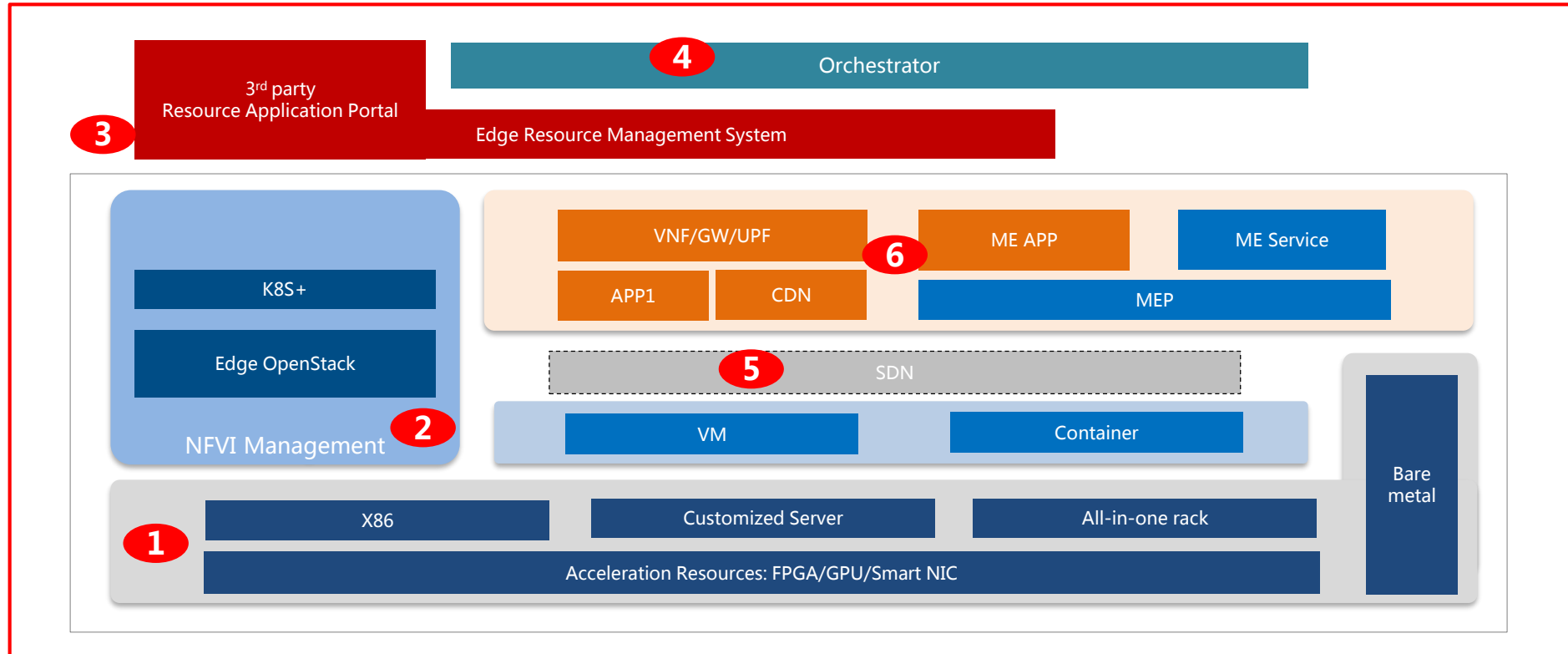


A proposal about single management platform for edge cloud

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**What should Telco Operators care
to build large-scale edge cloud?**



1 Diverse Hardware

- ✓ x86
- ✓ Customized Server
- ✓ All-in-one rack
- ✓ Bare metal
- ✓ Acceleration hardware

2 Heterogeneous Cloud Platform

- ✓ Container + K8S
- ✓ VM + OpenStack
- ✓ Container in VM

3 Centralized O&M and Resource Providing

- ✓ Centralized O&M for distributed edge resource (HW & SW)
- ✓ Resource application portal for 3rd-party applications

