China UnionPay adopts SDN-based next-generation cloud computing platform for financial services to enhance business agility and flexibility

Intel® Xeon® Processor E5 Family
Finance
Cloud Computing
OpenStack
Software Defined Network (SDN)

As the core and hub of China’s bankcard industry, China UnionPay is committed to providing commercial banking facilities, non-financial institutions and cardholders with comprehensive bankcard-based services with support of the OpenStack-enabled cloud computing platform for financial services. As China’s payment industry is becoming increasingly open, the demand for mobile payment and Internet payment has been intensified. Responding to higher requirements on business agility, flexibility and individualization, China UnionPay has joined hands with 99Cloud Inc. (99Cloud*), a leading professional OpenStack service company in China, to construct a Software Defined Network (SDN)-based next-generation cloud computing platform for financial services grounded in servers of the Intel® Xeon® Processor E5 Family and get prepared for upgrading, implementation and verification of key technologies in the future financial service industry of China.

CHALLENGE

• **Improvement of business agility:** China UnionPay needs to serve various commercial banks and institutions, for which the network service mode characterized by manual route and firewall configuration for virtual machine (VM) could no longer meet the demand of the growing client base for business agility.

• **Enhancement of business flexibility:** Masking differences among various network data transmission devices and eliminating dependence of deployment and operation of network services on network technologies underlying special network hardware equipment have helped to flexibly meet clients’ individualistic demands for network performance.

• **Reinforcement of network service ability:** With continuous business expansion, China UnionPay expects to realize via great interfaces and protocols a “plug-and-play” mode where network services are included and service modules are standardized, and to continue to scale up the network at lower costs.

SOLUTION

• **Construction of SDN-based next-generation cloud computing platform for financial services:** 99Cloud and Intel have assisted China UnionPay in building a SDN-based new-generation cloud computing platform for financial services. The platform that is made up of 42 physical nodes based on Intel® Xeon® Processor E5 Family and customized according to open-source OpenStack L supports innovative research and applications, including biological identification and
Adopting the financial cloud solution based on IA, SDN and open-source OpenStack, China UnionPay has enhanced its business agility and flexibility, reduced TCO and provided clients with more open, secure and efficient payment access services.

“China UnionPay has joined hands with China’s leading OpenStack open-source enterprise and the internationally advanced X86 server chip provider for close cooperation from applications to software platforms and then to hardware. Based on the latest open hardware platform, they have faced the challenges arising from construction of the SDN-based next-generation cloud computing platform for financial services, achieved the business goals of scalability, transparency and modularization of financial cloud, and verified service abilities of the platform with deployment of related business applications. This is a move to help the payment industry gain paces in business agility and flexibility, and also an innovative practice to reduce network expansion costs.”

Zu Lijun
Head and R&D Manager of Cloud Platform Project of Research Institute of Electronic Payment China UnionPay

IMPACT

• Maintenance of competitive edge on market: China UnionPay has built a more open, efficient and flexible system oriented toward next-generation cloud computing technologies for financial services, in the hope of actively responding to market competition with forward-looking technical advantages.

• Establishment of a model for the financial and payment industry: Based on network services on large-scale standard servers, China UnionPay can provide clients with faster and more individualistic payment access services and the financial and payment industry with referential platform architecture.

• Reduction of costs: By providing network services in the form of software and removing limits of special network hardware equipment, China UnionPay has significantly reduced the input in network hardware of the cloud computing platform for financial services and its space utilization and maintenance costs, and lowered the business operation costs as well.

• Strengthening of scalability: SDN on OpenStack-based cloud computing platform has enabled China UnionPay to perform network expansion flexibly according to clients’ demands for network services.

China UnionPay’s open-source OpenStack cloud computing platform for financial services has been in service for 5 years, and VMs of various sizes and for computing and storage services have been running on Intel® Architecture (IA)-based physical servers. Using virtual technologies, China UnionPay has constantly carried out business innovation and provided clients with secure and reliable payment access services.

