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The ONSP Directive and a Model of Network Interconnection for the Competition Safeguards of Telecommunications Business in Korea

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전기통신사업의 공정경쟁을 위한 국내의 ONSP현황 및 통신망 상호접속 모델

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ABSTRACT

Recently, the Ministry of communication in Korea issued a directive for a policy on competition safeguards as a first step to a free telecommunications market. This paper discusses the motivations behind the directive which introduces a guideline for a level playing field in a free market and analyzed the main contents of it. Also as a precondition of such competition safeguards, a network interconnection criteria and a model for networking when various kinds of network operators exist, are proposed from the viewpoint of a third party.

要 約

최근, 정보통신부에서는 전기통신시장 자유화의 1단계 조치로 전기통신사업 공정경쟁보장지침을 발표하였다. 본고에서는 이 지침의 배경과 핵심 내용을 분석하고 있다. 또한 이러한 경쟁보장 장치의 선결 요건으로서 우리나라의 통신망 현실을 고려한 망 상호접속기준과 상호접속도 모델을 제3자의 입장에서 제시하고 있다.

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Ⅰ. Introduction

It is generally accepted that the opening of all parts of market to competition are not desirable since some parts of it can benefit from being a "natural monopoly". In telecommunications, the laws and regulations are being changed to a new framework to encourage competition between network operators for the provision of competitive services by separating the natural monopoly segments of the markets (basic transmission service) from parts which might benefit from competition (value-added service)[1]. In Korea, the telecommunications regulation was reformed to a more competitive one in 1991 and, now, there is a competition in international telephone services[2]. Furthermore, there is no limitation to the foreign capital investment in value-added service area from 1994. Therefore, we have a free market of value-added service in the near future. Upon this phase, the government (Ministry of Communication) has prepared a directive entitled, "Directive on Competition Safeguards in Telecommunications Services" in order to bring a level playing field in a new telecommunications environment, where various kinds of service providers will appear sooner or later[3]. The policy on competition safeguards in Korea is called "Open Network Service Provision" (ONSP), which makes network disclosure on equal and nondiscriminative basis[7].

Ⅱ. ONSP DIRECTIVE

The ONSP directive demands the Network Service Provider (NSP) submit a ONSP plan which describes the detail network service offerings. NSPs are those who own telecommunications circuits such as PSTN or PSPDN in contrast to Value-added Service Providers (VSP) who lease circuits from NSPs. The ONSP plan is a gradual basis-network disclosure plan including a measure NSPs prohibiting from engaging in anti-competitive conduct such as cross-subsidization, predatory pricing etc. It seems that the main items are those of accounting separation and network disclosure. First, accounting separation means that when an NSP offers diverse telecommunication services, the accounting for each service should be separated. We believe that this measure is aimed to have a same effect as the structural separation in the provision of telecommunication services. Accounting separation between an NSP's service units is now globally being considered as a nonstructural safeguard, i.e. if a cross-subsidization occurs between service units, it will be clearly revealed in the account book. Thus, the accounting separation is a measure of prohibition on cross-subsidization. For example, if an NSP's profit from the natural monopoly position in the basic telephone service is invested for an NSP's value-added service unit (internally cross-subsidization), the small VAPs will lose competition power by the NSP's financial attacks especially when they offer similar services to those of an NSP. It is believed that the ONSP in Korea is very similar with othe ONA (Open Network Architecture)[5] in the USA in a sense that an NSP could offer the value-added services without structural separation and the NSPs being obliged to file an ONSP plan. The ONA in USA is also a regulatory concept for the provision of value-added services on the basis of Comparably Efficient Interconnection(CEI). CEI, as defined by the FCC, aims to prevent discrimination by traditional NSPs against new sup-

pliers and promote efficiency. It also requires the NSPs spell out the basic service functions that they will offer specifically to support competing VSPs directly. The CEI functionality parameters are :

- Equal functionality
- Unbundling of basic services
- Equivalent technical characteristics
- Resale of basic service to all VSPs
- Equal time to install, maintenance, and repair
- Equivalent end-user access
- Available before NSP sells value-added service
- Minimize transport costs
- No purchaser discrimination.

