Networking at NTT I3 and Outlook of SDN

Robert Raszuk
Distinguished Research Engineer,
NTT Innovation Institute, Inc.

Abstract

NTT I3 (NTT Innovation Institute, Inc.) has actively been carrying out the tasks of developing cloud-related network technologies. Software-defined networking (SDN) in particular is considered to be a key technology for creating differentiation services for service providers such as NTT. Robert Raszuk, Distinguished Research Engineer at NTT I3, has a lot of experience in achieving company visions of implementing networking and SDN. We asked him about the current status and prospects of SDN.

Keywords: global, cloud, SDN

Introduction

Distinguished Research Engineer Robert Raszuk, who hails from Poland, has a wealth of experience needed to develop network solutions and achieve the Institute's vision of software-defined networking (SDN). In 1993, he went to the U.S. to study computer science, which led to his starting a business in Poland. He completed his master's degree in electrical engineering in 1995, as the growth of the Internet was booming, and began his career as a network engineer. He has a wide range of experience in areas involving network management to the development of technologies involving internal customers.

How will Mr. Raszuk's experience at vendor companies be utilized at NTT, a service provider? He had the choice of working at a number of world-famous companies. However, he decided to join NTT, saying, "I admire Japanese culture, and believe that Japanese companies are No. 1." We asked Distinguished Research Engineer Raszuk about the state and outlook of SDN.

—What is a network and what is SDN?

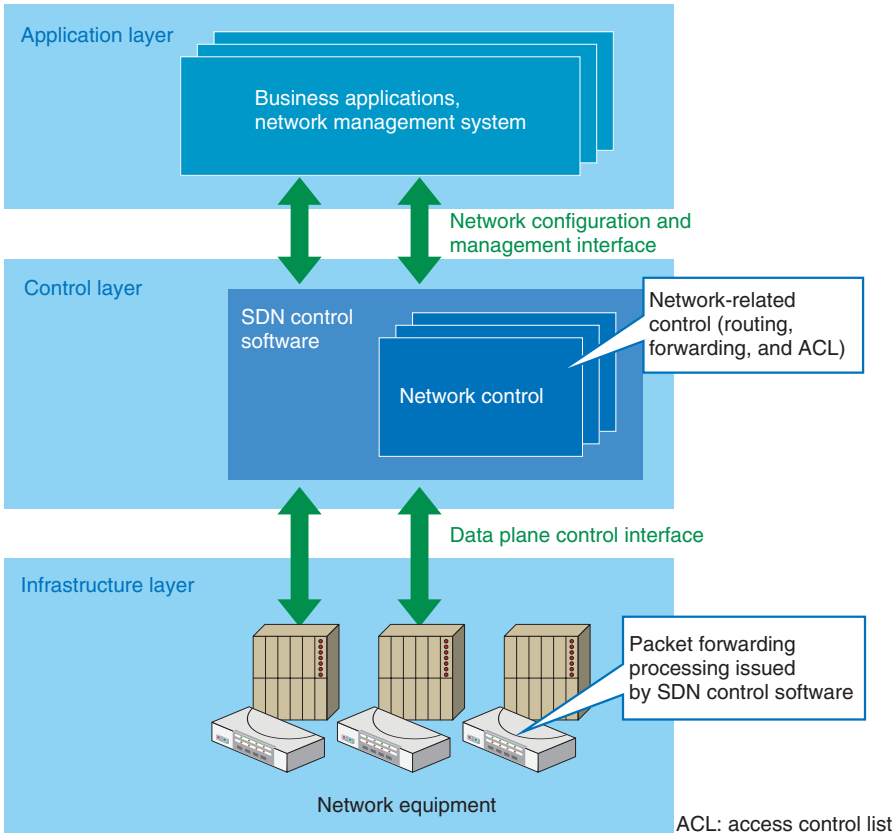
There are a variety of definitions of a network. My interpretation is, "A network is composed of data transport and services." Please think of it this way.

Right now, the concept of SDN differs from person to person (**Fig. 1**). SDN is a technology for quickly offering new, competitive services. I think that instead of standing for "software," the S in SDN really should stand for "service."

In general, there is no fixed way of thinking about SDN, even among people in the industry. I can only explain my concept by giving specific examples of what I want to offer.

Some of my colleagues and I think that the value of SDN lies in the focus on services. But there are also developers who think that it is also important to build and reinvent the transport part of the network.

