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Business Impact Analysis of a Mediator between the Network Management Systems of the IP/MPLS Network and the Transport Network

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Business Impact Analysis of a Mediator between the Network Management Systems of the IP/MPLS Network and the Transport Network

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Abstract: IP/MPLS service providers rely on transport networks to provide bandwidth on demand with the lowest possible provisioning time. However, due to the static nature of transport networks and the differences in the communication languages and switching systems, the IP/MPLS and transport network management systems are isolated from each other. To address this issue, a mediator called "ONE Adapter" has been developed. It allows automatic interaction and coordination of network management functions between the two network management systems. The objective of this paper is to capture the deployment impact of the mediator on the business of IP/MPLS providers and transport service providers, and to illustrate the changes in the market. To achieve that, we have conducted a survey of the literature on business models in the telecommunication sector and analyzed the service offerings of 15 leading telecommunication operators. The result is a description of the current Internet ecosystem, including the market players, their roles, and relationships. Furthermore, our results suggest that a mediator deployment will change the way how the IP/MPLS network and the transport network interact. It will allow new players to enter the market and new business models to emerge. This study will help IP/MPLS and transport service providers to anticipate the changes in the market due to a NMS mediator entering the market.

Keywords: Network Service Provider, IP/MPLS Network, New Technology Deployment Impact, Business Model, Internet Ecosystem.

JEL Classification Numbers: L22, L26, L86, L96, M15, M21.

1. Introduction

The last three decades have shown drastic changes in the business models of telecommunication service providers (TSP). Early on, only a few services were offered to users by TSPs, among which voice communication was the main source of their revenue. These business models of TSPs remained in place until the emergence of the Internet, i.e., until the demand for data traffic increased significantly due to the growing popularity of IP-based applications.

Up to this point, transport networks of TSPs could successfully support data communication networks (i.e., IP/MPLS networks). Beyond this point, SDH/SONET-based transport networks with their static nature and their manual operations were found not to be ready to fulfill this demand for data traffic. Since then, many technologies have been introduced to ease this situation.

In particular, recent research proposed a new technology to address the shortcomings of network management and network control by facilitating automatic interaction and coordination of management tasks between the IP/MPLS network management system and the transport network management system (NMS). This technology, a NMS mediator, is called “ONE Adapter”. The NMS mediator is expected not only to improve the performance of networks but also lead to a change in the business models of IP/MPLS providers and transport providers.

The objective of this paper is to capture and analyze these changes in the business model with respect to the services offered, the market players involved, their roles, and their relationships. By having this understanding and knowledge of potential changes, TSPs can improve their strategic planning, adjust business processes, and introduce new services timely.

The remainder of this paper is organized as follows. In Section 2, we provide a literature review on business models of TSPs. Section 3 provides an overview about the survey conducted on TSP businesses. Section 4 discusses potential ONE-Adapter-enabled business models, and section 5 concludes the paper.

2. Telecommunication Market Changes

The telecommunication industry used to have simple business models, covering local, regional, and international telephone networks with users of only a few services (e.g., voice communication and telex). With the emergence of the Internet, TSPs were forced to adapt to the new environment, in which the distance between communicating users is not considered and the amount of bandwidth is large. To deal with this new situation from a business perspective, mobile and fixed-line TSPs needed to change their business models [2]. TSPs started to charge for connectivity, security, advertisements, and quality of service [1]. According to Valitalo and Kwiatkowski [3], the TSP business models also changed because of the huge number of players in the sector. Ballon and Kim et al. argue that the recent developments in mobile technology had even triggered the creation of a new generation of business models [4] [5]. Kapusta argues that the market environment (i.e., the convergence in network and service management, the service diversity) has also a large impact on network management systems as well [6]. Moreover, depending on how TSPs react to the changing market environment, two different types of business models are foreseen, namely one that

builds on a TSP-controlled platform for services and customers, or one that competes for customers with all other market players [7].

3. Internet Market Players, their Roles, Relationships and Services

Existing research has grouped players of the Internet ecosystem into 6 main categories, which include users, Internet resource service providers, software providers, standardization and regulation bodies, consultants, and providers of content services [8]. Ecosys proposed a division of the telecommunication network players into four groups: a transmission network operator, a core network operator, an access network operator, and the service operator, who offers value-added services on top of the services offered by the providers of the other three groups [9].

Based on this literature and our analysis of the service offerings of 15 major TSPs, we classified the services provided and identified the market players, their roles, their relationships in the Internet ecosystem. The final classification shows 11 categories of players: hardware and software vendors, government and regulators, research support organizations, standardization organizations, advertisers, Internet exchange points (IXP), content and application providers, management solution providers, transport network providers, IP/MPLS network providers, and users. An overview about the relationships between these players and about the roles each player takes on towards the other players is shown in Table 1.

Table 1. Internet players, their provider-consumere relationships, and their roles.

Service Provider \ Customer	Hardware and software vendors	Government and regulators	Research support organizations	Standardization organizations	Advertisers	IXPs	Content & application providers	Management solution providers	Transport network providers	IP network providers	Users
H/S vendors	Competitor	H/S	H/S	H/S and support	H/S	H/S	software	Hardware	H/S	H/S	H/S
Government and regulators	LR	Competitor	Support	Support	LR	LR	LR	LR	Licenses, LR	Licenses, LR	Rights protection
Research support organizations	NI	NI	Competitor	NI	NI	NI	NI	NI	NI	NI	=========
Standardization organizations	Business opportunities	=========	=========	Competitor	=======	SF	SF	SF	SF	SF	Protection from monopoly
Advertisers	AS	AS	AS	AS	AS	AS	Client	AS	AS	AS	AS
IXPs	=========	=========	=========	=========	=======	Competitor/ partner	=========	=========	TE	TE	=========
Content & application providers	=========	=========	=========	=========	=======	=========	Competitor/ partner	=========	=========	Client	Content and application
Management solution providers	=========	=========	=========	=========	=======	=======	=========	Competitor/ partner	Management solutions	Management solutions	=========
Transport network providers	Client	=========	=========	=========	=======	=======	=========	Client	Competitor/ partner	Transport services	=========
IP network providers	Client	IP services	IP services	IP services	IP services	Peer	Client	Client	Client	Competitor/ partner	IP services
Users	Client	=========	=========	=========	=======	=======	Client	=========	=========	Client	Competitors