4 Orchestration

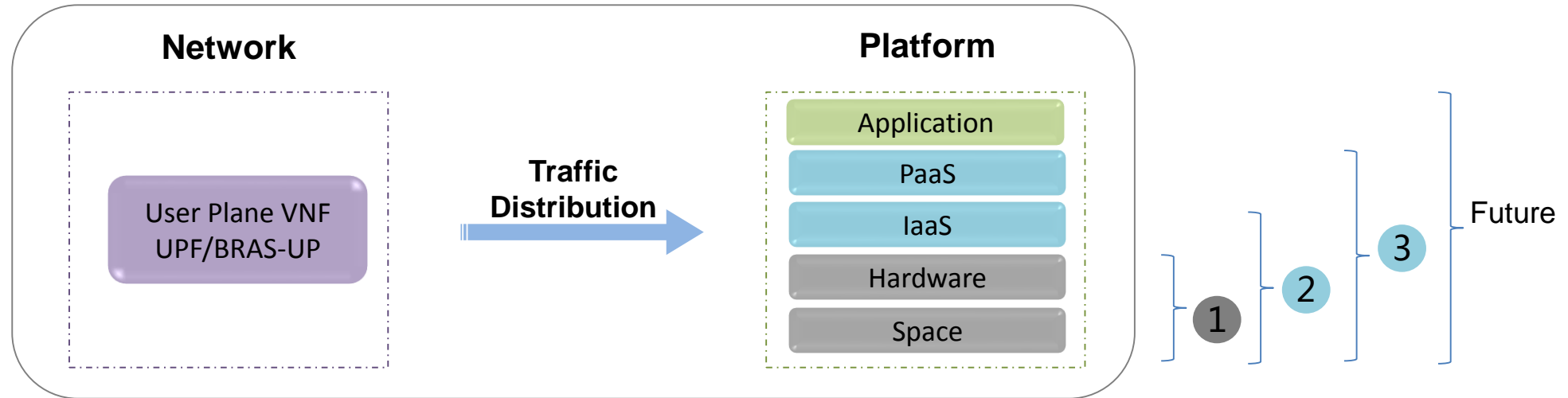
- ✓ Simplified orchestration for IT App if needed
- ✓ Orchestration and cooperation of IT App and telco network ability

5 SDN

- ✓ SDN for edge

6 Service and MEC

- ✓ Provide MEC ability for edge Applications
- ✓ Provide ability of 5G wireless and core network
- ✓ Cooperation between IT and CT services



