Network DevOps Solution for Creating New Network Services

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Fujitsu has systematized its experience and expertise in DevOps (a portmanteau of "development" and "operations") into a cloud solution that integrates products and services on the basis of software-defined networking (SDN) and network functions virtualization (NFV). This Network DevOps Solution provides telecom carriers with network development and operations-management systems and enables them to independently improve their systems and achieve flexible operations management by combining Fujitsu's network platforms, management system products, and partner products. Customers can then quickly respond to changing market needs and continuously enhance their service quality. These abilities will be crucial for carriers as network users' needs increasingly diversify and the demand for new network services multiplies in the era of the Internet of Things (IoT). This paper outlines this Network DevOps Solution, describes application examples, and discusses future development.

1. Introduction

An issue now facing telecom carriers is how to maintain the quality of their network services while responding quickly to new needs. In the area of cloud computing, Fujitsu has put DevOps (a portmanteau of "development" and "operations") into practice as a means of system development that integrates the development and operations functions. DevOps makes it possible to shorten the time for providing a new service from several months to a matter of days. Similarly, the need is growing for providing new network services for the Internet of Things (IoT) era in a prompt and flexible manner. This can be done by leveraging advances in software-defined networking (SDN) and network functions virtualization (NFV).

To resolve this issue and meet the needs of service users, Fujitsu has systematized its experience and expertise in DevOps into a Network DevOps Solution that supports an integrated lifecycle from service planning and development to implementation and operation in the creation of new network services.

The Network DevOps Solution features five key technologies:
- Core business systems transformation
- Agile development process and tools
- Network abstraction and modeling
- Network virtualization such as SDN and NFV
- Policy-based network optimization.

In this paper, we explain the basic ideas behind the Network DevOps Solution, describe its constituent elements, present an application example and its effects, and touch upon future activities.

2. Basic principles

The development (Dev) and operations (Ops) lifecycle envisioned in the Network DevOps Solution is illustrated in **Figure 1**. As the needs of service users become increasingly diverse, telecom carriers must be able to turn new business ideas into services, respond quickly to changes in the market, and take advantage of new business opportunities. They are therefore faced with the challenge of how to shorten the time required for implementing new services. To meet this challenge, we plan to apply the basic principles of DevOps—a best practice in cloud computing—to the network and speed up the entire service lifecycle, as summarized below.

1) Revolutionize the development process by switching from development and revision in calendar time periods to continuous integration (CI) through the modeling and agile development of

network services.

2) Revolutionize the operations process including development elements by switching from planning and operations based on a previously established design to growth-oriented optimization based on continual service improvement (CSI).

3) Enable continuous delivery (CD) by introducing process automation technology in DevOps and automating testing, verification, and implementation.

In addition, monitoring, analyzing, and visualizing operating conditions enables information to be fed back to the planning of new network services with the aim of enhancing the customer experience. The Network DevOps Solution shortens the service implementation period by repeating the entire development and operations lifecycle in an efficient and safe manner.

3. Constituent elements

Fujitsu has developed the FUJITSU Intelligent Networking and Computing Architecture[1] for optimizing the entire ICT platform on the basis of SDN/NFV principles. The Network DevOps Solution applies the concept of this architecture in particular to wide area networks. As shown in **Figure 2**, it covers three areas based on the lifecycle of the development and operations of a telecom carrier. Each area corresponds to a Fujitsu product-or-service group.

1) Network platform consisting of products and infrastructure such as the FUJITSU Network Virtuora series[2] announced in 2014.

2) Network integration and system integration (NI/SI) services already being provided to telecom carriers.

3) Network service solutions to be provided in accordance with customer needs on top of the above infrastructure.

A network integrated control infrastructure, a type of software-defined networking (SDN), and a network virtualization infrastructure, a type of NFV infrastructure link the individual development and operations lifecycles of network services of telecom carriers. With functions that support total customer service, they constitute the core technologies of the network platform. These network platform functions enable information linking and process linking and provide a consistent process chain for creating new services.

