National (Hangzhou) Novel Internet eXchange

Virtualized IX over SDX

Shicong Zhang
IX.CN

Geography of China

China has a vast territory and a large population. It is a great challenge to implement the Internet infrastructure across the country.

- Approximately 9.6 million square kilometres
- 23 provinces
- 5 autonomous regions
- 4 municipalities
- 2 special administrative regions
- Population exceeding 1.4 billion, mostly in the eastern area

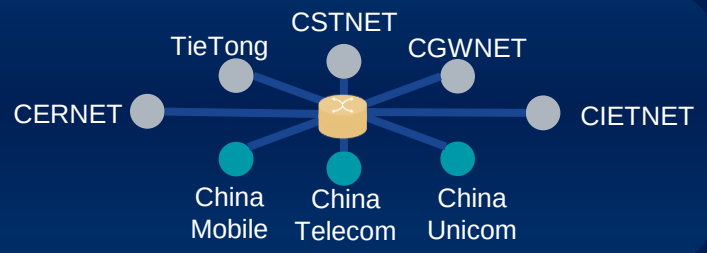
Internet Interconnection Architecture

China Internet interconnection architecture includes NAPs, backbone connection points and IXPs, each responsible for certain traffic flows.

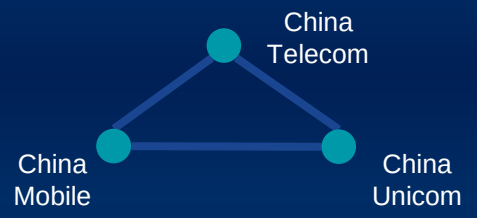
Infrastructure Distribution Map

Brief introduction of each architecture

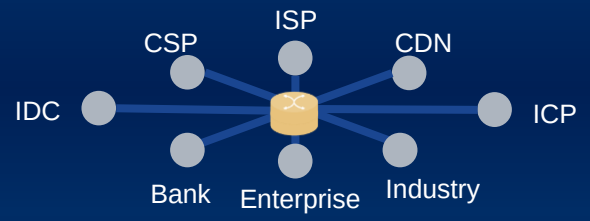
NAP **3**



Backbone Connection Point **21**



IXP **4**



IXPs in China

China has approved 4 IXPs since 2019, distributed in East China, South China and West China.

- ✓ Shareholders are basically composed of three Tier1 carriers, internet enterprises and local enterprises.
- ✓ Guided by Chinese government to keep neutrality, justice and openness, performing like a semi-public service organization.

IXP:3
City: Zhongwei
Formed: 2021.6.29

IXP:2
City: Shenzhen
Formed: 2021.4.14

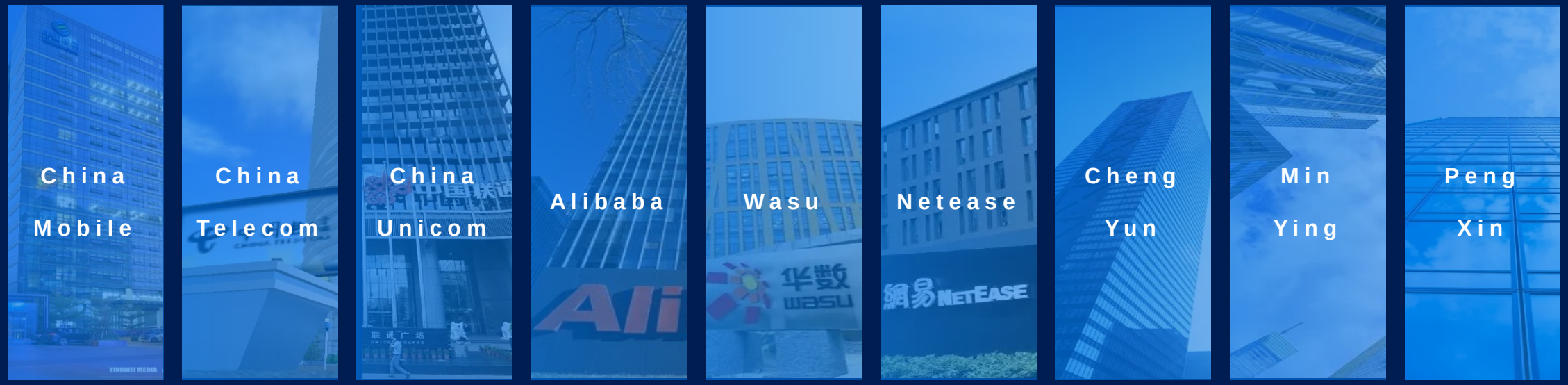
IXP:4 SHIXP
City: Shanghai
Formed: 2021.12.20

IXP:1
City: Hangzhou
Formed: 2020.6.30

Overview of NNIX

NNIX is approved and supervised by Ministry of Industry and Information Technology of China, we have more than fifty employees and have been running for nearly three years.

