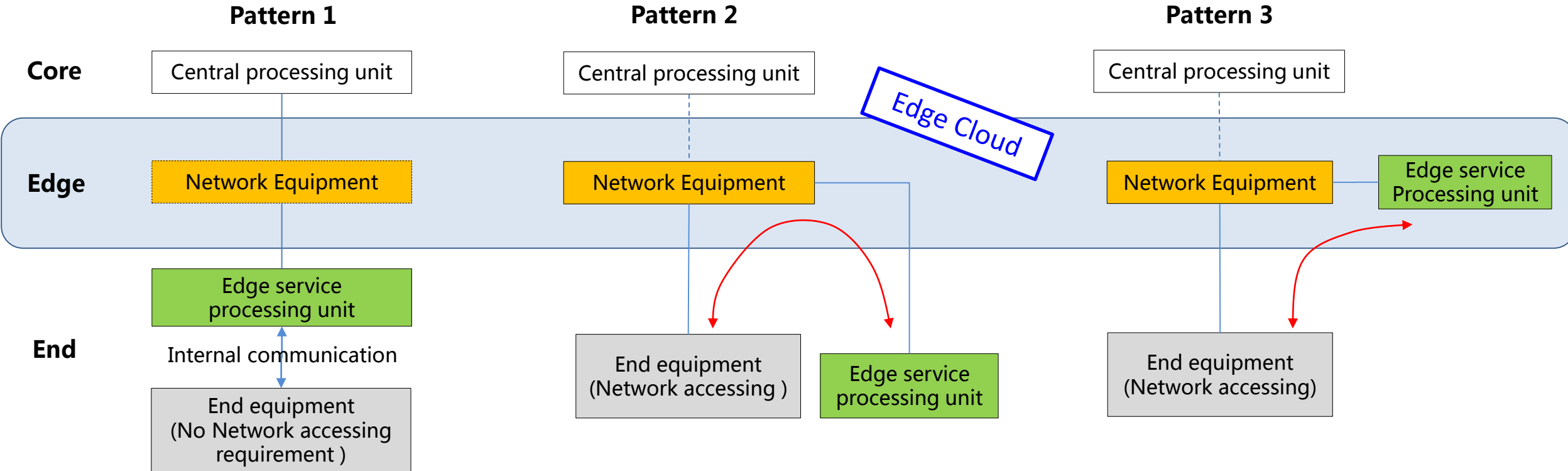


# Edge Cloud Experience from China Mobile

Qihui Zhao

[zhaqiqhui@chinamobile.com](mailto:zhaqiqhui@chinamobile.com)

# Three deployment patterns of edge services



Pattern	Service Type	Features
Pattern 1	Industrial/IOT	highly professional, large amount of data processing, no external network requirement
Pattern 2	School/enterprise/hospital/police	private and highly secured data/equipment, need external network
Pattern 3	Video/game/entertainment	popular, low-latency/real-time, fast iteration, high user experience requirement

# Whether edge services need edge cloud?

Pattern	Pattern 1	Pattern 2	Pattern 3
Use edge cloud or not	Not sure	Not sure	Yes
Premise to use edge cloud	High cost of deploying services locally and dispersedly, and provide local IaaS and O&M for resource/service providers, while some of the services could be centralized	<ol style="list-style-type: none"><li>1. Some non-private/non-sensitive data could be processed in cloud</li><li>2. Further need of low-latency and low-cost</li></ol>	Services in pattern 3 will use edge cloud for sure. Because deploying them in core won't ensure user experience while deploying them on end would cost a lot. Proper deployment position is edge cloud.
What can telco edge cloud provide	<ol style="list-style-type: none"><li>1. Enough and widespread IaaS</li><li>2. Free resource/service providers from high cost of resource and O&amp;M</li><li>3. Increase the flexibility of edge service development/management</li></ol>	<ol style="list-style-type: none"><li>1. Enough and widespread IaaS</li><li>2. Lower TCO for enterprise</li></ol>	<ol style="list-style-type: none"><li>1. High flexibility and low cost for service provider</li><li>2. Easy service management and update</li></ol>