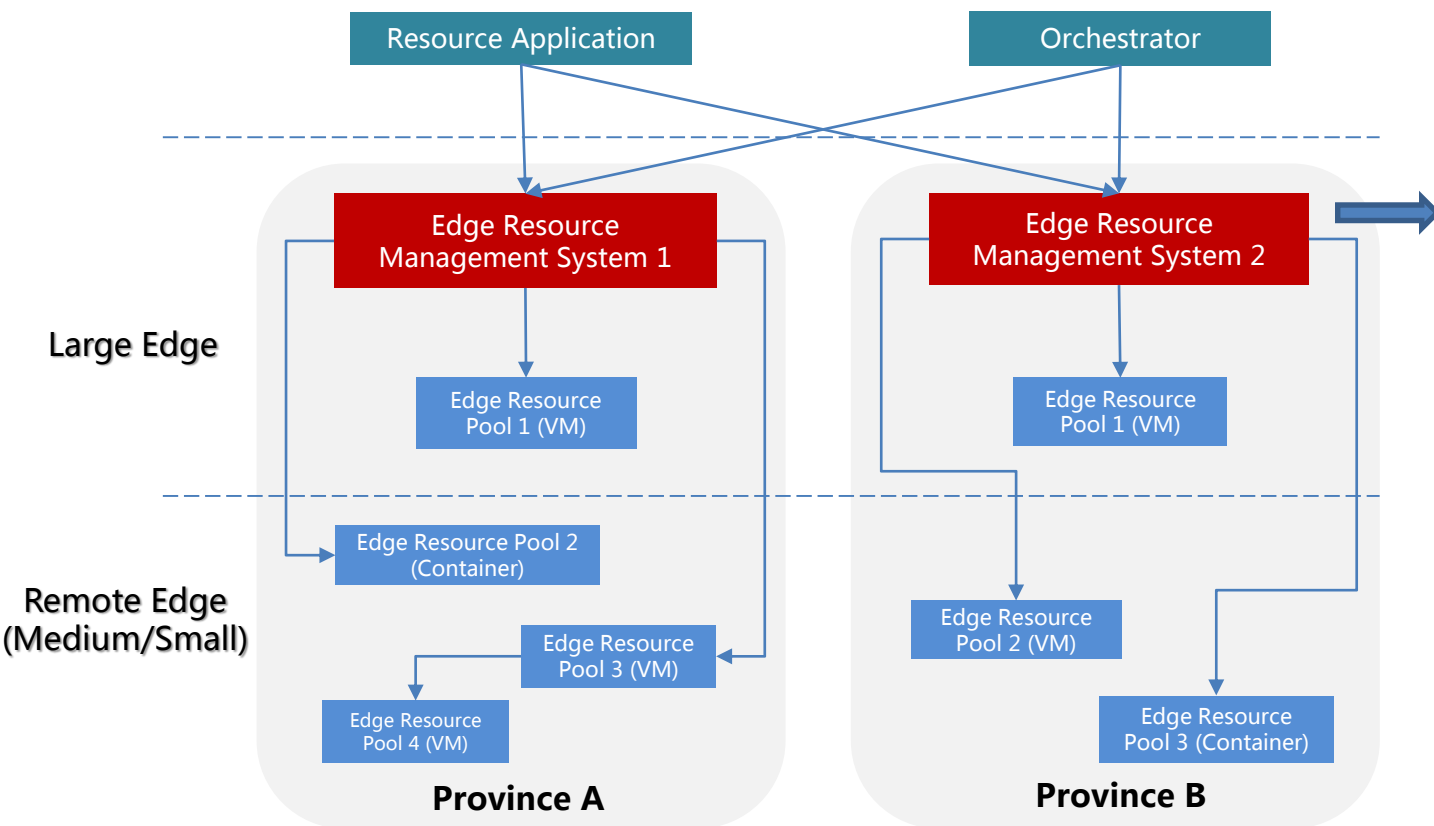
Model Number	Telco Operators	3 rd -party application vendor
1	Network ability + Space + Hardware	(IaaS) + (PaaS) + Application
2	Network ability + Space + Hardware + IaaS	(PaaS) + Application
3	Network ability + Space + Hardware + IaaS + PaaS	Application

- Applications on cloud under testing: Cloud Game, Video, Face Recognition, VR/AR etc.
- **Infrastructure is still one of the most important layer on edge that needs attention**
- However, current edge hot spot is IOT, not many projects focuses on infrastructure layer

Requirements of providing infrastructure on edge

● Key points of providing infrastructure on edge:

- ✓ Centralized operation and management on multi-cloud environment
- ✓ Maintain basic operations on edge sites once lost connection

