Creating a New Ecosystem for NFV/SDN Technical and Business Development: the Challenge of NTT Laboratories and Dimension Data APAC

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Abstract

Network functions virtualization and software-defined networking are changing the process of turning technology into commercial services, including the process of standardization. With this development, collaboration with other service providers in commercializing new technologies and the role of integrators are both growing in importance, especially as the granularity of functional components becomes ever smaller. This article introduces the NTT Information Network Laboratory Group's activities in promoting global deployment of NTT research results through collaboration with Dimension Data, one of the NTT Group integrators.

Keywords: network functions virtualization, software-defined networking, network architecture

1. Standardization activities in the process of network system development

For decades, the NTT laboratories have borne responsibility for research and development (R&D) of network systems that provide the infrastructure for various services such as voice, video, Internet access, and enterprise services.

In addition to creating new technologies, the laboratories had been engaged for many years in international standardization, a critical process to ensure successful commercialization of developed technologies. The importance of standardization includes ensuring interconnectivity between different networks, promoting implementation of new technologies by vendors, and enabling service providers to procure equipment and software products stably and at low cost. Even if NTT has developed remarkable technologies, the implementation of those technologies will be very expensive if they are used only at NTT. Unless the technology concerned is key to the carrier's service differentiation, it is beneficial to standardize the technology because this will lead to many service providers adopting common methods and specifications. This will in turn increase the demand for the product and reduce the product cost thanks to economies of scale, enabling service providers to lower their service charges or to make their operations more profitable.

Defining the functional structure of a system and standardizing the functionality of each functional component and the interconnections between them (modularization) enable vendors to develop products with highly specific functionality. This facilitates entry of vendors skilled in a particular field into the market, thereby expanding the alternatives of vendors available to service providers. A wider range of alternatives not only promotes competition, which results in a drop in prices, but also reduces carriers' dependence on specific vendors, making stable procurement

possible.

For a long time now, standards bodies such as the ITU (International Telecommunication Union), IEEE (Institute of Electrical and Electronics Engineers), and 3GPP (3rd Generation Partnership Project) have developed standards that have served as the foundation for various telecommunication services. Of course, they continue to play an important role, but the role each organization plays in each technical field and the standardization process each adopts have been changing. From the late 1990s to the 2000s, the Internet protocol (IP) became mainstream. It has been widely adopted as a common technology for linking the service layer with the transmission layer. Most of the technologies for IP were standardized by the IETF (Internet Engineering Task Force) through the leadership of US vendors. The result was that the functions for IP networks are concentrated in big boxes called routers and that the router market is dominated by a small number of major vendors. Service providers around the world have had no other choice but to depend on products from these vendors (vendor lock-in).

2. Standardization in the age of network functions virtualization and software-defined networking

The late 2000s saw web technology and cloud computing gain a strong foothold, raising demand for datacenter networks. Cloud providers such as Google and Facebook began to question the conventional ways of procuring and operating network devices. As the 2010s dawned, there was a giant shift in technology to software-defined networking (SDN) and network functions virtualization (NFV). In a word, they represent attempts to re-examine the way network functions are structured, and to open up and standardize the interfaces between functions. The aim is to split the dedicated devices such as large routers into smaller functional units. When this is achieved, software functions for routing, for example, do not necessarily have to run on a large router but can run on a far less expensive general-purpose server. As the functional requirements for each device become smaller, barriers to market entry become lower. Even hardware functions such as packet transfer will eventually become commoditized.

Standardization is still important for realizing NFV/SDN. It is necessary to determine how each functional entity should be split into functional units (architecture) and how these functional units should be interconnected. Standardization of these has been driven by the ONF (Open Networking Foundation) and ETSI (European Telecommunications Standards Institute). Alongside these activities, a different approach has risen. So-called *open communities*, in which service providers and vendors cooperate in developing products up to the stage of implementation and make the result open to the public, have gained more importance. When the granularity of functions is low, a wide variety of functional combinations becomes feasible. This poses a danger, as it could lead to greater complexity for users, making it difficult for them to choose a solution.