The purpose of network disclosure is to bring an effective usage of an NSP's network by opening network related information to the others. Network disclosure could be again divided into several subitems such as provision of equal access, network service offering, network information, and customer proprietary information.

The equal access requirement makes a network interconnection configuration technically nondiscrimination, when a new service provider wants to interconnect with an NSP's network. To do this, the first step is to establish a set of standard network interfaces according to a certain network interconnection criteria. The ONSP directive also requires a measure to guarantee that NSPs provide access to their services that is equivalent in price, terms and equality to the access they grant themselves and their affiliates. Also, the NSPs are required to make their basic service elements available to the users on unbundled, reason, and nondiscriminatory basis. NSP must define an unbundled and tariffed set of basic service elements that can be used for provision of value-added services. These basic service elements could be diversified in accordance with customer needs and telecommunications technology evolves. It is intended that competing VSPs will pay only for the basic service elements they actually select for their services, and they will be charged at a rate comparable to that of NSP itself.

NSPs are required to unbundle, the the greatest extent possible, service elements used in their provision of competitive services. The ONSP directive demands to ensure public disclosure of any network change or new basic service that affects the interconnection of value-added service with the network. In this way, the VSPs will be apprised early of network development considered by NSPs. Thus, the VSPs could take a proper measure in their service offerings timely. The network information disclosure should be announced in public media such as newspaper or NSP's regular magazine etc. Public disclosure should take place some months prior to the introduction of any new or modified network service that supports the value-added service offering, for example, 6 months, 12 months or more, in order to accommodate the network change. The ONSP directive even requires the NSPs disclosure R&D plans that lead to the introduction of a change to network interface specifications. This is to ensure disclosure of information on changes of the network to the telecommunications industries well in advance.

So far, we focused mainly on the network disclosure point. However, there will be some strictly private information, such as, customer proprietary network information (CPNI). This information should be kept secret upon the customer's request. Because

the NSP owns and operates the telecommunications network and they offer the network interconnection to the VSP, the NSP will unintentionally acquire competitive VSP's network related information including confidential information. If the NSP delivers the CPNI of VSP to the NSP's own value-added service unit, the NSP will hold a prominent position in business strategy. Particularly, if similar services are in competition and if NSPs utilize the VSP's CPNI in favor of NSP's service offering, the VSPs will lose the competition power and have serious damage to their business. It is strongly recommended that measures concerning treatment of VSP's CPNI be instituted.

Ⅲ. NETWORK INTERCONNECTION

1. Network interconnection criteria

In relation to network disclosure of NSP, the directive mentioned that interconnection criteria between NSP's networks would be notified in public by the Ministry of Communication. We now discuss the criteria for the network interconnection and we suggest an interconnection networking model as a third-party, bearing in mind existing Korean telecommunications market in which there are various kinds of service providers. The minimum items which are applicable to all cases of different interconnection are as follows, and consequently, these items should be set down as interconnection criteria at least[8]:

- Payment: The various payments between the new entrant and other operators will have to be defined. Each party will pay the other for delivering or collecting calls. The rates will probably depend on the distance that the call is carried and also depend on the time of day. The parties will have to decide whether unsuccessful call attempts should be paid for. The arrangements for billing, including the information to be provided, need to be defined.
- Point of interface(POI): The location of the interconnection points will have to be defined. There will probably need to be at least one interconnection point in each charge area if the charges payable by the new entrant have the same geographical structure as the tariffs for the existing public network. The interconnection points will need to be accessible to both the new VSP's engineers and the engineers of the other operator to allow maintenance, unless one party is prepared to allow the other to carry out maintenance.
- Signaling at the interconnection points: The signaling system for interconnection will have to be defined. CCITT No.7 signaling system is the obvious choice but the new VSP will need to be specific about the features to be offered.
- Interconnection circuit specifications: The specifications for the physical interconnection arrangements will have to be defined. The interfaces could be electrical or optical(fiber).
- Numbering: The numbering arrangements for the new entrant's customers and the codes for the selection of the new entrant's network by indirect customers will need to be defined.
- Synchronization: The new entrant will have to decide whether to synchronize its network to that of another operator, whether to provide its own timing

source.