Legend: H/S = hardware and software, LR = rules and regulations, NI = new ideas, AS = awareness, SF = standard frameworks, TE = traffic exchange

4. NMS Mediator and its Value Propositions

As IP/MPLS networks and transport networks were designed for different purposes, they use different protocols, and have different switching systems. Thus, the interaction between their network management systems is conducted mostly manual.

To allow automated multi-layer coordination of network management functions between the IP/MPLS NMS and the transport NMS, the ONE project introduced a

NMS mediator (ONE Adapter) between the network management systems [10]. The ONE adapter allows automatic IP/MPLS link/service provisioning and automatic IP/MPLS traffic offloading. Using this NMS mediator, IP/MPLS service providers can efficiently utilize their network capacity and increase the network availability for their customers. As a consequence of this and the little error-prone human management, link congestion is reduced on the network.

How this value of the ONE Adapter can be captured depends on the business model of the TSP running the ONE Adapter. Therefore, we identified the business models types that have the ONE Adapter deployment at their base (Figure 1).

The services offered by the ONE Adapter within these business model types are always the same, namely the coordination of network management functions between the IP/MPLS network and the transport network. If a network management function (e.g., automatic path computation) does not exist in a NMS (e.g., transport NMS), it is assumed that a third party provider, who offers this service on demand for a service charge, exists as a player (i.e., management solution provider) in the Internet ecosystem. Furthermore, roles can always be jointly offered by a single business entity (indicated by dashed circles in Figure 1, BM types 1, 2, 3, and 4), and a relationship between players always comprises service delivery and compensation (indicated by arrows in Figure 1, BM types 1, 2, 3, and 4).

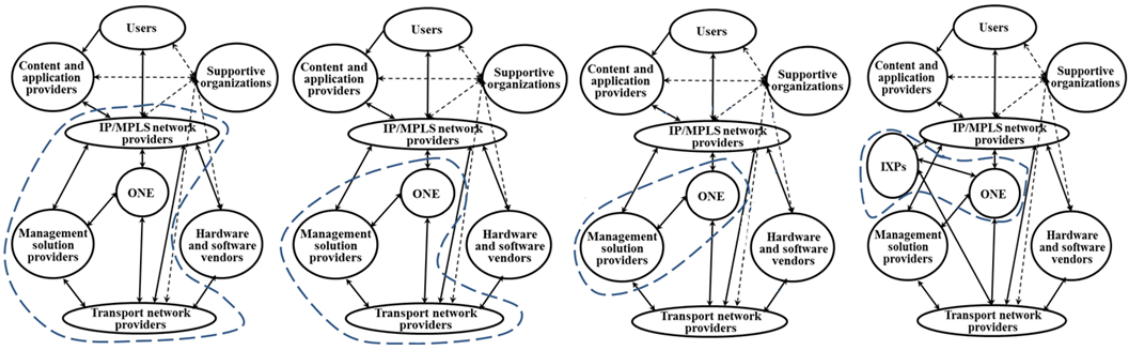

Figure 1. Business models types 1, 2, 3 and 4.

Business model type 1 (Figure 1) represents the cases, in which the ONE Adapter deployment is used for automating the operator communication between the two networks, which is currently performed manually. The ONE Adapter is also used to coordinate the use of third-party management solutions (e.g., path computation between two routers at the IP/MPLS network). The ONE Adapter and the management solution have been bought with perpetual software licenses. This means that the ONE Adapter allows joint use of different network management software.

Business model type 2 (Figure 2) considers the case that the ONE Adapter is operated by a transport service provider. This way the transport provider can serve multiple IP/MPLS providers, which are independent business entities, operating under different administrative domains.

Business model type 3 (Figure 3) is based on the assumption that the ONE Adapter is operated by an independent business entity, which belong to the management

solution providers category. This business entity provides the service of network management coordination and offers it to their customers (i.e., IP/MPLS service providers or transport network providers) on demand. This business model type works for IP/MPLS networks and transport networks under different or joined administrative domains.

Business model type 4 (Figure 4) is similar to the business model type 3. This business model type represents the case that the ONE Adapter is executed and offered as a service by an Internet exchange point (IXP). The advantage of this business model type compared to business model type 3 is that transport network providers have already installed network equipment for transport network interconnection at the premises of the IXP and, therefore, can offer network management coordination services across multiple domains.

5. Conclusion

The ONE consortium introduced a network management system mediator called “ONE Adapter” to overcome the challenges faced by telecommunication service providers (TSPs) in terms of coordination of network management functions. The paper analyzed its deployment impact on players in the Internet ecosystem, in particular on the business of IP/MPLS network providers and transport network providers.

Based on the analysis of the service offerings of 15 leading TSPs, the players, their roles, and relationships in the Internet ecosystem have been defined. This has been taken as the basis for analyzing potential business models involving the ONE Adapter. In total, four potential business model types have been described and discussed. It is observed that the ONE Adapter enables new opportunities in the market, ranging from automating the existing human operator communication between the IP/MPLS NMS and the transport NMS, handling requests of multiple IP/MPLS networks, offering the ONE Adapter as a stand-alone network management service, to offering the ONE Adapter as an additional service of an IXP.

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