To avoid this, it has become important to implement and operate functions for trial purposes. In the last two years, several open communities have been founded to address technologies for carriers. These communities include the OPNFV (Open Platform for NFV), OSM (Open Source Management and Orchestration), CORD (Central Office Re-architected as a Datacenter), OCP (Open Compute Project) Telecom Project, and the Telecom Infra Project. One of the characteristics of these organizations is that their operation is mainly led by service providers in the US and Europe such as AT&T, Deutsche Telekom, and Telefonica. The lowering of the entry barrier will encourage many vendors to enter the market. This will in turn raise the relative influence of the purchasers, that is, service providers.

Because each service provider has a different history, capability, and market according to their regional characteristics, sometimes their directions and the requirements for the demanded technologies become diverse. If one desires to let their direction become the mainstream and to encourage many vendors to implement it, it needs to work with other service providers to develop a mutually agreed upon idea, thereby increasing the demand for products that implement it. This means that it has become more important than ever for service providers to cooperate in the phase of creating the vision and developing the technologies.

3. Role of R&D in expanding global business

In recent years, the NTT Group has been pressing forward with efforts to expand global business. As the domestic market matures and the population of the country gradually declines, it seems only natural that NTT has been seeking to grow by changing its business models in Japan, for example, the previously announced Hikari Collaboration Model, and by

expanding its global business. This change means that the direction NTT's R&D should take has had to be re-examined. The commonly accepted marketing strategy recommends that R&D investment be focused on an emerging market where participants compete to gain an initial share rather than to a mature market where each competitor's market share is more or less stable. R&D in the networking area does not necessarily need to adhere to this principle because this R&D function has the continuous mission to support the operation of efficient and stable infrastructure.

However, if network-related R&D is to assert its raison d'être in the midst of extensive use of general-purpose technologies and the ever-growing trend of outsourcing telecom infrastructure operation, it must look at new activities in new fields. A question that arises from this new approach is how network R&D can contribute to the expansion of NTT's global business. A clue lies in the future direction chosen by system integrators.

As NFV/SDN accelerates modularization of devices, the role of integrators in selecting appropriate components and assembling them in such a way that they operate correctly will grow in importance. Dimension Data (DD), one of the NTT Group integrators, ensures that information technology (IT) business strategy evolves in four stages [1]. It envisages that IT business will shift from the first stage: great technology (product delivery), to the second stage: technology attached services (deploy and support), then the third stage: consulting and managed services, and finally to the fourth stage: platform services, where everything is provided, including the software/hardware resources, as a service based on a volume charging model. This can also apply to business for telecom service providers. Many service providers have already begun to outsource the operation of their networks, and new service providers have emerged who wish to run their business without the ownership of equipment as their asset.

Amid this market trend, network R&D can seek its value proposition in leading to establish the right NFV/SDN architecture, defining the common specifications that fit into this architecture, and transferring these technologies to NTT Group integrators. A commonly employed architecture can lead to many service providers choosing products that support common specifications. When this happens, an integrator with high technical expertise in this field can seize many business opportunities in consulting, delivery, and support of network systems at a large number of clients. Furthermore, because the technologies are common, such an integrator can offer the outsourced operation of multiple telecom infrastructures within the region. Operating multiple networks leads to improved efficiency, and it will make it much easier to provide various functions as a platform. A key to achieving this is to establish the right architecture and have it used by many service providers. It should be noted that only R&D organizations are able to, and are expected to, take on these tasks.

4. NetroSphere concept

In 2015, the NTT Information Network Laboratory Group announced the NetroSphere concept [2] in order to push the development of NFV and SDN and to advocate the future direction beyond them. In the long term, this concept is aimed at modularization at much higher granularity compared to what current NFV/SDN looks for. In the short term, we are developing an overall architecture that will enable carrier networks to use general-purpose products, and technologies that will ensure reliability and scalability—the two properties still lacking today—in order to make what NFV/SDN is intended to achieve a reality [3].