A variety of groups such as I2RS (Interface to the Routing System) and IRTF (Internet Research Task Force) working groups (WGs), are working on standardizing SDN. There are also foundations such as EWSDN (European Workshop on SDN) that develop services and the ETSI (European Telecommunications Standards Institute) Network Functions Virtualization WG, which is focusing on software-based



Source: Y. Nakajima, "Standardization Progress in Software Defined Networking/OpenFlow," NTT Technical Review, Vol. 11, No. 2, Feb. 2013.

Fig. 1. Overview of SDN architecture.

network functions and services.

So, there are many standardization efforts going on. ONF (Open Networking Foundation) is working only on the standardization of the OF (OpenFlow) portion, which is the protocol for controlling the data plane from the remote server.

Also, similar activities are being advanced by IETF (Internet Engineering Task Force). They are standardizing definitions of methods of building APIs (application programming interfaces) into network equipment.

Because of these activities, it is difficult to completely follow what is happening in the SDN world. There are activities being undertaken from various perspectives, so understanding their real value as services will take a little more time.

There are many people in this industry who just focus on services. However, if we don't strengthen data transport, we can't provide safe and secure networks.

An example of a service is a virtual private network (VPN). With a VPN, Internet websites and portals can also be provided. VPNs are therefore highly profitable services in the industry.

Using enterprise systems as an example, we see that many things are involved in the back office. For example, solving different problems for document management and server management and figuring out how to manage them using a cloud-based infrastructure are issues of great concern right now. In addition, cloud security is very important.

Instead of companies originally having their own networks, more and more customers are outsourcing their back office or using ready-made networks.

Almost all of these services are developed internally. The task of development is nothing special in particular, since general programming languages are used. I think the challenge lies at the level of

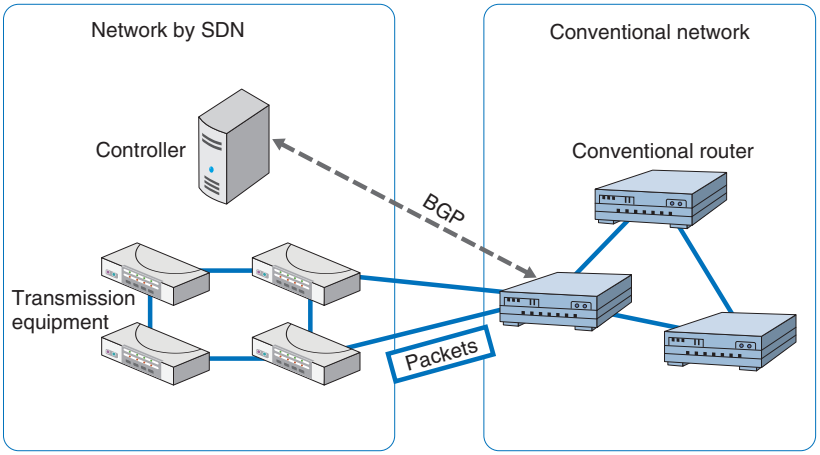


Fig. 2. BGP linkage.

innovation. What determines success is how to turn something from a concept into something real and commercial.

The No. 1 purpose of network operators and service operators is to increase revenue. In this industry, when one vendor develops a unique service, other vendors will quickly be able to provide similar features. Consequently, taking a year or two to conceive a new service and to study and realize it will not bring success to a business.

What is needed is the ability to conjecture what customers will need and what they will demand, and quickly provide solutions. Customers want to pay as little as possible for services that best match what they need. Also, customers do not like to be locked into just one service provider.

For mission critical applications, they generally rely on several service providers. Even for services, they do not wish to use a company's proprietary technology, but prefer to be able to migrate easily from one service provider to another. They also wish to integrate service providers' infrastructure and their existing applications, especially the applications they created in-house.

In recognizing these conditions, I think the way to proceed is to first understand what the customer is requesting, develop the service, and then design it for the existing transport method.

For example, instead of using Internet services from major vendors like Google for existing customers, I would rather offer services within NTT whose quality is guaranteed by service level agreements (SLAs).

Customers are more interested in the services themselves than in how they are offered. I think we should effectively leverage existing technologies. I don't think it's desirable to offer competing technologies especially for the transport part of networks.

By the way, a variety of work being developed by IETF can be applied to SDN. Border Gateway Protocol (BGP) is becoming an actual service transport protocol (**Fig. 2**).

—Mr. Raszuk, please share with us the specific research projects you are involved in.

I'm focusing on how to bring my knowledge of routing protocols into NTT I^3 products. My first project at NTT was the invention of a service called BGP Free Edge in 2011. This service removed the BGP control plane from all the network edges and centralized the state plane while maintaining the data plane. For example, we applied research to make use of technologies such as OpenFlow as applications.