The aim of the Network DevOps Solution is not simply to virtualize the network. It is also to optimize the entire network service lifecycle and thereby increase the value of a telecom carrier's network, support the creation of new services, and increase service revenues.
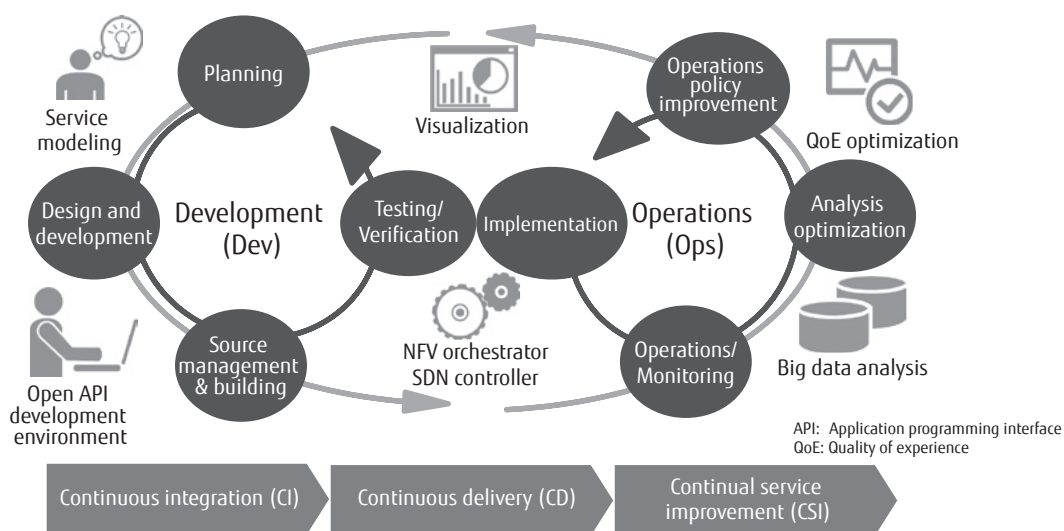
Figure 1
Lifecycle envisioned in Network DevOps Solution.

4.   Application example and effects

The "network service chaining" application shown in **Figure 3** is an example of a new network service using network virtualization technology. Network service chaining enables a telecom carrier to add to its existing lineup of leased-line services and data-center cloud services by providing companies with functions for customer premises equipment (CPE) as on-demand network services. These CPE functions, which companies typically implemented and operated on their own, include firewalls and load balancers, intrusion prevention systems (IPSs), and intrusion detection systems (IDSs). With this service, a telecom carrier can minimize capital expenditure (CAPEX) and operating expense (OPEX) with respect to their in-house network of CPE. The service also enables it to concentrate its efforts on its core business and to improve its business agility. The telecom carrier can provide new network services by using an SDN controller and NFV orchestrator, including

1)   Virtualization of network resources (multi-tenant format)

2)   Modeling of networks (abstraction of devices, networks, and services; definition of interfaces and data items)
3)   Automation of network service installation (programming using network model in 2) above)
4)   Release of network services (release of services on customer portal, etc.).

Introducing the principles of the Network DevOps Solution to the above process can shorten the service implementation period. At the same time, repeating a network-operations improvement process enables a telecom carrier to revise rates in conjunction with service level agreements (SLAs), to feed back information to the service modeling process, and to create new services. In this way, a carrier can continuously improve its market competitiveness.