9 shareholders, 3 Tier1 carriers reach 70%

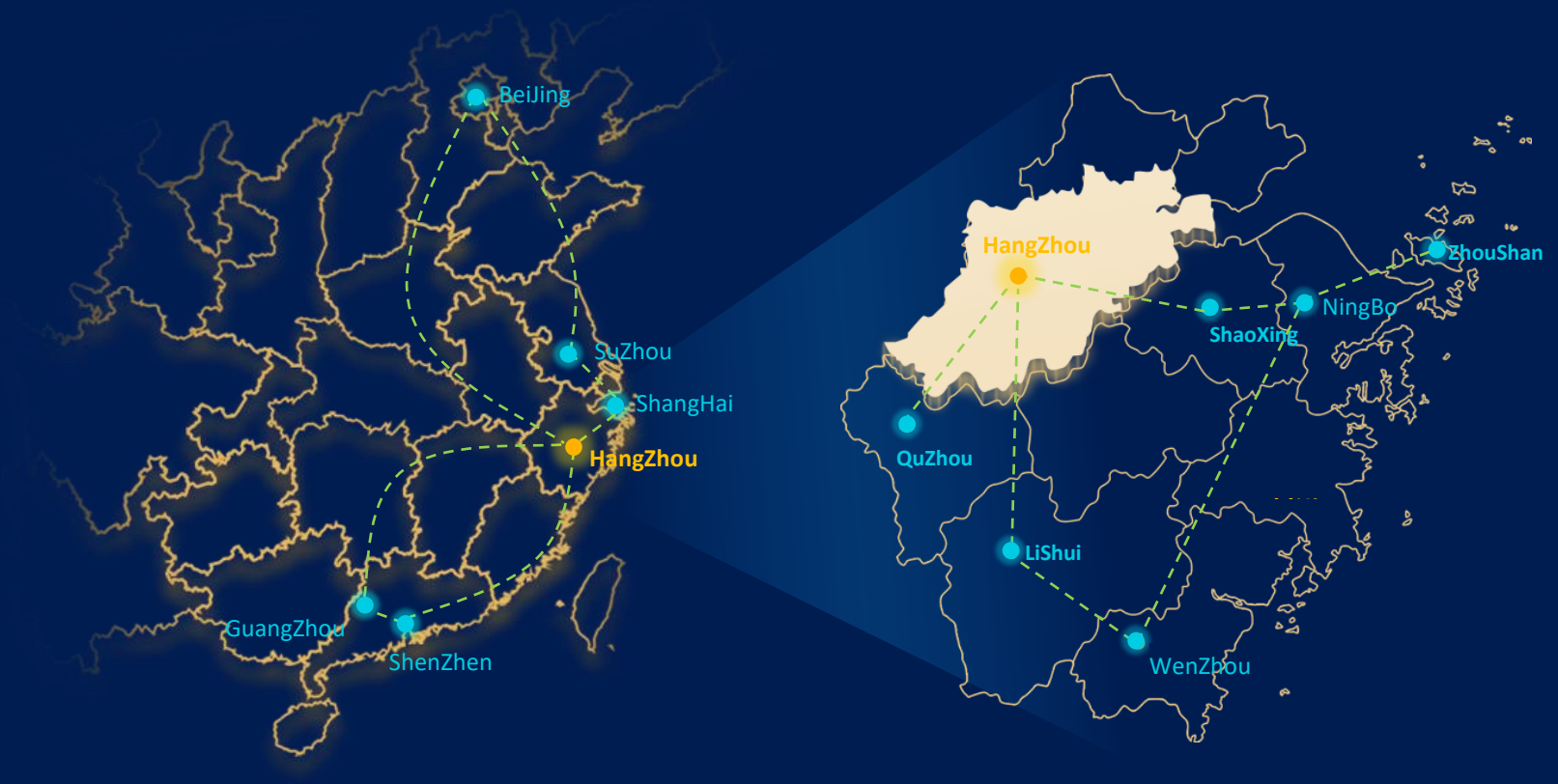


中国移动 China Mobile	中国电信 CHINA TELECOM	China unicom 中国联通	阿里巴巴 Alibaba.com	华数 wasu	網易 NETEASE	CCI 城云科技	民盈集团 MINYING GROUP	鹏信科技 PONSHINE
24%	23%	23%	13%	11%	3%	1.5%	1%	0.5%

Network of NNIX (1)

NNIX has built some exchange points nationwide, radiates key cities, important data centres and public cloud regions.

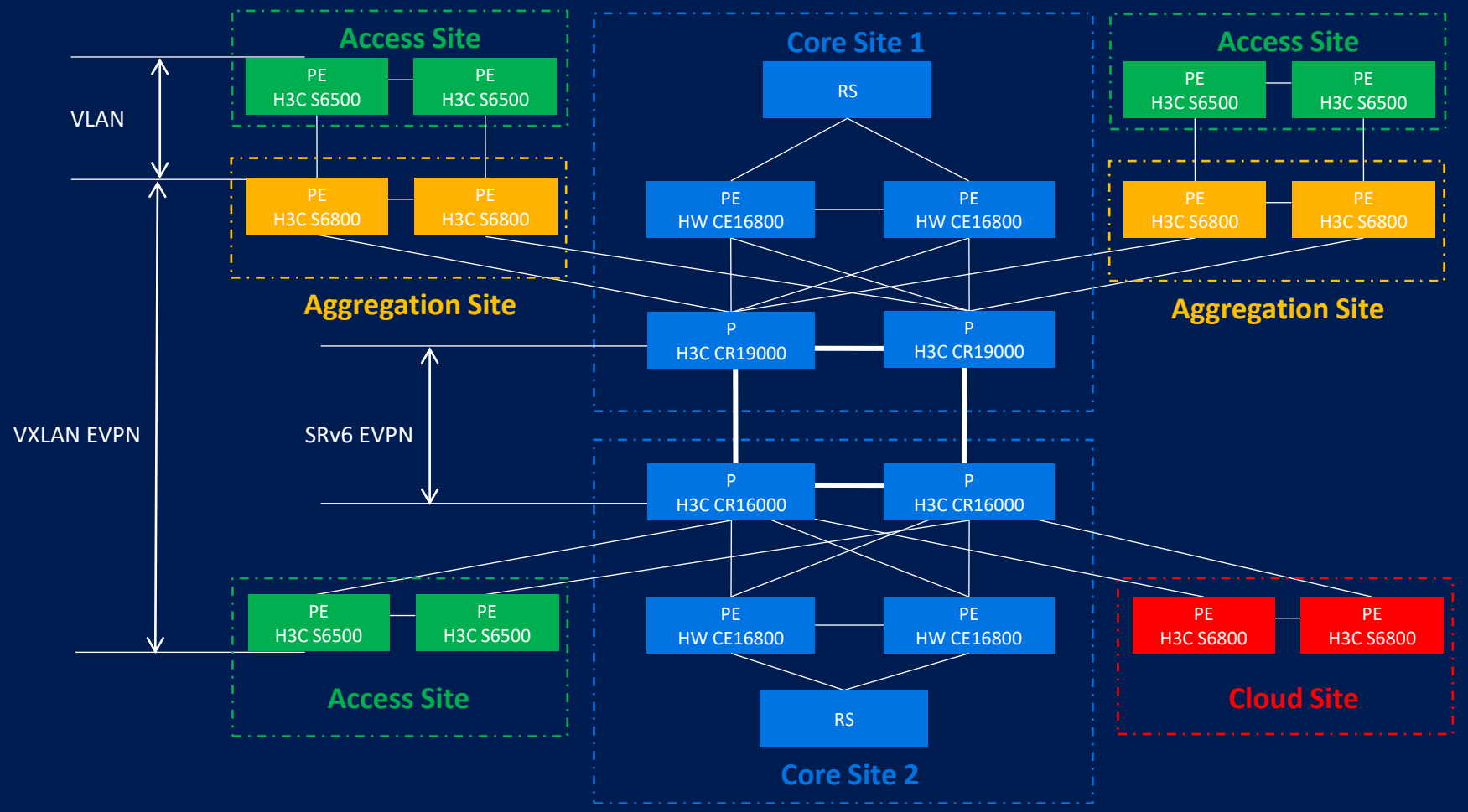
Physical topology



- Scale of Deployment
  - ✓ 6 Provinces
  - ✓ 12 Cities
- Number of Sites
  - ✓ 2 Core Sites
  - ✓ 6 Aggregation Sites
  - ✓ 5 Access Sites
  - ✓ 10 Cloud Access Sites