- Grade of service: The grade of service for the handling of switched traffic by other operators will have to be defined to ensure that the other operators do not subject the new entrants traffic to congestion.
- Investigation of faults: procedure needs to be established for collaborating to investigate faults.
- Emergency services: All operators will need to collaborate to ensure that calls to emergency services are handled correctly and routed to the appropriate emergency authority.
- Arbitration: There needs to be a swift and effective method for arbitrating disputes.

The possible internetworking topologies where requiring interconnection service and

Table 1. Comparison between local loop connection and trunk connection

Feature \ Connection	Local loop	Trunk
Advantages	• No requires additional facilities to interconnect with existing networks.	• Easy interconnection implementation by network identification code (at same network hierarchy) • Increase network usage efficiency and reliability • Possible to have flexible accounting rates • Improve the quality of service by short distance interconnection
Disadvantages	• Lowering of network usage efficiency, reliability, and quality of service • Possible to accumulate the call charges in telephone network side when data network is in failure	• Requires to install a special interworking facility in order to interface with data network and to treat interoffice relay signaling (MFR2, No7)

interconnection criteria are connections of PSTN-PSTN, PSTN-PSPDN, PSPDN-PSPDN, PSTN-VAN, PSPDN-VAN, and VAN-VAN.

2. Interconnection networking model

The way of the network interconnection is divided into 2 categories, subscriber line(local loop) connection and trunk side connection and these 2 types have some advantages and disadvantages respectively. Table 1 gives comparative analysis for the 2 different types of connection.

The actual interconnections between telephone network and data network in Korea are

Table 2. Merits and demerits for 3 different cases of IWF ownership

Feature / Owner	Merits	Demerits
Telelphone network operator (Ex. KT)	• Maximize the network usage efficiency • Simplicity of network service offering such as charge collecting, etc. • Easily implement the equal access (induce fair competition)	• Not fully support the network service required by data network operators • Need to develop a interworking facility with large interconnection capacity • Take long time for IWF development and installation
Data network operator (Ex. DaCom)	• Maximize the IWF's functionalities • Data network operators can operate their own network independently (DN operator could install a IWF with their own specs)	• Lead to complex network management since different kinds of IWFs • Lead to doubly invest in IWF installation • Communication tariff settlement between network operators are complicated
Third network operator	• Lead to a fair competition environment by equal access • Each network operator can operate their own network independently • Maximize the IWF's functionalities	• Need to establish a third party newly • Need to develop a IWF with very large capacity on long term basis

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all done through the subscriber line such as interface 1 of PSTN-VAN connection in Figure 1(a). But the interconnection through the subscriber line is not preferable way from a network management view. In other words, there will be some problems in the traffic treatment when the number of subscribers increase. Furthermore, it is impossible to route a call when network congestion occurs.

In principle, the interconnection through trunk is a standard way for network connection as shown in Figure 1(b). Accordingly, it is necessary to change the subscriber line connection marked as interface 1 in Figure 1(a) into the trunk side connection marked as interface 2 in Figure 1(b). For this purpose the Korea Telecom is to install network interworking facilities(IWF) which are in development by Electronics and Telecommunications Research Institute(ETRI) and associated manufacturers[8]. The main functions of the IWF are protocol conversion between two different networks, displaying the DB informations, and the traffic flow recording or the network access charge settlement.