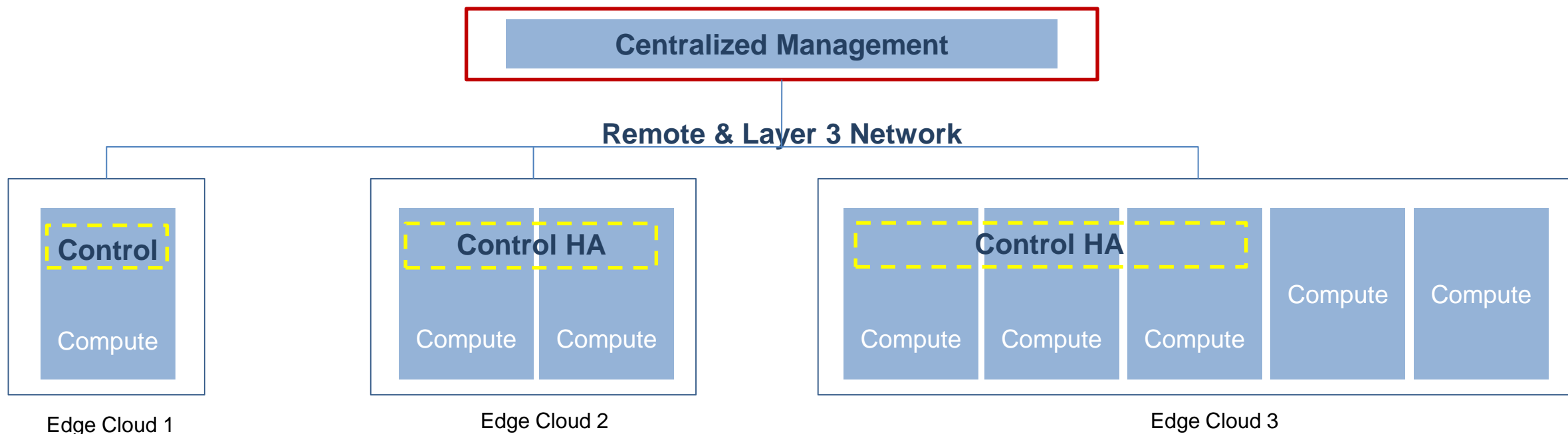


Sample Requirements

- User data management
 - ✓ Consistent data + different authorization
 - ✓ Single Sign on
- Site management
 - ✓ Add new site into management list
- Cloud resource management
 - ✓ Provide safe resource application API or portal
 - ✓ Manage heterogeneous cloud
- Image management
 - ✓ Image uploading and distribution on-demand
- Software management
 - ✓ OS, middleware, cloud platform patch, App uploading
- Hardware management
 - ✓ Operation on compute, network, storage, acceleration device
- FCAPS collection and report
 - ✓ Collect fcaps data from edge resource pools and report to whoever needs it

Test on platform selection

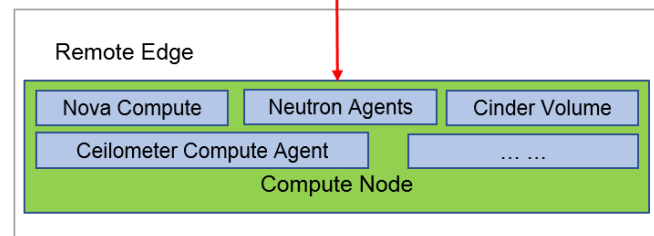
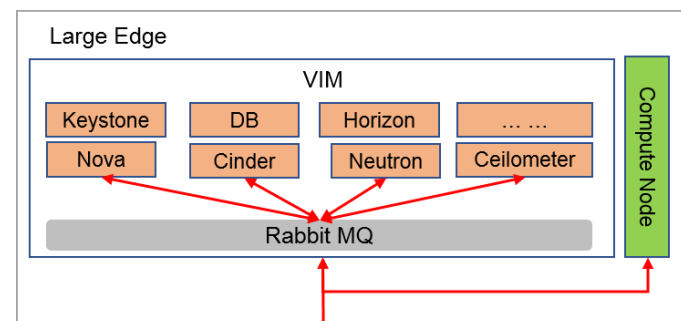
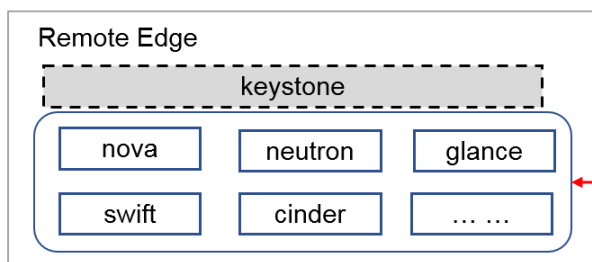
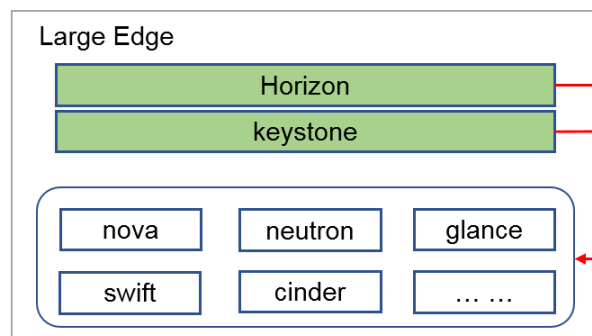
- **Purpose:** exploring structure and features of large-scale edge virtualization layer of telco operators
- **Major testing points:**
 - **Lightweight OpenStack** as controller for virtualization resources
 - Management and interoperability of **multiple cloud** on edge
- **Environment description:**
 - **Two sites located 30 km away** from each other with the **latency of around 2ms**
 - An edge system including **3 virtualization environments**, **centralized management ability** among those environments