Network of NNIX (2)

Logical topology



- Router
  - ✓ H3C CR19000
  - ✓ H3C CR16000
- Switch
  - ✓ HW CE16800
  - ✓ H3C S6800
  - ✓ H3C S9800
  - ✓ H3C S6500
- Protocol
  - ✓ SRv6 EVPN
  - ✓ VXLAN EVPN
  - ✓ VLAN

Operation of NNIX

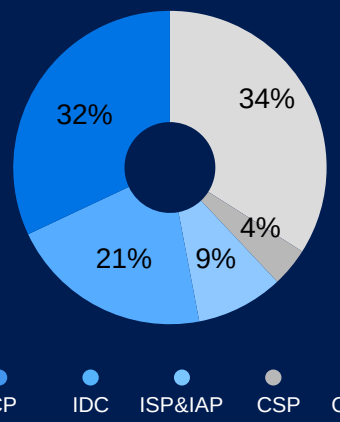
We have connected 163 enterprises of various types, bandwidth of the access port has reached to 9.77T while peak traffic has reached to 2.4Tbps.

163
Paticipants

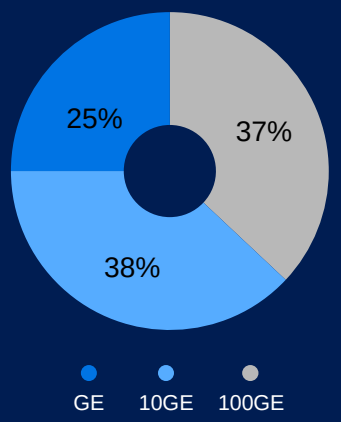
9.77T
Bandwidth

2.4T
Peak Traffic

Industry Distribution

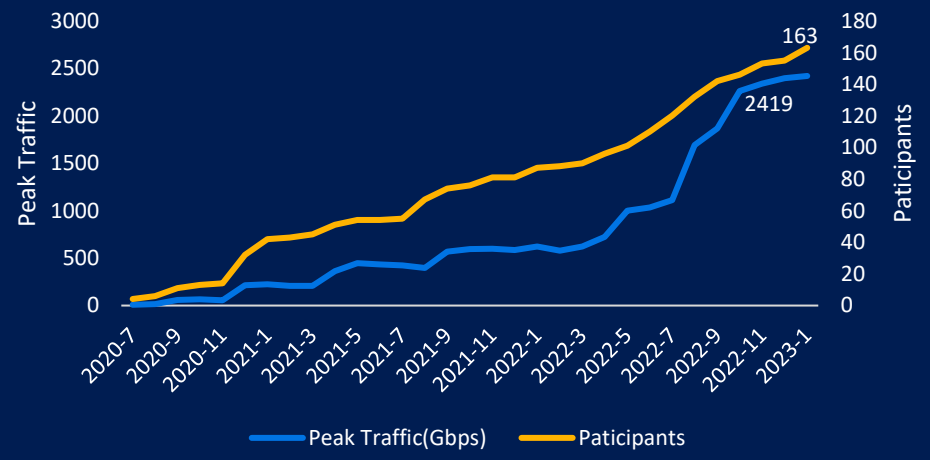


Port Distribution



A part of connected enterprises

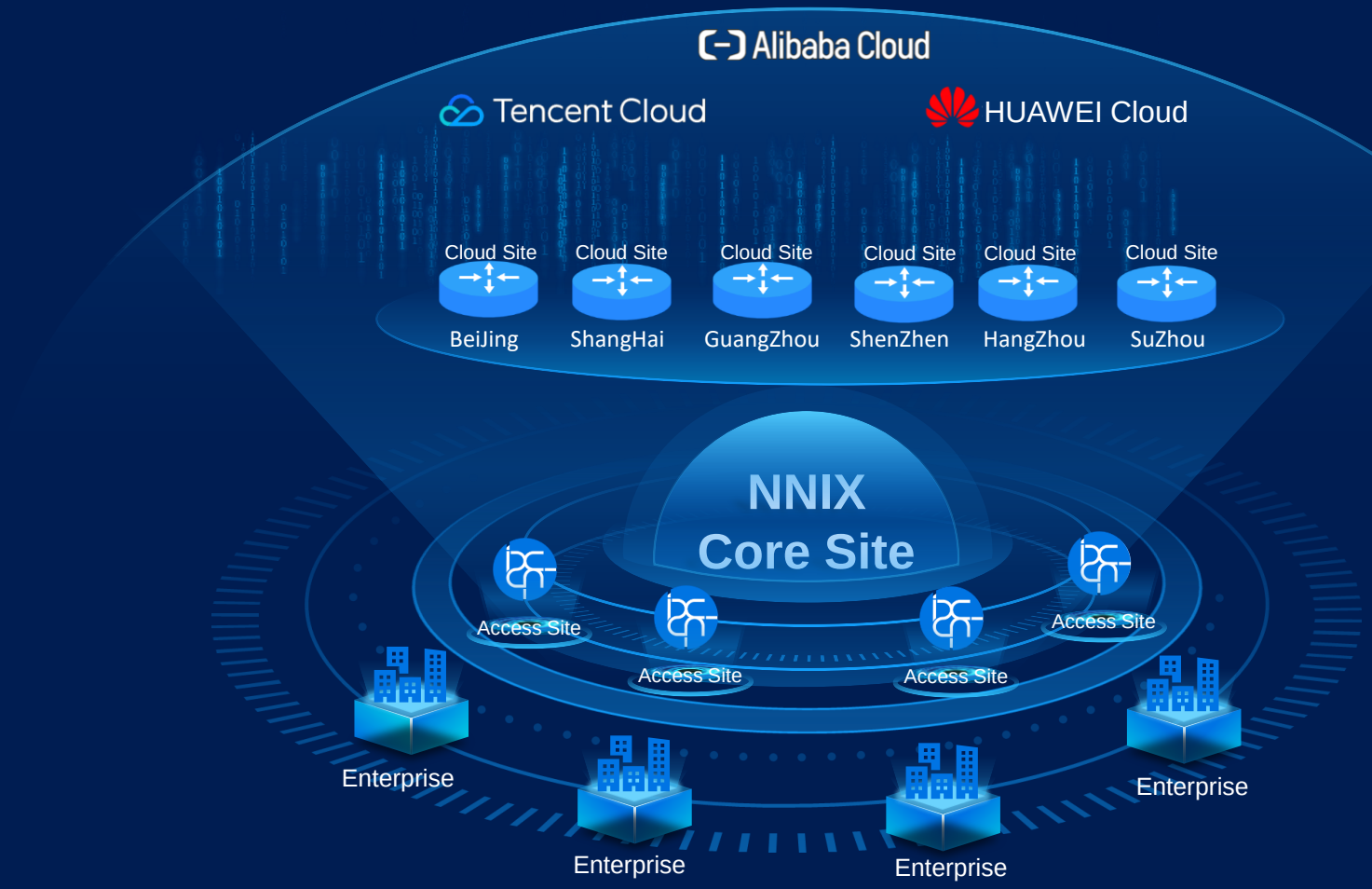
中国移动 China Mobile
中国电信 CHINA TELECOM
China unicom 中国联通
华数 wasu
阿里巴巴 Alibaba.com
腾讯云
华为云 HUAWEI
京东
網易 NETEASE
杭州钢铁集团公司
网银互联 www.netbank.cn
华通
Syscloud
Telstra
GEELY TECHNOLOGY GROUP
网鼎科技
NOVA 南凌
浙商银行 CZBANK
浦发银行 SPD BANK