In the case of trunk side connection, how-

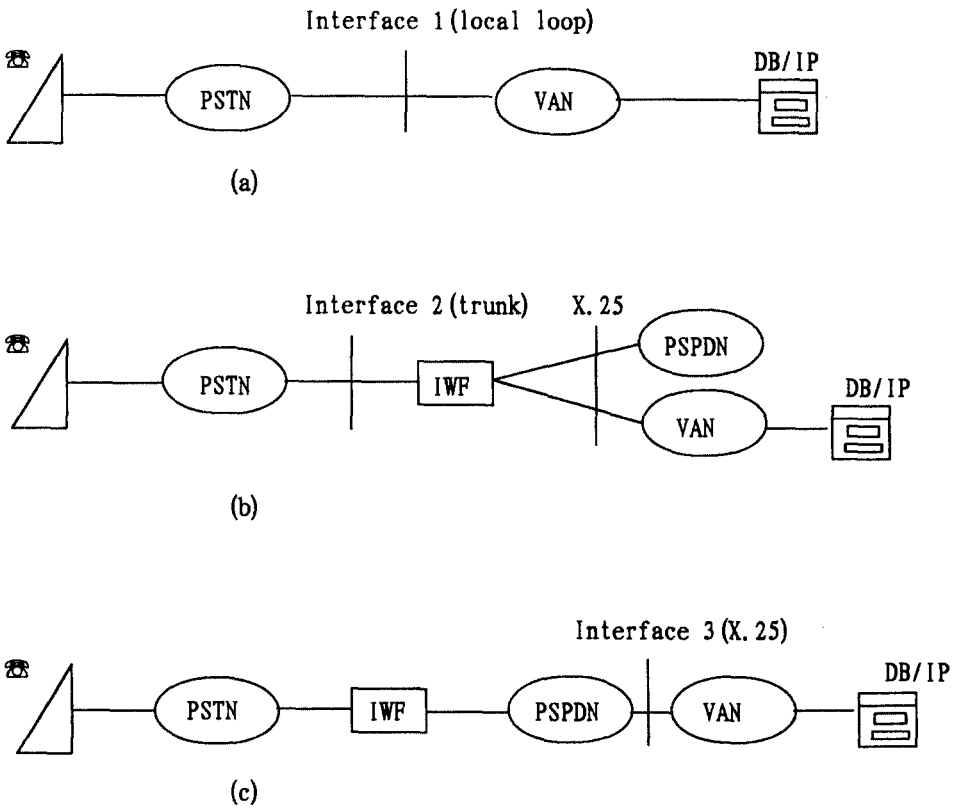

Fig. 1. PSIN-VAN Interconnection Topologies
(a) Interconnection by local loop
(b) Interconnection by trunk circuit
(c) Interconnection by through PSPDN

ever, a problem between network operators may arise from the responsibility of IWF installation, i.e. Who should install the IWF? Because any network operator could install the IWF, it will be important to define the responsible party for IWF installation as a interconnection criterion. Some merits and demerits for 3 possible cases of IWF ownership are summarized in table 2.

The network operator who owns the IWF could not offer the IWF's services for others in certain cases and they are not likely to invest money in the IWF service offerings for the new entrants. For the reasons of cost, capacity, and maintenance problem of IWF, if the public network operator who owns an IWF could not offer the IWF's services, the standardization of IWF specifications will be an important issue from a governmental standpoint.

On the other hand, the Value-Added Networks(VAN) could be interconnected with PSTN directly(interface 1) or with PSPDN(interface 3) and also with IWF just like PSTN-PSPDN interconnection(interface 2). As mentioned above, it is preferable to connect VAN with trunk such as interface 2 in Figure 1. Even though the VSPs who are relatively small would be faced with IWF purchase problem, it is believed that such connection configuration is reasonable one from the equal access point of view and especially the VSPs having DNIC(Data Network Identification Code). Also VSP's network could be directly connected to the public data network as interface 3 in Figure 1(c). This interconnection topology seems to have an interest for the NSPs because such connection is technically simple and leads to increase NSP's customers.

