Efforts to Apply Virtualization Technology to Mobile Network Nodes

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NTT DOCOMO R&D is tackling the development of systems that apply virtualization technology to mobile network nodes.

Virtualization enables hardware such as servers to be decoupled from their underlying physical structure and be utilized logically (For example, one physical server can be treated as multiple logical servers). Currently, network functions in a mobile network (for example, the Evolved Packet Core [EPC]) are realized by software operating on hardware dedicated to each node that forms the mobile network. By applying virtualization technology to these network nodes, software for each network node can operate on general-purpose hardware (called a network virtualization platform). Multiple network nodes can share the network virtualization platform.

The benefits of applying virtualization technology to network nodes are as follows:

(1) When traffic temporarily increases due to a disaster or large-scale event, the processing capacity on network nodes become insufficient. As a result, communication becomes congested and it becomes difficult for calls to connect. In such a case, the processing capacity on network nodes can be increased by incorporating the automatic addition of virtual resources on a network virtualization platform. In this way, calls connect more easily when communication is clogged.

(2) Customer service interruption can be prevented by establishing a redundant operational/backup hardware architecture for network nodes. However, even with such a design, once a hardware breakdown occurs, the architecture becomes in essence a single structure until the hardware is repaired and restored. By applying virtualization technology, new virtual resources can be automatically assigned from the network virtualization platform to take the place of the defective hardware. Thus, redundancy can be constantly maintained and the reliability of communication services against hardware failures is improved.

(3) To realize new network nodes/services, necessary software can be developed and deployed at once on the already prepared network virtualization platform. In this way, new functions can be realized without adding specialized hardware, which had been the case until now. New services can thus be provided promptly.

(4) Multiple network nodes can share general-purpose hardware that make up the network virtualization platform, thus improving efficiency of use. In this way, the number of hardware units can be reduced, and network facilities can be built economically.

To maximize these advantages, it is necessary for hardware and software to work together in a mixed environment consisting of equipment from multiple vendors. For this effort to succeed, cooperating with many vendors is necessary.

In October 2014, NTT DOCOMO released out a press announcement entitled "DOCOMO Successfully Trials NFV Using Multi-vendors' Virtualization Systems" [1]. This test demonstrated not only NTT DOCOMO's success in using multiple vendors' equipment to realize virtualization technology, it also proved that it is possible to build a system in which multiple vendors collaborate. Through this trial, we confirmed once again that to skillfully build and operate a multi-vendor environment, it is necessary to standardize a unified inter-system interface. At NTT DOCOMO, we are currently collaborating with major vendors and actively contributing documents toward standardization decisions.

In addition, we are seeking to commercialize virtualized Evolved Packet Core (vEPC) within FY2015. This is our first application of virtualization technology to network nodes. The LTE network is continuing to expand as customers increase. By applying virtualization technology to EPC, which provides core network functions to LTE services and has great processing loads, we can maximize the advantages of virtualization technology. Furthermore, as the next step, we are also researching and expanding the application of virtualization technology to other network nodes that make up current mobile networks.

As described in this article, standardization of the application of virtualization technology to network nodes is being intensively deliberated. We are convinced that virtualization technology will make our core network, which bears the "mission of NTT DOCOMO," even more stable, economical, and attractive. We are also actively incorporating new technologies in the development of future core networks to provide a satisfying communication environment to our customers.

REFERENCE

[1] NTT DOCOMO Press Release: "DOCOMO Successfully Trials NFV Using Multi-vendors' Virtualization Systems," Oct. 2014.
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