SDN Practice for Cloud Overlay Network: From Infrastructure to Products

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Agenda

1. Introduction
2. SDN Overlay Network
3. SDN Products
4. Summary
About Alibaba Cloud

World Leading Public Cloud Service Provider

47.6% Market share

104% Revenue growth
Some Numbers

Powered By Alibaba Cloud

325K Orders/s 256k Payments/s 162.8B RMB
Applications

Applications such as cloud resource management, obtain the network resources by calling the north bound API of overlay network controller.

Overlay Network

The overlay network of Alibaba Cloud is a SDN network consisting of control plane, data plane, and management plane.

Physical Network

Alibaba physical network is one of the world largest SDN network infrastructure.
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Architecture Overview

**Data plane**
Various data plane acceleration technologies are intensively used in Alibaba Cloud Overlay network, e.g., user mode networking stack, programmable white box switch.

**Control Plane**
The SDN controller of Alibaba Cloud Overlay network consists of three parts: SDN host controller agent, regional controller and global controller.

**Management Plane**
The management plane driven by machine learning & big data technologies empower the automation of SDN overlay network.
Apsara Virtual Switch (AVS)

- Route
- TAP
- QoS
- ACL
- Meter
- NAT
- Fastpath

Apsara Network BaseOS

Separated slow path & fast path
Allow rich network functionalities and achieve high performance

Business & Platform Abstraction
Business & platform abstraction enables AVS to run on different platform and support different applications

High Performance
Data plane acceleration with kernel-bypass technology/user mode network stack, SR-IOV, or SmartNiC
SDN Regional Controller

- Supporting up to 1M virtual networks in a region (each virtual network with maximally 100K VMs) places great pressure on the SDN controller performance
High Availability

- Redundancy on both control plane and data plane
Data Collecting

Tracing and logs from both underlay and overlay networks are collected and fed into big data analysis service.

Big Data Analysis

The big data analysis ensures log data can be processed in a real-time fashion so that failures can be identified quickly enough.

Machine Learning

Machine learning helps reduce the recovery time and reduce the human intervention.
## Performance

<table>
<thead>
<tr>
<th></th>
<th>Virtual Switch</th>
<th>Gateway</th>
<th>Controller</th>
</tr>
</thead>
<tbody>
<tr>
<td>High throughput</td>
<td>• High throughput</td>
<td>• Scale out</td>
<td>• 1M VPCs per Region</td>
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<tr>
<td>Ultra low latency</td>
<td>• Ultra low latency</td>
<td>• Hot upgrade</td>
<td>• 100K VMs per VPC</td>
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<td>Hot upgrade</td>
<td>• Hot upgrade</td>
<td>• 5m connections/s</td>
<td>• 100K routes in 3 seconds</td>
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<td>Hot migration</td>
<td>• Hot migration</td>
<td>• 30M PPS</td>
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The Benefits from SDN Approach

- scalability
- performance
- convenience
- reliability
- intelligence
Cloud-Network Convergence
Overlay Network Evolution

Classic Network

VPC

VPC Peering

VPC

The First Generation

The first generation network, only provides public internet access capability.

VPC Network

Besides the functionalities provided the first generation, the second generation network provides point-to-point connection between the VPCs.

The Third Generation

The third generation cloud overlay network has the intelligence and capability to provide global connectivity.
Cloud Enterprise Network (CEN)

CEN: a fully meshed backbone network

Region A

Region B
The explosive business growth of Alibaba Cloud calls a solution with higher performance, better scalability, and less cost.
CEN Architecture

A Cloud Based SD-WAN Network Solution
An Use Case of Programmable SDN Switch

- Controller
- GW
- VPC
- Bare Metal
- VM
- Docker

Control Plane

- Overlay Network Controller
- Regional Route Compute & Controller
- GW

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Our SDN Overlay Network

SDN Overlay Network
- Flexible
- Automated management
- Highly available
- Quick iteration

Rich Functionalities
- Xen, KVM, Docker…
- Hybrid cloud
- SD-WAN

Security
- Strong anti-DDoS capability
- Tenant isolation
Our Experience

Future, Globalization, More Intelligent
Thank You

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