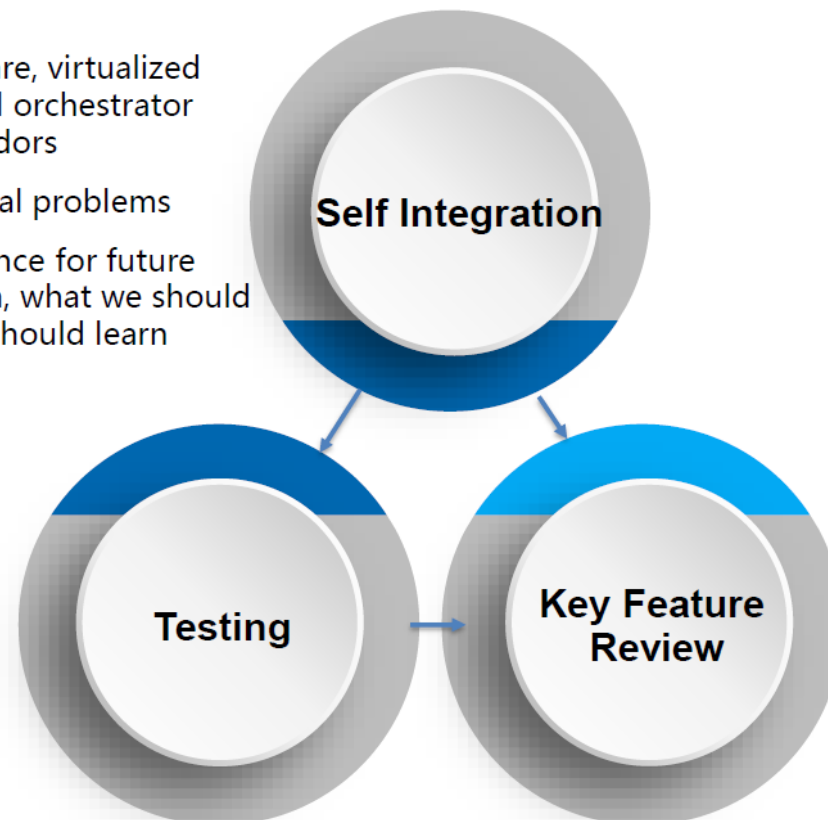
- **Conclusion 1: edge cloud can provide high-enough flexibility and low cost for edge service providers.**
- **Conclusion 2: telco edge cloud can be a good resource provider on edge and needs to redeploy some gateways (CU, UPF and etc.) to carry edge services.**

## ➤ What is China Mobile NovoNet Experiment Network?

- A **future network structure validation system** of China Mobile, built in 4 major Provinces in China Since 2016
- Focus on **integration, testing and key feature review** of newly-born network technologies/structures
- 9 virtual infrastructure vendors, 5 VNF vendors, 3 orchestrator vendors, 4 SDN vendors are involved
- Two phases of test have been accomplished (Phase 1: 2016.12-2017.7, Phase 2: 2017.9-2018.2)

- Integrated hardware, virtualized software, SDN and orchestrator from multiple vendors
- Figure out potential problems
- First hand experience for future network operation, what we should change, what we should learn

- Virtualize layer testing
- Service testing
- SDN testing
- ...



- Is the virtualization of Telecom service ready for deployment?
- How should we benchmarking and choose virtualization platform vendor?
- Should we use a regional Orchestrator or Centralized one?
- Can SDN work with NFV? What are the key issues?
- ...

## ➤ What are we doing for Phase 3?

- **Time:** 2018.11 ~ 2019.3
- **Location:** Beijing, Guangzhou, Shanghai, Zhejiang
- **Involved:** 4 virtual infrastructure vendors, 3 SDN vendors, 3 VNF vendors
- **Major Content:**
  - **Edge cloud key-tech verification:** light-weight OpenStack, multi-cloud management, acceleration
  - **Service performance testing:** vCDN, 5G-CU
  - **Tool functioning testing:** ONAP

## ➤ Things we observed:

- ❑ Centralized/remote management and resource saving are major topics for edge, due to huge-amount and widespread features of edge sites.
- ❑ Two types of edge infrastructure layer existing now: OpenStack & VM, Kubernetes & Container .
- ❑ OpenStack & VM is still the mainstream existing model of telco services because of high security requirements, while Kubernetes & Container is preferred by third-party services like IT services.
- ❑ For telco edge, the ability of NFVO to manage huge amount of edge sites remains to be tested. But multi-cloud management platform would be a good choice to help to reduce central management difficulty and open resource to third-party services which not follow NFV system.
- ❑ For telco edge, meeting functional, performance and reliability requirements is much more important than how to implement those requirements. Diversity should be allowed for edge.