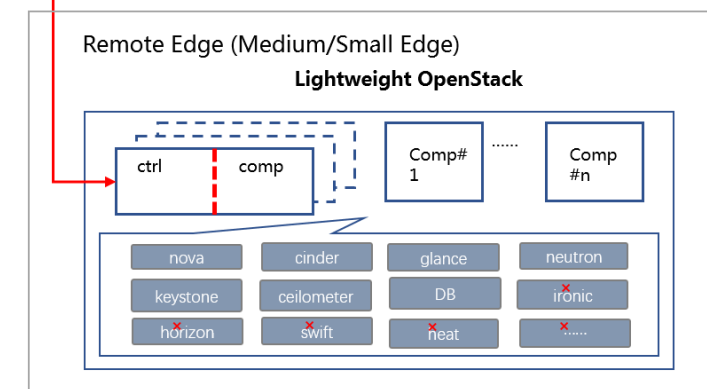
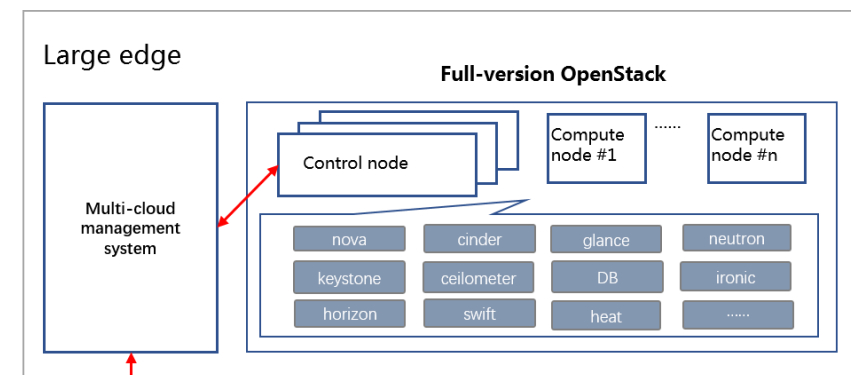
Platform Selection

3 different solutions have been tested:

- Enhanced Multi-Region (old-version StarlingX but with some close-source enhancement)
- Centralized OpenStack control with remote compute
- Independent lightweight OpenStack as VIM with external multi-cloud management system



RPC



Features & Outcomes

Solution	#1 Enhanced multi-region	#2 Centralized control with remote compute	#3 Independent lightweight with external multi-cloud management system
Endpoints	Multiple for multi-region	Single for all edge	Single for all edge + vim_id
Consistent user data	Support (Sync DB)	Support (One DB)	Support (Outside DB)
Different quota on different site	Not Support	Not Support	Support
Requirement on DCI management network quality	Medium	High	Medium
Difficulty of adding new sites	Medium (modify config)	High	Low (add link)
Image distribution	Sync to every region	One for all	Distribute on-demand
Heterogeneous cloud MGT	Not support	Not support	Support
Suitable scenario	Small-scale multi-cloud environment with reliable DCI network		Large-scale multi-cloud environment
Pros	Easiest Sync (DB, image, flavor)	Most lightweight; One SDN for multiple sites	Most flexible and reliable; Local O&M
Cons	Not support local management; Require high network quality;		Introduced non-OpenStack multi-cloud management platform