Our efforts during the past 2022 (1)

Multi-cloud connection

Upgrading multi-cloud connection product by accessing to 10 public cloud regions of 3 public clouds to provide Alibaba cloud, Tencent cloud and Huawei cloud direct connect service.

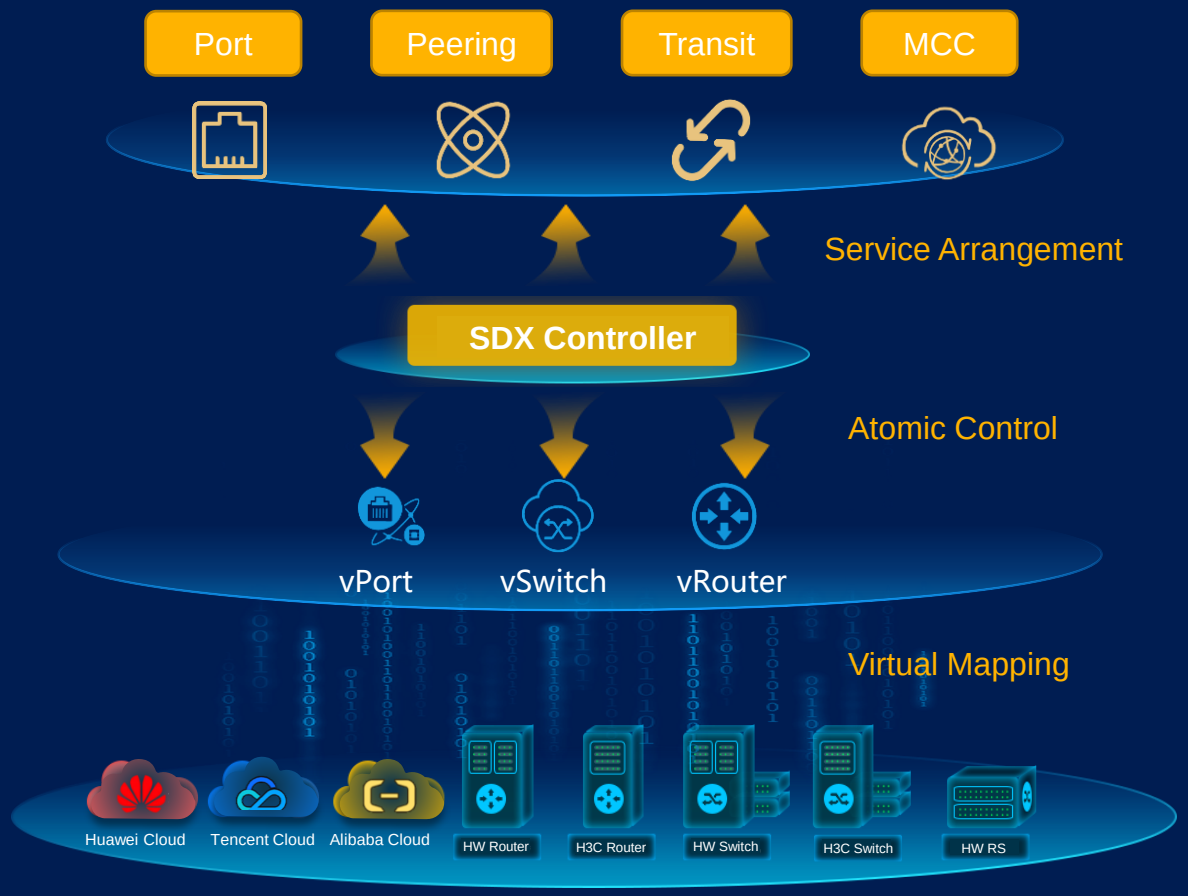


- ✓ Implement 10 cloud sites in 6 cities, including Beijing, Shanghai, Guangzhou, Shenzhen, Suzhou and Hangzhou
- ✓ Covering 10 regions of Alibaba Cloud, Tencent Cloud and Huawei Cloud
- ✓ The number of multi-cloud customers has increased to 6 times compared to 2021

Our efforts during the past 2022 (2)

Virtualization IX over SDX

NNIX SDX V1.0 was launched in 2022, together with the virtulization system, it supports both classical and new service scenarios in an IXP and compatible with several device manufacturers. In 2023, we will continue to optimize it according to the self-use condition and plan to make it open to APIX.



