degree of such diffusion can be approximately assessed by looking at, after each trial, a parameter that represents the gradual reduction in the degree of separation between the respective nodes and *Origin*. Among the basic and commonly used parameters, the author employs the *closeness centrality* standardized by multiplying it by “size - 1” ( $C'_c(i)$ ) for that purpose:

$$C'_c(i) = \frac{size - 1}{\sum_{j=1}^{size} d_{ij}}$$

$$i = Origin$$

$d_{ij}$  is the distance between node<sub>i</sub> and node<sub>j</sub>.

The extreme form of diffusion of the *new creation* initially transmitted by *Origin* is represented by a graph in which every node is directly connected with either or both of the nodes denoting suppliers. Assuming the distance between *Origin* and both of the suppliers is  $d_s$ , the distance between *Origin* and each of the nodes that are neither *Origin*, *suppliers*, nor the nodes directly connected with *Origin* from the beginning is  $d_s + 1$ . Accordingly, if *size* is sufficiently large, the *closeness centrality* of *Origin* becomes very close to  $\frac{1}{d_s+1}$  (if the suppliers are directly connected with *Origin* (or,  $d_s = 1$ ), 0.5).

## 3. Competition between a Supplier with Stronger Sales Capabilities and another Supplier with Weaker Sales Capabilities in a Market with Growing Demand

The set of variables shown in the *Table* are employed to denote competition between a supplier ( $S_f$ ) with stronger sales capabilities and another supplier ( $S_s$ ) with weaker sales capabilities in a market with growing demand. The development of the network of the *Market* is shown in *Figures 3, 5, 7 and 9* respectively for each condition of the *Market*. Also, the growth of the *closeness centrality* of *Origin* is shown in *Figure 4, 6, 8 and 10*. According to the results, IP rights enforced by the supplier ( $S_f$ ) with stronger sales capabilities against another supplier ( $S_s$ ) with weaker sales capabilities causes little difference in the growth of the *closeness centrality* of *Origin* compared with that in the case of free competition between suppliers. On the other hand, IP rights enforced by the supplier ( $S_s$ ) with weaker sales capabilities against another supplier ( $S_f$ ) with stronger sales capabilities causes a substantive delay in the growth of the *closeness centrality* of *Origin*.

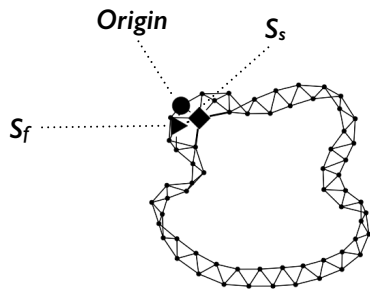


Figure 1. *Origin*, *S<sub>f</sub>* and *S<sub>s</sub>* are nominated.

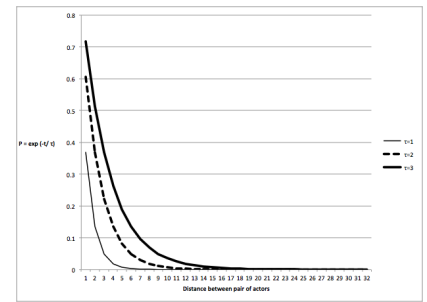


Figure 2. The difference in the transition of *P* according to the value of  $\tau$ .

Set of variables	Conditions of the market	size	<i>vRegular</i>	<i>cCapa</i>	<i>fDegree</i>	<i>sDegree</i>	<i>f<math>\tau</math></i>	<i>s<math>\tau</math></i>	<i>fForce</i>	<i>sForce</i>	<i>nTrial</i>
(i)	<i>S<sub>f</sub></i> conducts substantially no sales activities (for the purpose of comparison)	64	4	64	1	1	0.001	1	0	0	200
(ii)	Neither <i>S<sub>f</sub></i> nor <i>S<sub>s</sub></i> enforces IP rights	64	4	64	1	1	2	1	0	0	200
(iii)	<i>S<sub>f</sub></i> enforces IP rights	64	4	64	1	1	2	1	0.8	0	200
(iv)	<i>S<sub>s</sub></i> enforces IP rights	64	4	64	1	1	2	1	0	0.8	200