5.   Future activities

The network and operations system of a telecom carrier provides services by coordinating equipment and systems from a variety of vendors. Consequently, to increase the customer's network value while using SDN/NFV network virtualization technology, "co-creation" of
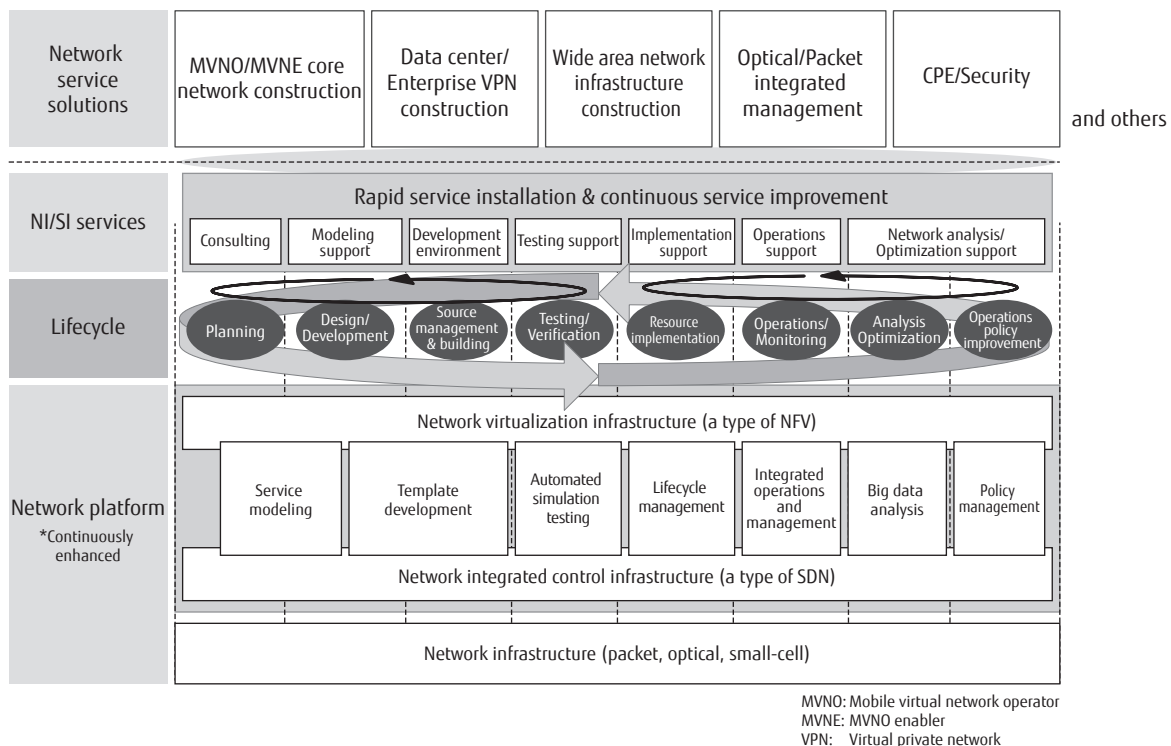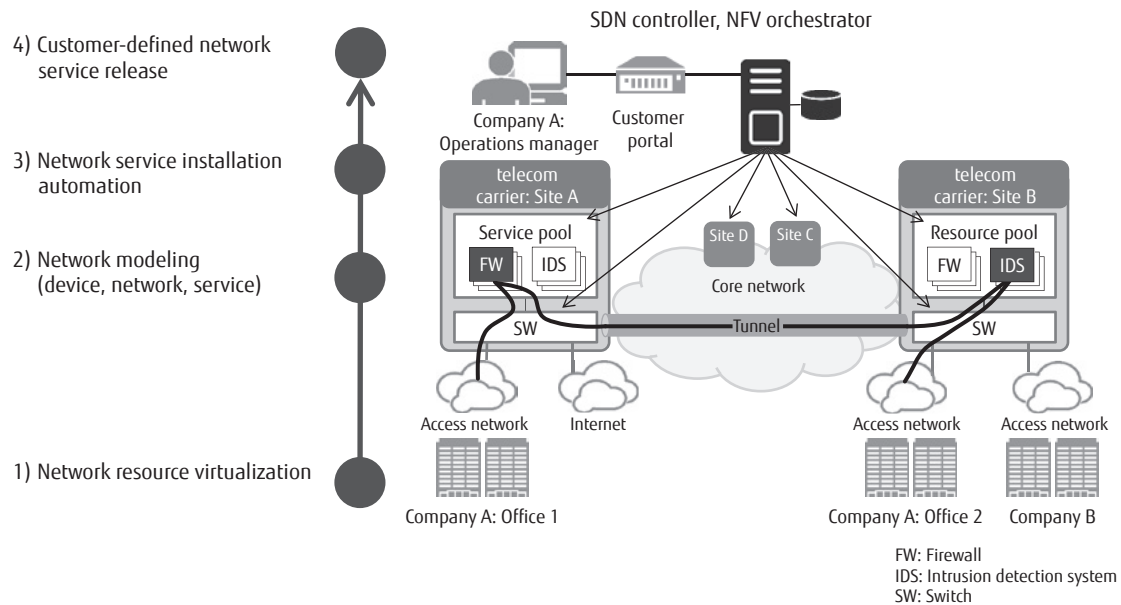

Figure 2
Network DevOps Solution system.

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Figure 3
Network service chaining application example.

network services not only with customers but also with other global vendors is important. As an example of working with customers, Fujitsu plans to use proof of concept (PoC) and proof of business (PoB) practices to test and demonstrate how network virtualization technology can provide business value.

Furthermore, as network functions come to be converted into software along with advances in network virtualization, it is becoming necessary to construct networks by combining open source products and software from a variety of vendors. There will therefore be a need for advanced integration capabilities going forward. Fujitsu plans to collaborate with other global vendors to promote mutual-connection and mutual-operation trials and build a global ecosystem.

Additionally, by participating and making proposals in open communities and standardization bodies and applying PoC and PoB practices with customers, Fujitsu intends to maximize network value for telecom carriers and to continuously incorporate results from PoC/PoB demonstrations into solutions as part of the Network DevOps Solution lifecycle. Finally, by promoting continual improvement in network services, Fujitsu plans to collaborate with customers to co-create and roll out new network businesses for the IoT era.

6. Conclusion

This paper described Fujitsu's Network DevOps Solution system. In the face of increasing volumes of network traffic and widening gaps in business revenue models, increasing revenues by introducing new services has become a major challenge for telecom carriers in addition to reducing CAPEX and OPEX. Going forward, Fujitsu is committed to applying the principles of its Network DevOps Solution to the further optimization of the entire network service lifecycle of telecom carrier customers centered about network virtualization technology.

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