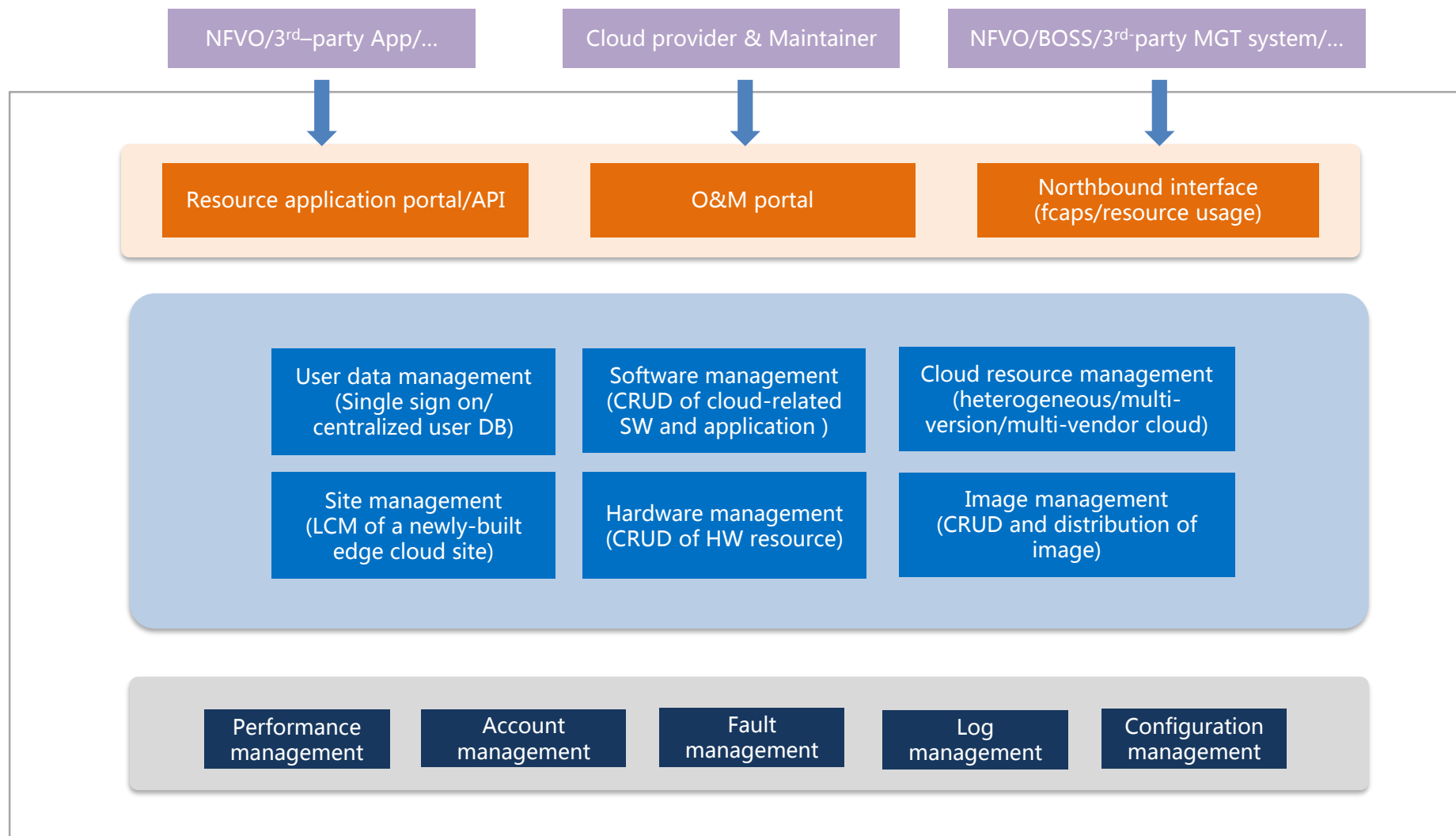
Outcomes come from test data and theoretical analysis.

- In the aspect of centralized resource utilization, all the three solutions support applying for resource at the center of edge (large edge in previous plots) and specifying VM locations
 - Multi-region → region
 - Centralized OpenStack control with remote compute → AZ
 - Independent lightweight OpenStack as VIM with external multi-cloud management system → vim/cloud

- In the aspect of centralized O&M and interoperability of multiple cloud, an external management system is recommended.
 - Hard to relying on pure OpenStack to achieve multi-cloud interoperability and O&M
 - E.g. different quota on different site, image distribution on-demand, SW/HW management

A platform for multiple edge cloud

A platform for multiple edge cloud



Thank You !