The interconnections between PSPDN and PSPDN, PSPDN-VAN, or VAN-VAN are implemented by the X.25, X.75 protocol through high speed data links. The data network interconnection such as interface 3 in Figure 1(c) may not be popularized by the

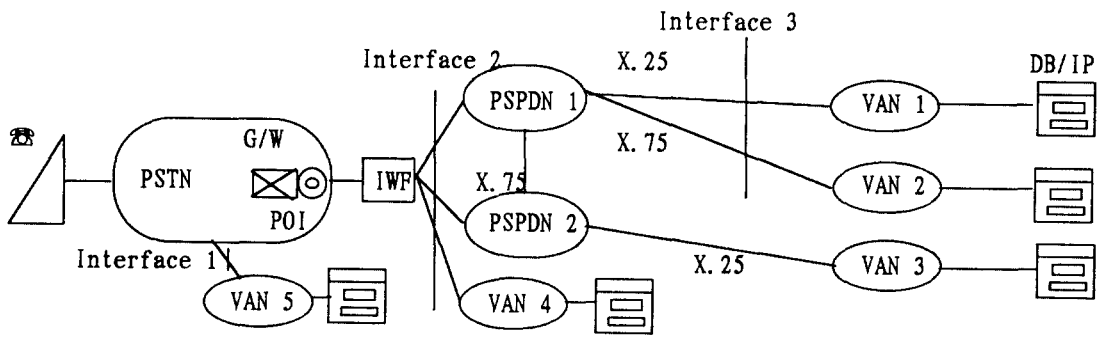

Fig. 2. Network Interworking Model

VSPs since the repetitive data retrievement or repetitive man-machine dialog is not possible for the reason of X.25 and X.75's synchronous mode operation. In other words, the VSPs probably request the interconnection configuration taking account of customer's convenience in their service access. Moreover if the VSPs are connected to PSPDN through interface 3, they should pay the network connection charge to the NSPs. Then it will be a rare case to have a such connection.

Considering the existing Korean telecommunications network realities, one of the interconnection models could be depicted as Figure 2. This model allows the data network operators(VSP) to interconnect with telephone network operator in various manners according to the data network operator's choice. As mentioned earlier in Table 1, the interconnections by local loop and trunk circuit have some merits and demerits in technical and economical considerations. Therefore, it is rather normal to have various interconnection alternatives as a interconnection model.

The interconnection between telephone network and data network again could be divided into 2 cases: PSTN-PSPDN and PSTN-VAN interconnections. Korea Telecom's Hinet-P network and DaCom's DNS network belong to PSPDN and all of the other private networks are classified to VANs. The important points in network connection are that one should bear in mind the allocation of DNIC to the new entrants and the trunk side connection since all the telecommunications service providers are equal from a business point of view. Here a telecommunications service provider denotes a network operator having a leased or owned telecommunication network and a certain number of its subscribers. Thus NSP and VSP are all telecommunications service providers but the only difference is the ownership of the telecommunications circuits.

Specifically, the criteria for the Point Of Interface(POI) is required to be clearly defined since the POI is just the physical boundary of each network operator. Ideally, it is desirable to have locally independent interconnection gateway switch at the midpoint between the two network operators. However, from network operating and economical reasons, it seems more practical to select a gateway switch among NSP's existing switches by agreement of interested parties. It may be difficult and time-consuming to reach an agreement for the physical location of POI. Anyway, the key factors to consider in defining a criterion for the location of POI are the effectiveness of network operating and the call traffics. The number of POI also should be considered in relation to the routing plan. If the telecommunication service charge is distance-dependent, the number of POI will be more important. In interconnection services which several network operators involve in connecting a call, it is also important to have criteria for interconnection charge settlement.

Ⅳ. CONCLUSION

The Open Network Service Provision in Korea is a regulatory regime that prohibits Network Service Providers from engaging in anticompetitive conduct such as cross-subsidization, unauthorized disclosure of CPNI without the customer's authorization, or discriminatory access to network services or functions. The implementation of ONSP directive requires NSPs in Korea to undertake same responsibility as the NSPs in United

States because the essential requirements of ONA and ONSP are very similar. The interconnection criteria should be established the manner in which the new entrants should not be restricted in business by the NSP's anti-competitive conducts and the Value-added Service Providers could select one of the network interconnection topologies according to their own business strategy. As an open interconnection architecture, we have suggested a reference model. The model encompasses the requirements of ONSP. The model goes beyond the requirements of equal access, in a sense that VSPs may choose the access type and the access protocol to the existing networks.

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