In the development of technologies based on this concept, it is important to actively participate in open communities such as those mentioned above, collaborate with service providers throughout the world to create greater demand for the technologies, and enlist the participation of integrators, who assemble components. To do this, since the announcement of the concept, the Information Network Laboratory Group has had discussions with service providers, vendors, and integrators in Europe, the US, and Asia. In order to execute these initiatives effectively, we have started a new type of engagement with Dimension Data Asia Pacific (DDAP) since 2016.

5. Collaboration with DDAP

DD is a global enterprise that became a member of the NTT Group in 2010. They have five business regions: Europe, North America, Asia and the Pacific (APAC), the Middle East and Africa, and Australia.

There are several reasons why we have selected the Asia region (Southeast Asia, India, and New Zealand) for collaboration with other service providers and for future business engagement and why we have begun to cooperate with DDAP. First, this is one of the markets where the greatest growth is expected. The

demand for renewal of the infrastructure is expected to rise. Moreover, many service providers have just begun to formulate an overall architecture for such updates, and we will be able to find partners that are keen to explore the new technologies there. Second, this region is simply close to Japan. Although many forms of communication are available today, the fact that travel distance is short and time differences are small makes it easy to cooperate. Lastly, people in this region have a certain level of respect for Japanese culture and technologies. It helps to establish communication by developing a relationship based on mutual trust with people in this region who actually tune in to what we are doing, hoping to learn from Japan.

Our collaboration with DDAP targets two areas: development of inter-service provider partnerships and new business opportunities.

(1) Activities to find service provider partners in APAC region

We meet with our service provider clients together in order to introduce the NetroSphere concept, exchange opinions, and propose collaboration. DDAP's client base includes many service providers with which the NTT laboratories have had no contact in the past. Furthermore, this engagement enables us to meet people involved in decision making on technical direction and procurement that the laboratories usually do not have any contact with. In addition, the involvement of local sales teams facilitates the communication with our partners.

In general, one of the challenges in conducting business overseas is determining how to overcome barriers in language, culture, and business practices. A look at existing global business successfully conducted by telecom service providers reveals that they target regions to which they are closely related culturally and linguistically. For example, German service providers typically aim at East Europe, French service providers target Africa, and Spanish service providers focus on South America. These are the regions where these countries were formerly colonial powers; hence historic, cultural, and linguistic links already exist.

I have heard stories that the NTT Group has also tried many times to explore business based on R&D achievements targeting Southeast Asia but encountered difficulty in communicating directly with customers there, so had little success. We hope to overcome such barriers through support provided by DDAP's local sales experts in communicating and establishing effective connections with the clients.

(2) Technical collaboration for developing new businesses

To promote widespread use of our technologies and turn them into business opportunities, it is necessary to have service providers understand the applicability and the benefits of these technologies. For this, we need to transfer the technologies to DDAP so that they themselves can propose, deliver, and support our technologies. It is also important for NTT laboratories to understand the management strategy and requirements of those service providers and enhance the applicability of the technologies that we are planning to propose. For this purpose, we have established a Network CoE (center of excellence) where we can conduct proof of concept (PoC)* demonstrations in collaboration with client service providers using DDAP's facilities. Through these efforts to verify promising technologies and vendor products together with clients, DDAP aims to strengthen the relationship with its clients, expand its ability to propose new technologies, and develop new businesses based on NTT laboratories' technologies. The NTT laboratories, for their part, hope to strengthen their presence in the world by taking the results achieved in this region and transferring them to the rest of the world as field-verified technologies from Asia.

6. Future prospects

As DDAP responds to rapid progress in technology and implements reforms of its business model, it has high expectations for collaboration with NTT laboratories in their sales activities targeting service providers. The NTT laboratories, for their part, take this as a good opportunity to explore a new approach to conducting R&D in collaboration with integrators within the NTT Group and to study ways of commercializing R&D results. As part of this effort, the author has been stationed at the DDAP Head Office in Singapore since August of 2016 and has been engaged in the above-mentioned activities that involve making proposals to service providers and establishing the Network CoE. We will intensify collaboration between the two organizations and move steadily forward in the hope of contributing to the development of the NTT Group in both R&D and business.

* PoC: Here, PoC means a field trial or verification that service providers generally conduct when they seek to employ new technologies.

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