Service Performance

Concurrency capability: 300+

Average activating time: 51s

Service Capability

Number of services supported: 10

Number of arrangement supported: 50+

Virtualization Capability

Registered atomic: 100+

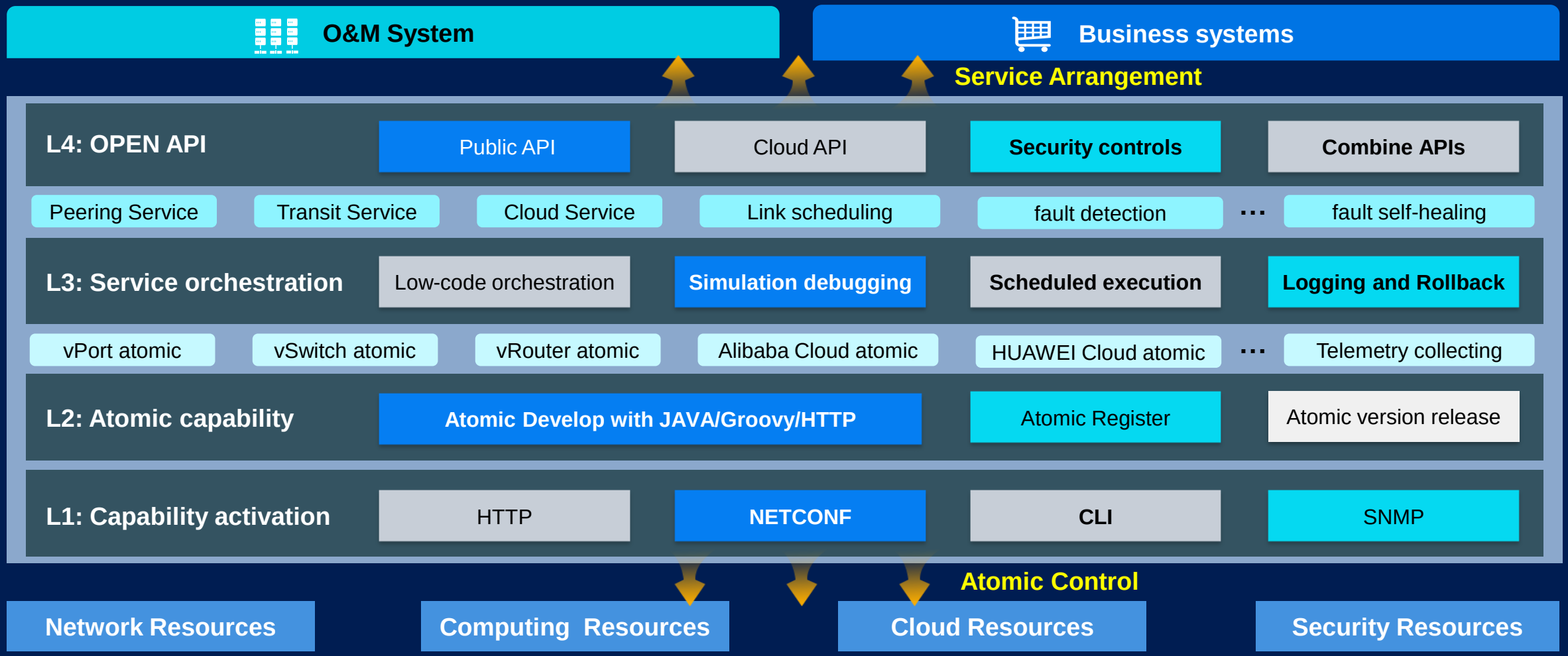
Management Compatibility

Supported device model: 9

Integrated public cloud API: 3

SDX system architecture

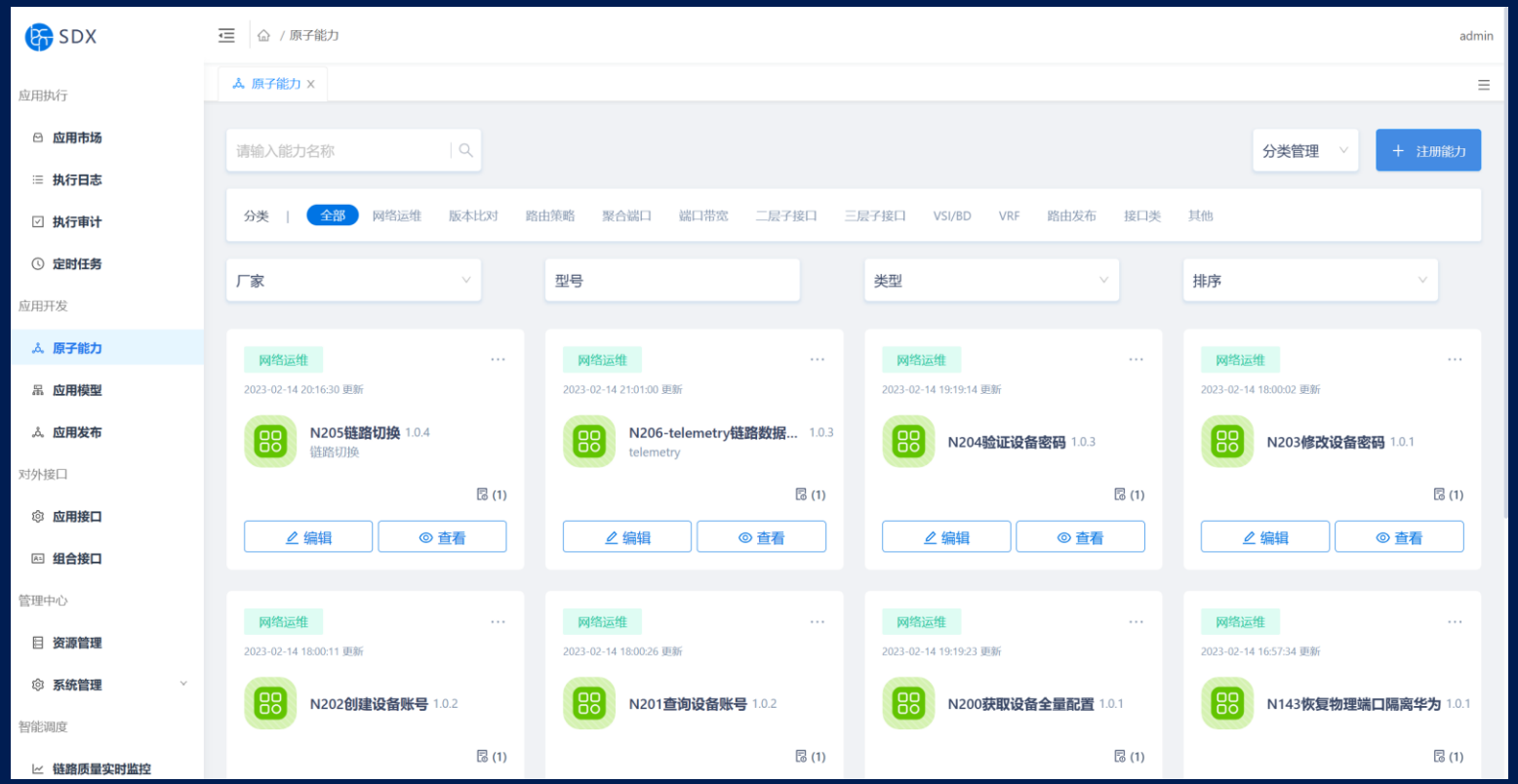
SDX system architecture includes 4 layers, following principles such as diversified managed devices, complete compatible functions, rich capability registration, flexible application orchestration and complete service coverage, implement Atomic Control and Service Arrangement.