Table The set of variables

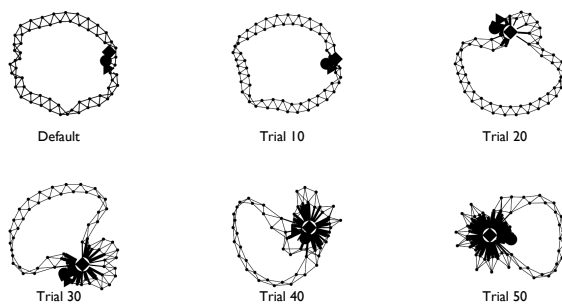


Figure 3 The examples of the development of the network using the set of variables (i) of Table, which denotes the case where *S<sub>f</sub>* conducts substantially no sales activities in a market model with growing demands (*S<sub>f</sub>* with stronger sales capabilities, and *S<sub>s</sub>* with weaker sales capabilities).

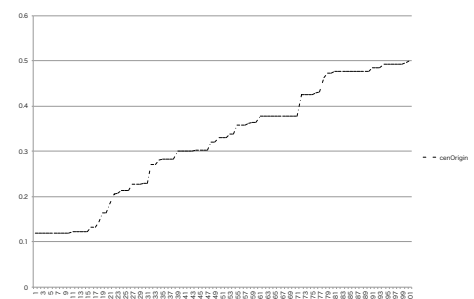


Figure 4 The examples of the development of the closeness centrality of the *Origin* ("cenOrigin") and the betweenness centrality of *S<sub>f</sub>* ("btwnSf") and *S<sub>s</sub>* ("btwnSs") resulting from the network using the set of variables (i) of Table.



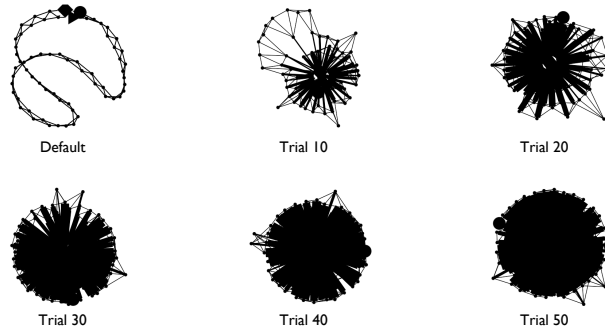


Figure 5 The example of the development of the network using the set of variables (ii) of Table, which denotes the case where neither  $S_f$  nor  $S_s$  enforces IP rights, in a market model with growing demands ( $S_f$  with stronger sales capabilities, and  $S_s$  with weaker sales capabilities).

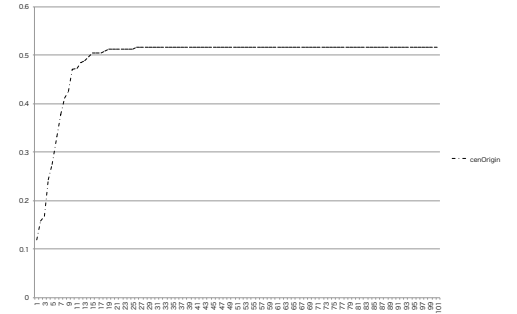


Figure 6 The examples of the development of the closeness centrality of the *Origin* ("cenOrigin") and the betweenness centrality of  $S_f$  ("btwnSf") and  $S_s$  ("btwnSs") resulting from the network using the set of variables (ii) of Table 5.

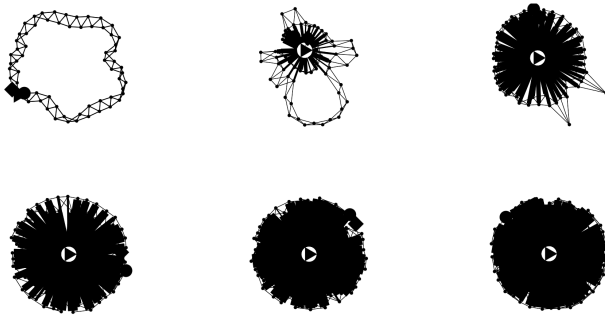


Figure 7 The examples of the development of the network using the set of variables (iii) of Table, which denotes the case where  $S_f$  enforces IP rights against  $S_s$  in a market model with growing demands ( $S_f$  with stronger sales capabilities, and  $S_s$  with weaker sales capabilities).

