China Mobile creates DevOps private clouds for its subsidiaries

As the leading mobile services provider in Mainland China, China Mobile Limited and its subsidiaries manage the world's largest mobile network and the world's largest mobile customer base. China Mobile operates nationwide mobile telecommunications networks in all 31 provinces, autonomous regions and directly administered municipalities in Mainland China and in Hong Kong Special Administrative Region through these subsidiaries.

Business benefits

Development of differentiated services

By choosing open and open source software platforms, China Mobile has complete control over the solution stack. With this control, China Mobile can deliver differentiated services whereas their competitors are limited by legacy approaches.

Services can be taken commercial

With a DevOps approach, China Mobile can easily transition its internal services to commercial customers in the near future. This minimizes both time to market and cost — both key advantages in a competitive market.

Strong competitive posture

With an open software approach, China Mobile is gaining significant cost advantages versus competitors who are leveraging expensive legacy approaches. Over time, these cost advantages will provide a strong competitive advantage.

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From Nokia

Needs

In a fiercely competitive environment, China Mobile needed to transform its internal systems to a cloud model. While this model needed to support customers eventually, the initial impetus was to create a robust architecture for development and operations (DevOps). Further, given that other large telecommunications and cloud services providers in China had already staked out their ground, China Mobile needed to pick a strategy that could leapfrog its competitors. The challenges identified were the following:

- Support for initial internal development and then production on the same architecture
- Differentiation based on software and on custom programming
- Requirement to leapfrog cost economies by using open source software running on industry-standard hardware
- Scalability out of the box at a Fortune 500 enterprise level with expansion up to Cloud Service Provider level without re-architecting the approach

China Mobile's approach

China Mobile decided on an all-software approach to its internal DevOps groups' needs — Virtual Private Clouds (VPCs). VPCs are designed to accommodate subsidiaries of all sizes. Each internal customer is provided with a unique combination of resources as part of its VPC.

To accomplish this visionary goal, China Mobile initially selected a software stack of all open source components. However, when OpenStack® software's built-in networking capabilities ("Neutron") did not provide the required functionality including scalability and isolation, Nuage Networks Virtualized Services Platform (VSP) was selected. Beyond meeting the scalability needs of one of the largest companies in the world, Nuage Networks VSP provides the full isolation and controls at the subsidiary level required by this solution.

OpenStack provides the overall coordination within and among subsidiaries, communicating to Nuage Networks VSP via Representational State Transfer (REST). The key components of Nuage Networks VSP are:

- Virtualized Services Directory (VSD) serves as a policy, business logic and analytics engine for the abstract definition of network services. Through REST APIs to the VSD, administrators can define and refine service designs and incorporate enterprise policies.
- Virtualized Services Controller (VSC) serves as the robust control plane of the datacenter network, maintaining a full per-tenant view of network and service topologies. Through network APIs using interfaces such as the OpenFlow™ standard, the VSC programs the datacenter network independently of datacenter networking hardware.
- Virtual Routing & Switching (VRS) is a module that serves as a virtual endpoint for network services. Through the VRS, changes in the compute environment (such as instantiation of a new KVM virtual machine) are immediately detected, triggering instantaneous policy-based responses in network connectivity to ensure that the needs of applications are met.
- Virtualized Routing & Switching Gateway (VRS-G) is a software-based gateway that bridges non-virtualized (bare metal) and virtualized servers. Gateway functionality is delivered by a robust and scalable Virtual Tunnel End Point (VTEP) implementation that supports virtual LAN (VLAN) interconnection to virtual extensible LAN (VXLAN) from the non-virtualized servers.

FIGURE 1. China Mobile's DevOps implementation based on open source and Nuage Networks products
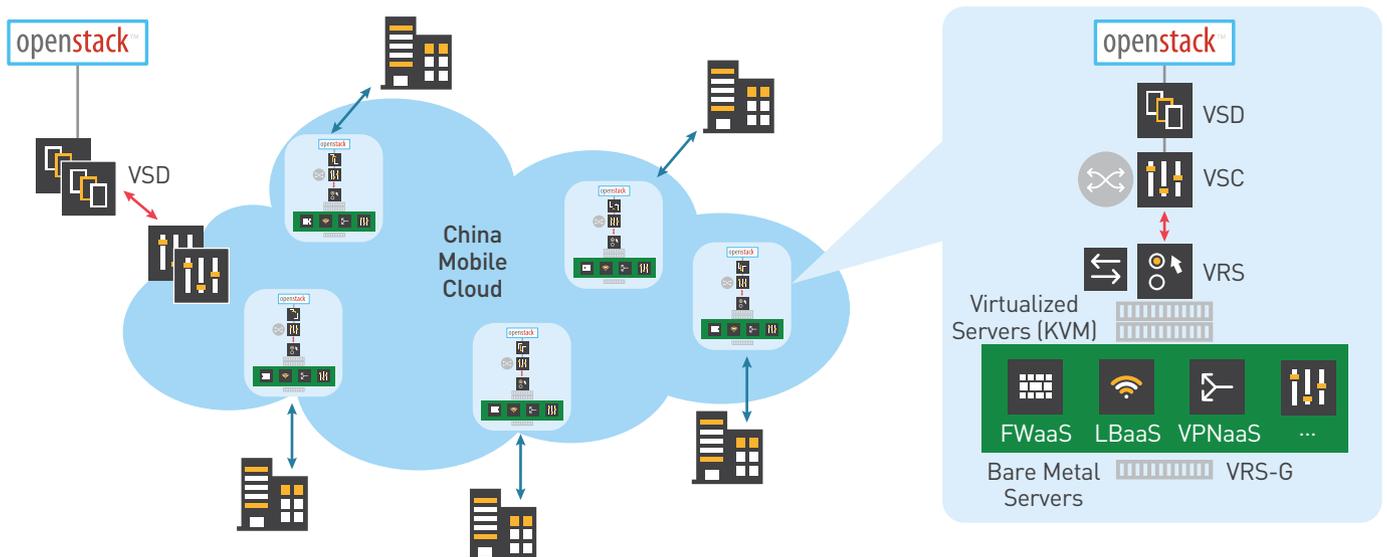
About China Mobile