BGP Free Edge is a technology that makes it possible to expand the footprint without additional costs for service providers. For example, adding a new POP (point of presence) can be implemented at an extremely low cost without purchasing expensive routers or switches. This project is complete. We are currently at the stage of carrying out trials with NTT Communications.

Another project I'm involved in is AP (access point) gateway automation. This project involves speeding up connections to customers' datacenters by using a type of hotspot. I'm also actively participating

in IETF's router-related activities.

I think new services can be produced as a result of the in-house development of the control portion of network controllers related to NTT I^3's own two BGP protocol implementations. I'm tackling this right now. We have made it to the trial stage, but we are not quite there yet for the development release. However, I expect that the fruit of our labor from this project will give a boost to its productization. This project will be the first contribution of NTT I^3 to NTT's telecommunication companies.

—Why does NTT I^3 need to be involved in SDN?

Right now, it looks like we are in an SDN bubble. Small companies, not big companies, are beginning to participate. Opportunities to develop new X86-based services are being created. There is a trend of not only big network equipment vendors but also many hardware manufacturers selling ODM (original device manufacturer) boxes.

However, service providers, not vendors, are most dominant in the area of the overall network becoming software-defined. Also, even as service providers have become involved in software recently, there aren't many companies that can develop their own services as NTT I^3 can. As a result of NTT I^3's involvement in SDN, the NTT Group is more competitive and can provide customers with innovative products and services.

—How is NTT I^3 positioned in the IT industry with the research you are involved in?

I believe NTT I^3 is trusted as a company that delivers quality services and delivers them securely.

Recently, I have been doing R&D on internal service development for NTT Communications. Because I have been focusing on improving infrastructures that are associated with operators, my contribution to the technology being developed that enhances the overall lives of people in society has only been indirect, and I have not disclosed anything about this work to the public due to its proprietary nature. However, I know from experience that this is the first research of its kind in the industry.

In the future, we can make life richer by building robust systems, and contribute, for example, to the medical field. I want to work on such projects that will make life better and deliver them to the world.

So I want to leverage NTT I^3's strength, which is its ability to develop services that meet customers' needs, in order to build up its competitiveness. Major vendors tend to provide solutions for worldwide use. I think we can strike a different path by using open source software and open stack orchestration to create services with value and offer them in a timely manner.

—Mr. Raszuk, you are living in Poland while working for NTT I^3, which is in Silicon Valley. To me, this reflects a unique lifestyle. Is it natural?

There are various ways to work on a project. A concept is formed by having different ideas. After you come up with the general idea, you create the basic design called the system architecture, and then move on to creating the component architecture. And then you move onto the actual tasks of development. You start from the beginning with ideas of individuals, and gradually move on to forming an organization. You consider what personnel with what kinds of skills are needed depending on the project, and build a team. There are times when we use people who live in Silicon Valley, and there are times when people from other countries participate.

I lived in Silicon Valley for a period of time before, but then moved back to Poland for family reasons. Since 2002 I have been working in Poland by telecommuting. Where a person lives is not an issue for engineers at companies like Cisco or Juniper. There are people who communicate with one another through e-mail and videoconferences even though they work on the same floor. By the way, when I was living in Silicon Valley, my entire team was near Boston, and we communicated by telephone/video conference without any problems.

I'm able to do this because I maintain good relationships with team members. When we must hold important meetings for a project in person, engineers from around the world, including me, gather in Silicon Valley. I spend two to three weeks every quarter in San Mateo (Silicon Valley), or we organize meetings in Japan.

The key to achieving success on a project doesn't hinge on where a developer lives, but lies in gathering outstanding human resources. The only challenge might be in finding a suitable time for people in different locations to participate in a teleconference.

It's very exciting to be able to create and develop new services with my colleagues at NTT I^3 in Silicon Valley. Going forward, I want to improve these services by solving the challenges we face together with NTT Group companies around the world, include the

Group companies in North America. I'm looking forward to collaborating with Dimension Data, which is a system integrator. We can make a big impact on the industry overall as a result of having common goals.

Even now, I'm building quite a close relationship with the NTT laboratories. I'm thinking of further building up and expanding this relationship by involving the research departments in different NTT Group companies. To seriously carry the concept of SDN further, we must focus more on the area of development than on research when it comes to "R&D".

Interviewee profile

■ Career highlights

Robert Raszuk began working for NTT in 2011. His work currently focuses on defining new network architectures for innovative network services. He has over 20 years of experience working with large scale computer networks, including Nations Bank (now Bank of America), Cisco Systems, and Juniper Networks. At NTT Innovation Institute, Inc., he holds the position of Distinguished Research Engineer.