## ➤ Things we observed:

### □ Environment setup:

- Inter-site-network (layer 3) with real delay and packet loss (could be simulated by tools)
- At least two OpenStack separated by inter-site-network to simulate different sites (Kubernetes&container environment is not tested in this phase)

### □ Major test point:

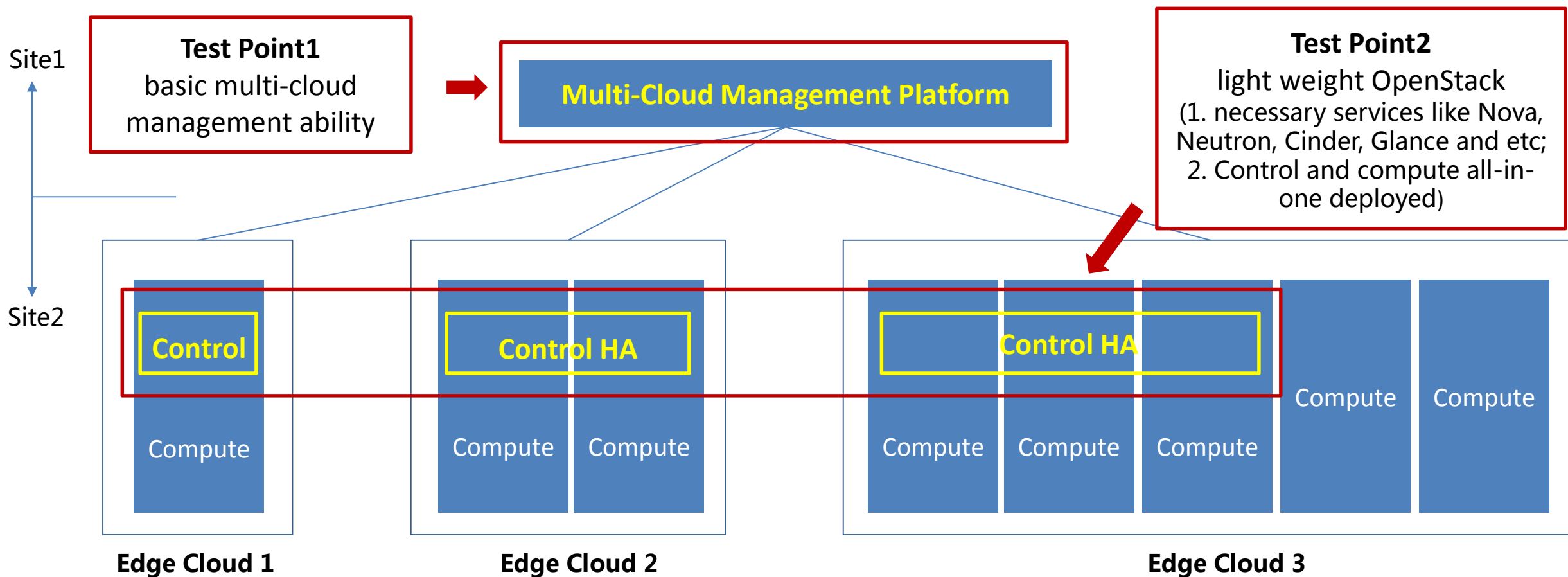
#### ✓ Light-weight OpenStack

- **Footprint** of control services
- **Functional testing:** including virtualization function of hypervisor and virtualization resource management function of VIM (supposed to be similar to full-version OpenStack)
- **Performance testing:** how many VMs could be managed, how long it takes to create/delete/reboot a certain amount of VMs, etc.
- **Reliability testing:** what action it will take when error occurs, etc.

#### ✓ Multi-cloud interaction and management

## ➤ Environment description

- Real edge environment: **two sites located 30 km away** from each other with **latency around 2ms**
- Management platform deployed in site 1 to **provide remote multi-cloud management**
- **Three types of light-weight openstack** deployed in site 2 to simulate different edge cloud (layer 3 network between each cloud)





## ➤ Testing:

- ❑ Edge OpenStack products from 3 vendors will be tested (currently finished one)
- ❑ Vendors including open source vendors and closed source vendors
- ❑ 21 basic test cases picked from telco core OpenStack test cases which cover functional, performance and reliability ( e.g. user/tenant create, migration, etc. )

## ➤ Things we observed:

- ❑ **Footprint:** resource used by control services can be **limited to as low as 2 to 3 physical cores**, but management ability remains untested because of lab resource constrains
- ❑ Light-weight OpenStack can **meet basic functional requirement**, more detailed cases need to be tested
- ❑ Performance of light-weight OpenStack is unevaluable for now due to lack of performance data of core OpenStack (but concurrency tests indicate performance of light-weight version is worse full version)
- ❑ Service reliability on edge could be ensured by service itself or by infrastructure layer. No conclusion on this by now because it is related to resource utility, backend storage and many other factors.

➤ **Testing:**

- ❑ 10 test cases about multi-cloud management such as central user management, single sign on, remote software upgrade, data backup to central place

➤ **Things we observed:**

- ❑ Multi-region solution has good testing outcome, while other private solutions of some close source vendors remain to be tested
- ❑ Implementation of multi-cloud management platform includes but not limited to OpenStack solution like multi-region

Thank You !