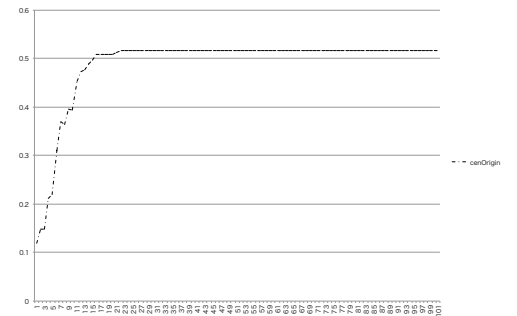


Figure 8 The examples of the development of the closeness centrality of the *Origin* ("cenOrigin") and the betweenness centrality of  $S_f$  ("btwnSf") and  $S_s$  ("btwnSs") resulting from the network using the set of variables (iii) of Table.

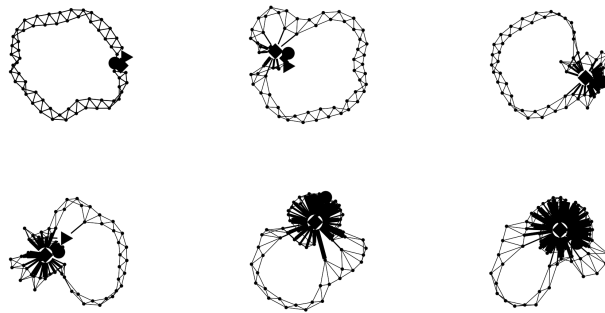


Figure 9 The examples of the development of the network using the set of variables (iv) of Table, which denotes the case where  $S_s$  enforces IP rights against  $S_f$  in a market model with growing demands ( $S_f$  with stronger sales capabilities, and  $S_s$  with weaker sales capabilities).

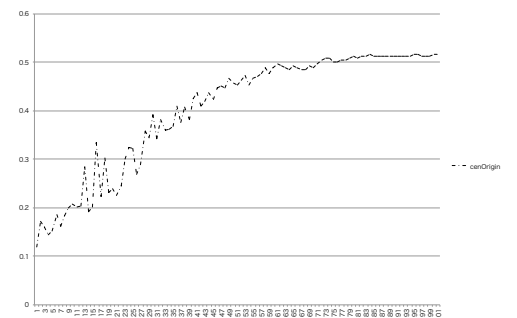
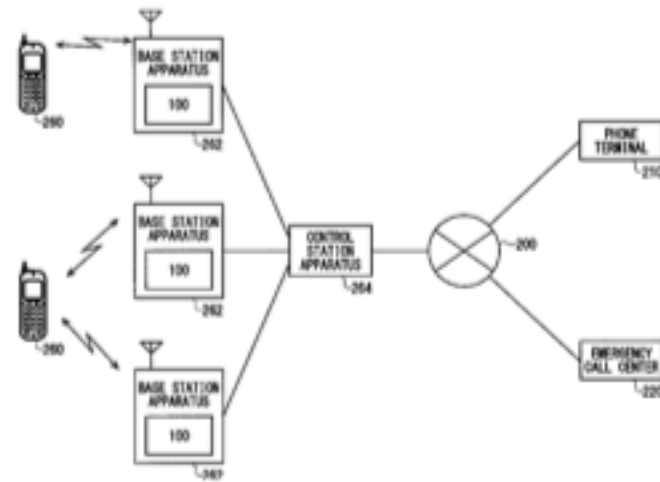


Figure 10 The examples of the development of the closeness centrality of the *Origin* ("cenOrigin") and the betweenness centrality of  $S_f$  ("btwnSf") and  $S_s$  ("btwnSs") resulting from the network using the set of variables (iv) of Table 5.