China Mobile Limited is a world-leading mobile communications service provider with the largest mobile subscriber base of nearly 800 million and the largest mobile communications network globally. It has been listed on Hong Kong and New York stock exchanges. In 2013, the Company was ranked among the FT Global 500, and Forbes Global 2,000 Leading Companies, and was selected as a composite stock in Dow Jones Sustainability Index Emerging Markets. The Company currently enjoys an AA3/Stable Outlook rating by Moody's and an AA-/Stable Outlook by S&P, the same rating as the sovereign rating of China.

About Nuage Networks

Nuage Networks (www.nuagenetworks.net) brings a unique combination of groundbreaking technologies and unmatched networking expertise to the enterprise and telecommunications industries. The Silicon Valley-based business has applied radically new thinking to the problem of delivering massively scalable and highly programmable SDN solutions within and across the datacenter and out to the wide area network with the security and availability required by business-critical environments. Nuage Networks, backed by the rapidly growing IP/Optical Networks business of Nokia, has the pedigree to serve the needs of the world's biggest clouds. The cloud has made promises – the mission of Nuage Networks is to help you realize them.

China Mobile is innovating an open source approach at a Fortune 500 scale. Their DevOps architecture will provide internal efficiencies today and competitive advantage in the near future. Nuage Networks' openness, flexibility and scalability are critical to China Mobile's architecture and growth plans.

Open source Kernel-based Virtual Machine (KVM) is used for server virtualization. Other open source components are utilized for network services, including firewall as a service (FWaaS), load balancing as a service (LBaaS), VPN as a service (VPNaaS) and more.

Netting out, each subsidiary is allocated its own VPC composed of resources that may be physically dispersed yet seamlessly connected and accessible from anywhere in the China Mobile cloud. Further, each VPC is isolated and secure internally and externally. So, subsidiaries have the best of both worlds – enhanced software controls along with cost efficiencies.

How this approach changes the game

This innovative approach helps China Mobile change the game for its internal customers. New capabilities include:

DevOps learnings translate to customer advantage

By building and iterating the design based on the feedback of internal DevOps teams, invaluable insights are being gained into how to address the public cloud as well. This strategy will not only help China Mobile develop a better approach internally but also bring it to market much faster than having separate and isolated development and operations environments.

Full control over the environment

As the solution is based on open source software, the source code is readily available and customizable. Nuage Networks VSP is also highly customizable. This capability provides China Mobile with full control over the environment.

Open with scalability to Telco volumes

Leveraging open source components along with Nuage Networks VSP, China Mobile can provide services at public cloud or telephone company volumes. This provides China Mobile with the complete flexibility to address any market that they target.

Leverages economies of (developer) scale

This approach leverages a key advantage of China Mobile. With literally hundreds of developers on the payroll, China Mobile can now freely innovate independently of hardware development cycles and of vendor lock-in. In a fiercely competitive market, this gives the company a huge advantage.

Real-time elasticity

Since all functionality is virtualized, VPCs can adapt in real time to changing workloads. Should demand for a particular application arise, more virtual machines can be instantiated in near real time.

"White box" economies

The architecture also utilizes industry-standard ("white box") hardware. This approach enables China Mobile to compete based on price — if they elect to do so.

Platform for the future

The architecture fully supports emerging open source development environments (such as Apache Mesos and Kubernetes). These emerging development environments provide incredible flexibility and power for future efforts.

Adding it all up

Rather than follow the path set by many Cloud Service Providers, China Mobile is taking a bold leap into the future by building a private DevOps cloud based on open source software and Nuage Networks. With this approach, China Mobile will be able to establish long-term innovation, time to market, and cost advantages in a fiercely competitive market.