SDX atomic control

Atomic Control feature is implemented based on Capability activation layer and atomic capability layer.

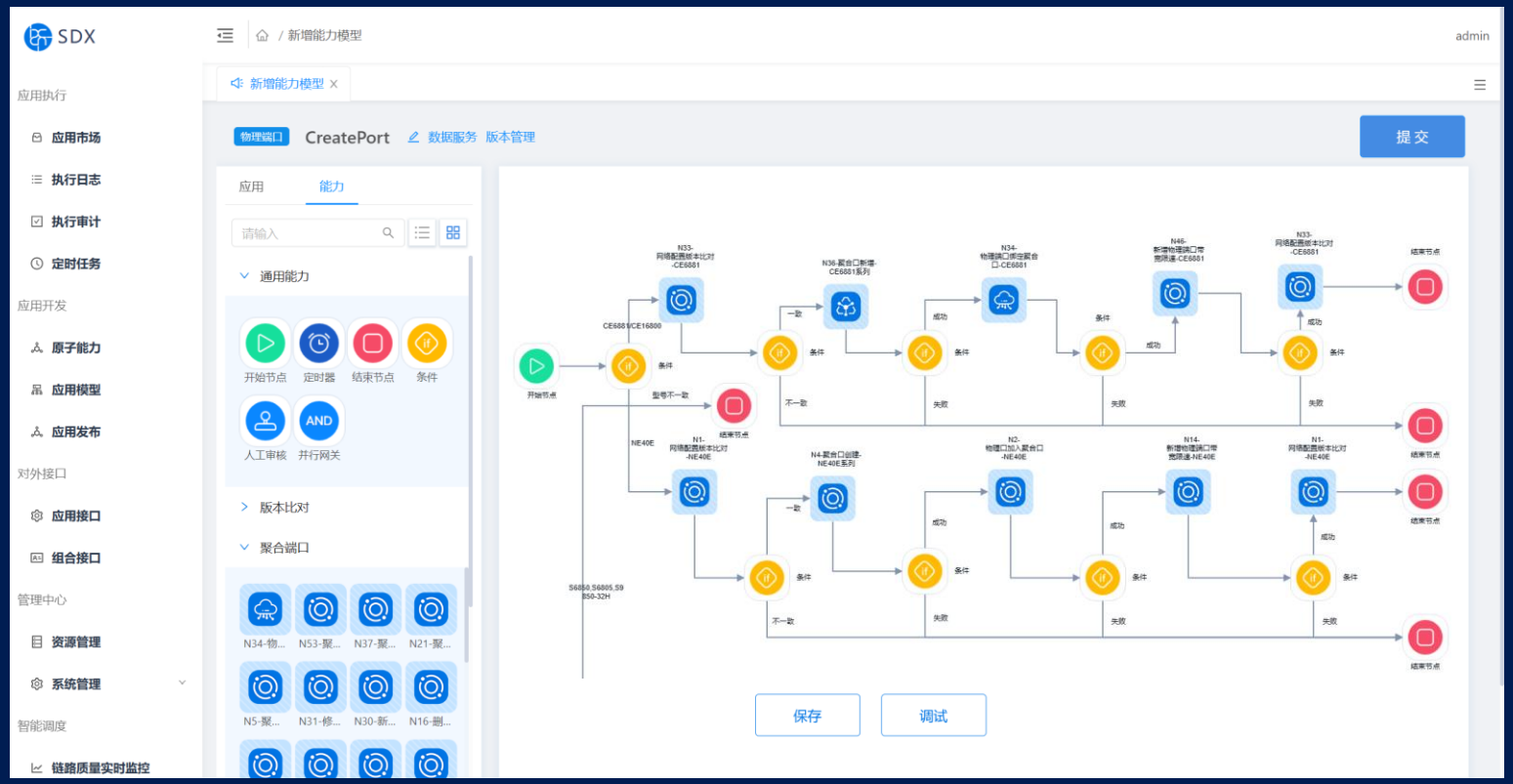
- Capability activation layer intelligently adapts network, computing, cloud and security resources. At present, the equipment adaptation of Huawei, H3C and other manufacturers has been completed.
- Atomic capability layer abstracts resources into services that can be invoked by software based on Netconf/CLI/SNMP protocols. At present, it completed the creation, deletion, configuration atomics for vPort, vSwitch, vRouter and third-party resources such as Alibaba and HUAWEI Cloud.