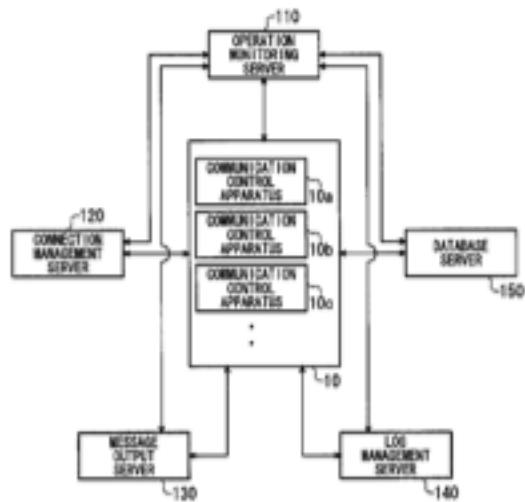
## Appendix B An Overview of Duaxes' Patent Applications

Name of Invention	Solution sought by the Invention	Patent Application No.	Japan Patent No.	US Patent No.	Assignee
Data Processor/ Data Processing Unit	To provide a technique for achieving high-speed data processing	2006-552407	JP4087427		
		2006-552413	JP4087428	US7,865,474 B2	
		2007-106290	JP4201822		
		2007-234536	JP4060348		
		2007-323169, 329646, 329647, 329648, 329649, 329650, 329651			
		2007-503569	JP4027416		
		2008-019937, 019938, 019939, 019940, 019941, 019942, 019943			
A Communication Control System and/or a communication control unit	To provide a technique for controlling communication appropriately in accordance with the party on the other end of the communication	2006-541527	JP3930044	US8,295,802 B2	SPV1
		2007-330236, 330237, 330238, 330239, 330240, 330241, 330242			
		2007-503571	JP4546998	US8,336,092 B2	
		2007-503606	JP4554671		
		2007-503607			
		2007-505311	JP4554675	US8,073,855 B2	
		2007-513544			
		2007-507601	JP3981150		
		2007-525095			
		2007-558389	JP4638513		
		2008-508419	JP4676530		
		2008-540803	JP4319246		
		2009-542403	JP5380710		
		2009-542405, 542406, 542407, 542409, 542410, 543585			
A Binary Search Circuit	To provide a technique for enabling high-speed communication environments.	2006-541526	JP3993885	US8,065,322 B2	
		2008-504558	JP4104649		
Communication management system, communication management method, and communication control device	To provide a technique for managing P2P communication appropriately.	2007-507599	JP4188409	US8,117,305 B2	
		2007-507600	JP4015690	US8,417,677 B2	
		2007-513542	JP4571184	US8,572,759 B2	
		2007-513543	JP4574675	US8,463,727 B2	SPV2
Testing Device/ Method	To provide a technique for suitably testing a route information managing device	2007-513545	JP4101283		
		2007-329462, 329525, 331217, 329632, 329652, 330012, 330243, 330921, 333188, 333202, 333217, 333230, 333264, 333324, 339593, 338986			
		2008-018231, 018273, 019890, 01992, 018101, 018146, 018186, 018256, 018310, 019934, 019944, 019953, 024546, 024559, 024573			
		2009-543586			
A Determining Device	To offer the technology of judging the processing which should be performed at high speed	2007-558388	JP4146505		
Detection Circuit / Method	To provide the technology to enable highly secure communication control	2009-542404			
A Log Output Control Device/ Method	To provide the means to output appropriate log of communication device	2009-542408	JP5156892		
Load Distribution Apparatus	To provide the means to adequately distribute load of communication control device	2008-540807			
Database Access Controller	To provide the means to adequately control the access to a database	2007-329460, 329461, 329462, 329463, 329464, 329465, 329466, 329467			
File Access Control Device	To provide the means to adequately control access to the files stored in a file server	2007-329518, 329519, 329520, 329521, 329522, 329523, 329524			
Grammar Checking Device	To provide the means to check the grammar of the script contained in a communication data	2007-330005, 330006, 330007, 330008, 330009, 330010, 330011			
Accounting Management Device	To provide the means to appropriately filter the communication data concerning accounting	2007-331210, 331211, 331212, 331213, 331214, 331215, 331216			
Monitor/ Communication Monitoring Unit	To provide technology for constructing a high-reliability security system	2007-329625, 329626, 329627, 329628, 329629, 329630, 329631, 329646, 329647, 329648, 329649, 329650, 329651, 32965			
Device, Method, And System For Virus Inspection	To provide the system to inspect virus including unknown ones without depending on OS	2001-366884	JP3914757		
		2007-333181, 333182, 333183, 333184, 333185, 333186, 333187			