Challenges to traditional network zone planning mode

Clients require bringing business online on a tighter schedule. Under the current architecture, it is very easy for China UnionPay to provide clients with front-end VM for payment access in line with computing and storage resources, but it is rather hard for it to realize network service abilities. Limited by special network hardware equipment (e.g. router, firewall, etc), network abilities has become one of the critical factors affecting the business launch cycle.

According to China UnionPay, “The essence of network lies in data stream forwarding between nodes, and the multi-tenant cloud service mode has resulted in a sharp increase in
historical accumulation, and that in development efforts but lack of defined service providers are active situation is that emerging ‘software-
of this evolution. However, the actual means of software is an efficient way to open and recycle network resources and to meet these demands, its realization has led to continuous increase in hardware operation environment for the next-generation financial cloud platform.

In addition, the growing client base and increasing complexity of their demands have led to continuous increase in network service provided by hardware network equipment and traditional ‘hardware device’ providers go with the tide of reform but carry a heavy historical burden. In terms of SDN with financial institutions, the absence of top–level guidance for evolution strategies, unified standards for model selection and neutral sources for technical data has affected technical solutions for the time being."

Making use of the research resources of the first national e-business and e-payment engineering laboratory in China's financial industry, China UnionPay, 99Cloud and Intel have worked together to create an innovation research environment of the quasi production level for SDN-based next-generation cloud platform.

**Future-oriented network expansion**

Although network service provided by means of software is an efficient way to meet these demands, its realization is not easy at all, as differences among various network data transmission devices are to be masked on one hand, and the operation status of the application has to be followed closely to open and recycle network resources flexibly on the other.

Pointed out by China UnionPay, “SDN is an essential technical component of this evolution. However, the actual situation is that emerging 'software-defined service' providers are active in development efforts but lack of historical accumulation, and that**
expected business demands and verified the external service capabilities of the platform through deployment of related business applications.

According to China UnionPay, “The SDN-based financial cloud platform brought orchestration automation of network services, which catered to the demand of clients for agility and flexibility of payment access services. However, this solution has also incurred loss of network service functions. Hence, it’s necessary to collaborate OpenStack open-source company with hardware provider to make up the loss through a second modification of the drive program, calling code and configuration mode.”

Intel technology-assisted performance improvement

Network data forwarding performance is an important factor influencing the SDN financial cloud platform solution. For performance optimizations, China UnionPay has adopted three critical technologies of Intel: Intel® Ethernet Controller-supported SR-IOV technology and VxLAN Offload technology and Intel® DPDK. For instance, SR-IOV technology allows VMs with virtual routers to directly access hardware of network card and achieve data delay performance similar to that of hardware. Intel® DPDK provides a software library specially optimized for high-speed packet network. Intel® technologies, such as SR-IOV and VxLAN Offload, were fully used to develop network applications of higher performance.

Moreover, Intel has worked with more than 100 third-party suppliers and service providers on innovation, exploration and research of SDN. They have defined Intel® open network platform that is made up of several open-source programs, underpinned by the IA-based hardware platform and optimized and improved by Intel® DPDK and various Intel technologies in terms of the performance of network data forwarding. “This represents a perfect marriage of network intelligence and performance, and will push forward migration of the data center from the traditional network to SDN.” China UnionPay thought.

Summary of innovation practices on SDN

In future, China UnionPay will continue to cooperate with 99Cloud and Intel to convene discussions with banking institutions and advance the following work based on current research:

- Use new-generation servers based on V4 Series of Intel® Xeon™ Processor E5 Family and more advanced Intel® technologies to improve overall performance.
- Define standard architecture for SDN oriented toward the financial industry and unified network application demand of the upper-level financial data center to develop a reference implementation for SDN-based and application-centered cloud management prototype.
- Develop unified test and assessment criteria for SDN of the financial industry and release industry-wide joint test services based on the OpenStack open-source cloud computing platform.
- And carry out best practices on SDN platform for the financial industry, design, realize and release source codes developed on the national engineering laboratory platform of open architecture and publish technical evaluation data.