SDX service arrangement

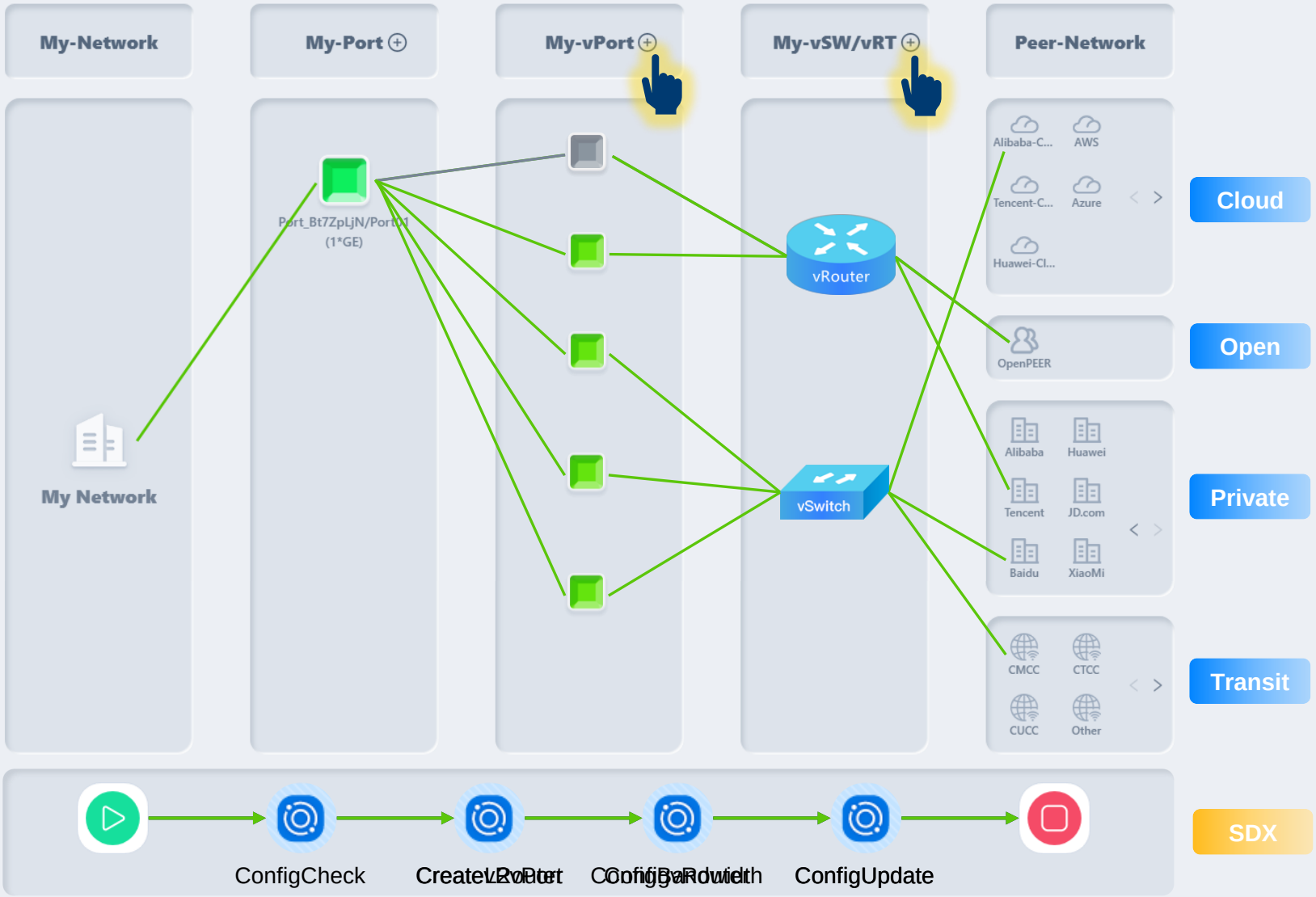
Service Arrangement feature is implemented based on Service orchestration layer and OPEN API layer.

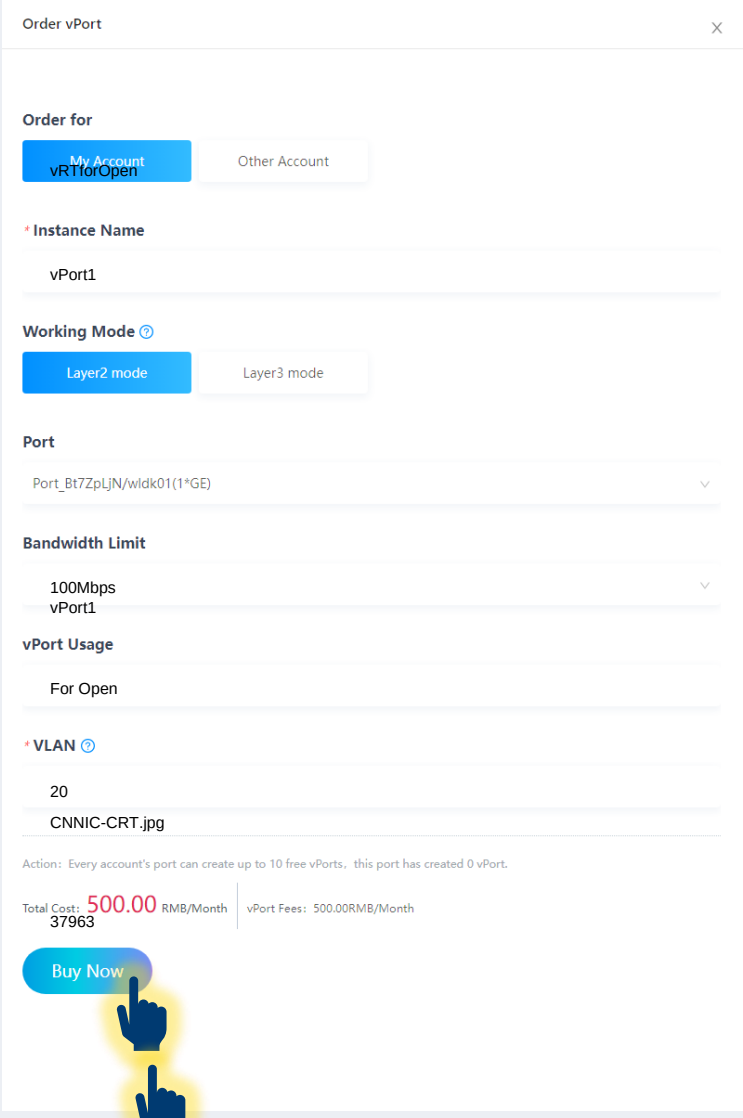
- Service orchestration layer performs low-code programming capabilities, enabling rapid roll-out and O&M of diversified services. At present, it can complete create, upgrade, downgrade, renewal and unsubscribe typically services of IX, and supports O&M inspection, custom fault detection, and fault self-healing.
- OPEN API layer provides interfaces upward. The security of API ensured through mechanisms such as API version, permission, authentication, information encryption, and lifecycle monitoring.