Protocol Converting Apparatus	To provide the means to exchange IP protocol appropriately	2007-333195, 333196, 333197, 333198, 333199, 333200, 333201, 333202			
Network Address Translator	To provide the means to exchange network address of a telecommunication device appropriately	2007-333210, 333211, 333212, 333213, 333214, 333215, 333216			
Network Address And Port Translator	To provide a technology for appropriately translating a network address and a port number of a communication device	2007-333223, 333224, 333225, 333226, 333227, 333228, 333229			
Call Origination Control Apparatus	To provide a technology for appropriately controlling call origination to a specific telephone number	2007-333257, 333258, 333259, 333260, 333261, 333262, 333263			
Filtering/ Mail Filtering Device	To provide a technique for suitably filtering communication data	2007-330814, 330815, 330816, 330817, 330818, 330819, 330820, 330824, 330825, 330826, 330827, 330828, 330829, 330830			
Band Control Apparatus	To provide a technology for efficiently sending communication data	2007-333317, 333318, 333319, 333320, 333321, 333322, 333323			
Emergency Call Controller	To provide techniques for an emergency call using a mobile phone or an IP telephone.	2007-338979, 338980, 338981, 338982, 338983, 338984, 338985			
Bot Detector	To offer the technology of detecting the bot which performs unjust communication.	2007-339586, 339587, 339588, 339589, 339590, 339591, 339592			
Fire Wall Device/ Apparatus for Preventing Unauthorized Entry	To provide techniques for achieving high-speed packet filtering	2008-018179, 018180, 018181, 018182, 018183, 018184, 018185, 018303, 018304, 018305, 018306, 018307, 018308, 018309			
Circuit Inspection Device	To provide a technique for suitably inspecting a circuit of a communication controlling device	2008-019905, 019906, 019907, 019908, 019909, 019909, 019910, 019911, 019912			
Authentication Apparatus	To provide a technique for performing authentication processing on a user, at a high speed	2008-019915, 019916, 019917, 019918, 019919, 019920, 019921			
Peer-to-Peer Communication Controller	To provide a technique for suitably controlling P2P communication	2008-019927, 019928, 019929, 019930, 019931, 019932, 019933			
Layer-2 Switch Device	To provide a technique for suitably relaying communication data	2008-018094, 018095, 018096, 018097, 018097, 018098, 018099, 018100			
Speed Conversion Device	To provide a technique for raising efficiency of communication by adjusting the sending amount of communication data flexibly in packet units	2008-018139, 018140, 018141, 018142, 018143, 018144, 018145			
Virtual Private Network Management Device	To provide a technique for easily constructing a virtual private network	2008-018249, 018250, 018251, 018252, 018253, 018254, 018255			
Defence Apparatus	To provide a technique for properly defending a communication apparatus against an attack	2008-018266, 018267, 018268, 018269, 018270, 018271, 018272			
Domain Name System Server	To provide the mean to achieve high-speed domain name system	2008-018279, 018280, 018281, 018282, 018283, 018284, 018285			
Layer-7 Switch Device	To provide a technique for properly relaying communication data	2008-019883, 019884, 019885, 019886, 019887, 01988, 019889			
Database Inspection Device	To provide a technique for suitably inspecting a database of a communication controlling device	2008-019895, 019896, 01987, 019898, 019899, 019900, 019901, 019902			
Router	To provide the means to relay communication data appropriately	2008-024539, 024540, 024541, 024542, 024543, 024544, 024545			
SIP (Session Initiation Protocol) Server	To provide the means to high speed process communication data	2008-024552, 024553, 024554, 024555, 024556, 024557, 024558			
Signal Processing Apparatus and Signal Transmission Method	To provide a signal processing apparatus that can avoid a reception failure due to transmission delay in a bus system	2008-024566, 024567, 024568, 024569, 024580, 024571, 024572			



A drawing which outlines the scheme of US 8,295,802 patented invention



A drawing which outlines the scheme of US 8,463,727 patented invention

## **Appendix C Progress of Patent Deal Conducted by the NPEs employed by Duaxes**

During 2012, a U.S. NPE (NPE<sub>1</sub>) contacted Duaxes, which contracted with NPE<sub>1</sub> to assign Duaxes' patent rights to NPE<sub>1</sub> so that NPE<sub>1</sub> could market such rights to potential licensees. However, NPE<sub>1</sub> failed to conclude a license agreement with any potential licensees until the expiration of the two year term of the contract between NPE<sub>1</sub> and Duaxes.

During 2014, another U.S. NPE (NPE<sub>2</sub>) contacted and started negotiation with Duaxes over possible patent assignment contracts. According to NPE<sub>2</sub>, they located Duaxes through their contact with NPE<sub>1</sub>.<sup>12</sup> NPE<sub>2</sub> established two special purpose vehicles in the form of limited liability corporations (LLC) (SPV<sub>1</sub> and SPV<sub>2</sub>), each of which was formed to market different patent rights.

In March 2015, Duaxes entered into separate patent assignment agreements with SPV<sub>1</sub> and SPV<sub>2</sub>. According to these agreements, Patent US 8,295,802 B2 "Communication control device and communication control method for an emergency call over the internet"<sup>13</sup>, whose patented invention was made for the purpose of enabling secure emergency calls through the Internet, was assigned from Duaxes to SPV<sub>1</sub>, which, in turn, exercised this patent right to prompt and induce potential licensees to obtain a license to practice this patented invention by paying royalties to SPV<sub>1</sub>. Patent US 8,463,727 B2 "Communication management system and communication management method"<sup>14</sup>, whose patented invention was made for the

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<sup>12</sup> According to this, it seems that NPE<sub>1</sub> contributed to a certain degree to the successful license of Duaxes' patent rights, although NPE<sub>1</sub> failed to close any licenses for themselves.

<sup>13</sup> The first claim of this patent reads as follows: A communication control apparatus, comprising: a database which stores identification information of an emergency call; a search circuit which acquires communication data from a first connection request and searches the database for the identification information of a first terminal that is a transmission destination of the first connection request; and a control unit which, when the identification information of the first terminal is found in the database, transmits a connection termination request to a second terminal that is a transmission source of the first connection request, further transmits a second connection request to the second terminal to establish a connection with the second terminal before establishing a connection with the first terminal, thereafter establishes a connection with the first terminal, and relays communication data between the first terminal and the second terminal.

<sup>14</sup> The first claim of this patent reads as follows: A communication management system, comprising: a first rule database which stores a rule for extracting specific communication data among communication data; a search unit which acquires communication data and searches the first rule database to check if the communication data complies with a rule stored in the first rule database; an output unit which, when there is detected communication data complying with a rule stored in the first rule database, outputs the communication data; an update unit which accepts a change in a rule for extracting specific communication data to analyze a communication data with reference to other communication data when the communication data against which a warning has been issued by reason that the communication data does not match the rule stored in the first rule database is analyzed; a second rule database which stores an updated rule changed by the update unit; and a database server which transmits the updated rule changed by the update unit from the second rule database to the first rule database, and reflects in real time, the change in a rule.

purpose of enabling the Internettelecommunication, such as web browsing, e-mail, etc., to reject access to or attack from harmful sites or senders, was assigned from Duaxes to SPV<sub>2</sub>, which, in turn, exercised this patent right to prompt and induce potential licensees to obtain a license to practice this patented invention by paying royalties to SPV<sub>2</sub>.

During the 1st quarter of 2015, SPV<sub>1</sub> filed litigations against 33 telecommunication or security device, system and/or software companies in the U.S. to seek injunctions to cease the practice of the US 8,295,802 patented invention, and compensation for damages by contending that each of them was practicing one or more of such inventions. Also, SPV<sub>2</sub> filed litigation against 18 telecommunication or security device, system and/or software companies in the U.S. to seek injunctions to cease practice of the US 8,463,727 patented invention, and compensation for damages by contending that each of them was practicing one or more of such inventions.

Until the end of October 2015, SPV<sub>1</sub> reached agreements with 4 of 33 defendants and concluded license agreements to finally resolve the litigation between SPV<sub>1</sub> and the respective defendants. According to these license agreements, SPV<sub>1</sub> is expected to receive US\$185,000 royalties in total (US\$50,000 from three licensees, and US\$35,000 from one licensee).

Currently, SPV<sub>1</sub> and SPV<sub>2</sub> are negotiating with an NPE which is representing the multiple potential licensees.