SDX powers virtualization system

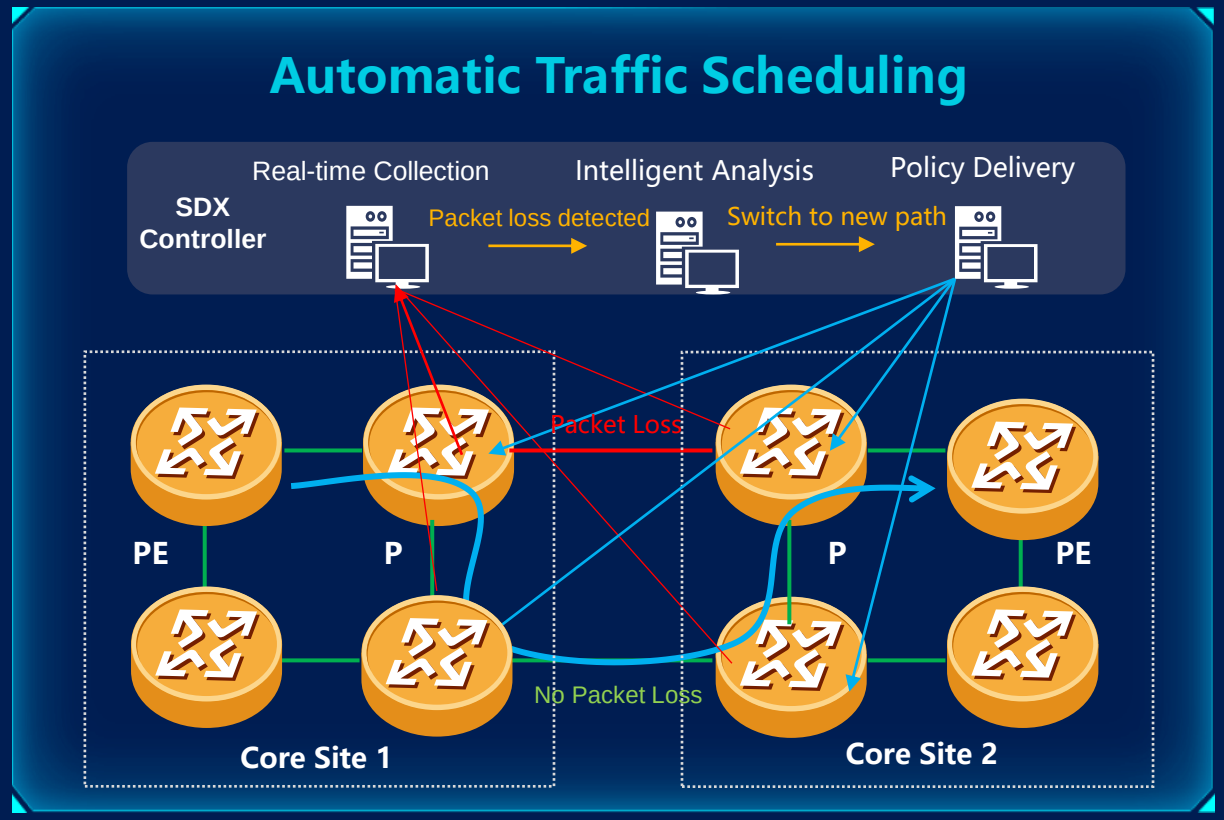
Based on SDX and virtualization system, automatic service were realized， customers can complete orders and activation autonomously.

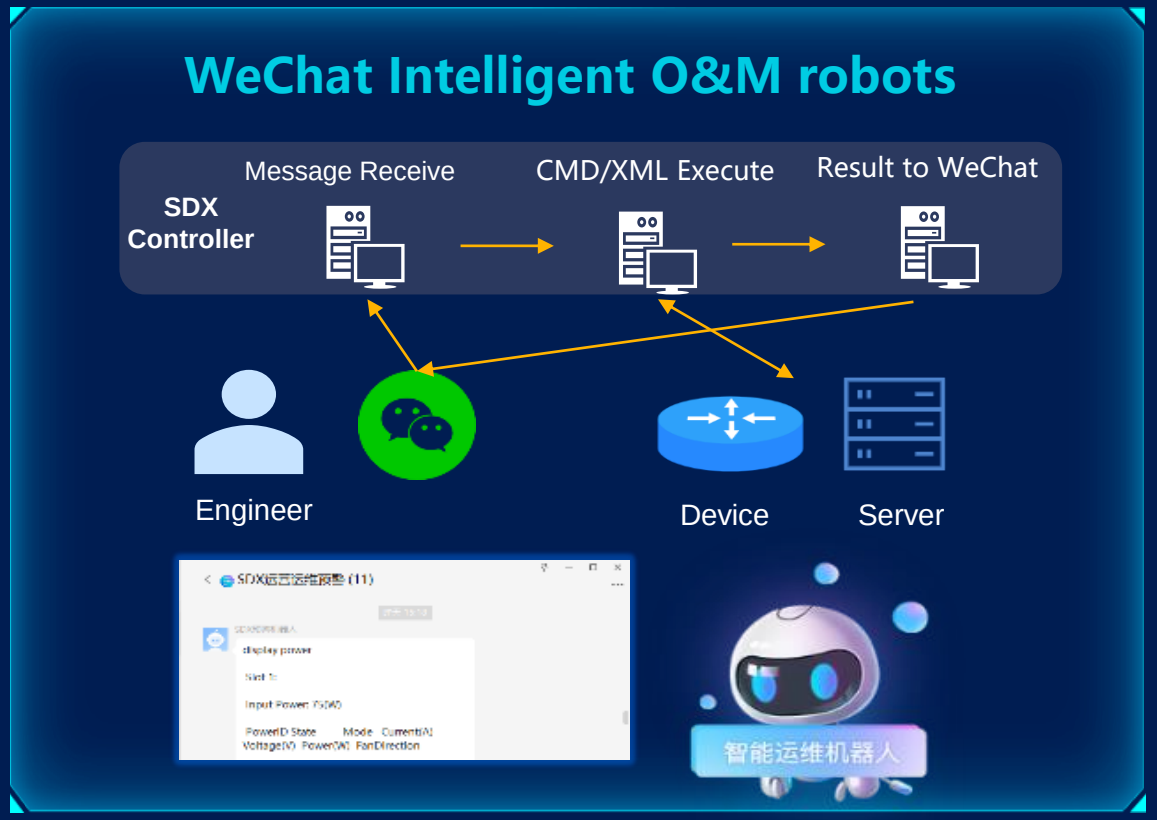




SDX powers automatic traffic scheduling

Based on SDX, automatic traffic scheduling is also realized. it can help us quickly complete the launch of network, solving complex network O&M problems.





Need your guidance

Tier1 carriers connect to each other directly or through IXP? Are there any cases where Tier1 carriers peering and exchange traffic through APIX members? What is the typical traffic composition of an IXP?

What is the cooperation mode between IXPs, including division of labor and the settlement mode, etc? For instance, Chinese IXPs are widely distributed around the country. Who will invest in transmission resources, which cost a lot?

How to stimulate IXP's traffic? In China, personal users and commercial users are mostly located in the Tier1's network, using Tier1′ s IP address to access the Internet. There are very few independent companies using their own AS and IP adresses. IXP's traffic is limited to the traffic between Tier2/3 and ICP/CDN.

Welcome to HangZhou