SDN implementation plan in China Science and Technology Network

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2018.5

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Our Task

- user cables to connect over 200 research institutes in China together, such as IHEP and etc.,

- Provide Reliable Network Service to Scientists in many field to help them exchange science data

Before: We are CSTNet
China Science & Technology Network (CSTNET)

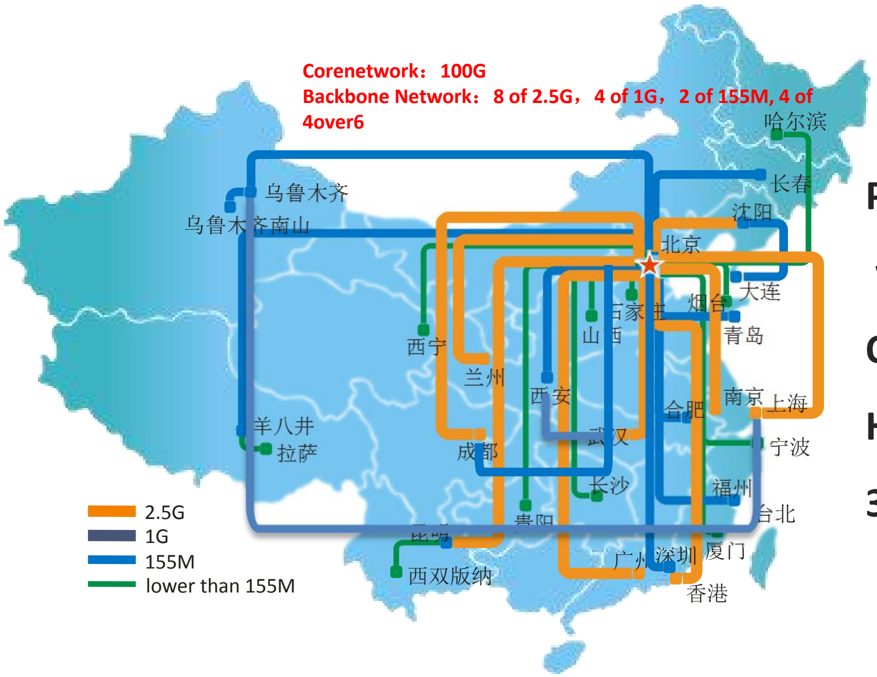
12 Branches across China, most branches 2.5G-15G to Beijing Backbone

Bandwidth of North American node 10G

Beijing Backbone 10G

300 connected institutions, approx. 1 million end users

Domestic Bandwidth 109.5G


Corenetwork：100G
Backbone Network：8 of 2.5G，4 of 1G，2 of 155M, 4 of 4over6
哈尔滨
长春
乌鲁木齐
乌鲁木齐南山
沈阳
北京
大连
石家庄
烟台
山西
青岛
西宁
兰州
西安
南京
上海
合肥
羊八井
拉萨
武汉
宁波
成都
长沙
福州
2.5G
1G
155M
lower than 155M
贵阳
台北
昆明
厦门
广州
深圳
西双版纳
香港

IPv4/IPv6 connections

International Bandwidth 52G

PacificWave and Starlight with U.S.: 10G

OrientPuls with Europe: 10G

Hongkong Exchange Point: 32G

GLORIAD
PROJECTED
2011

COPENHAGEN
BEIJING

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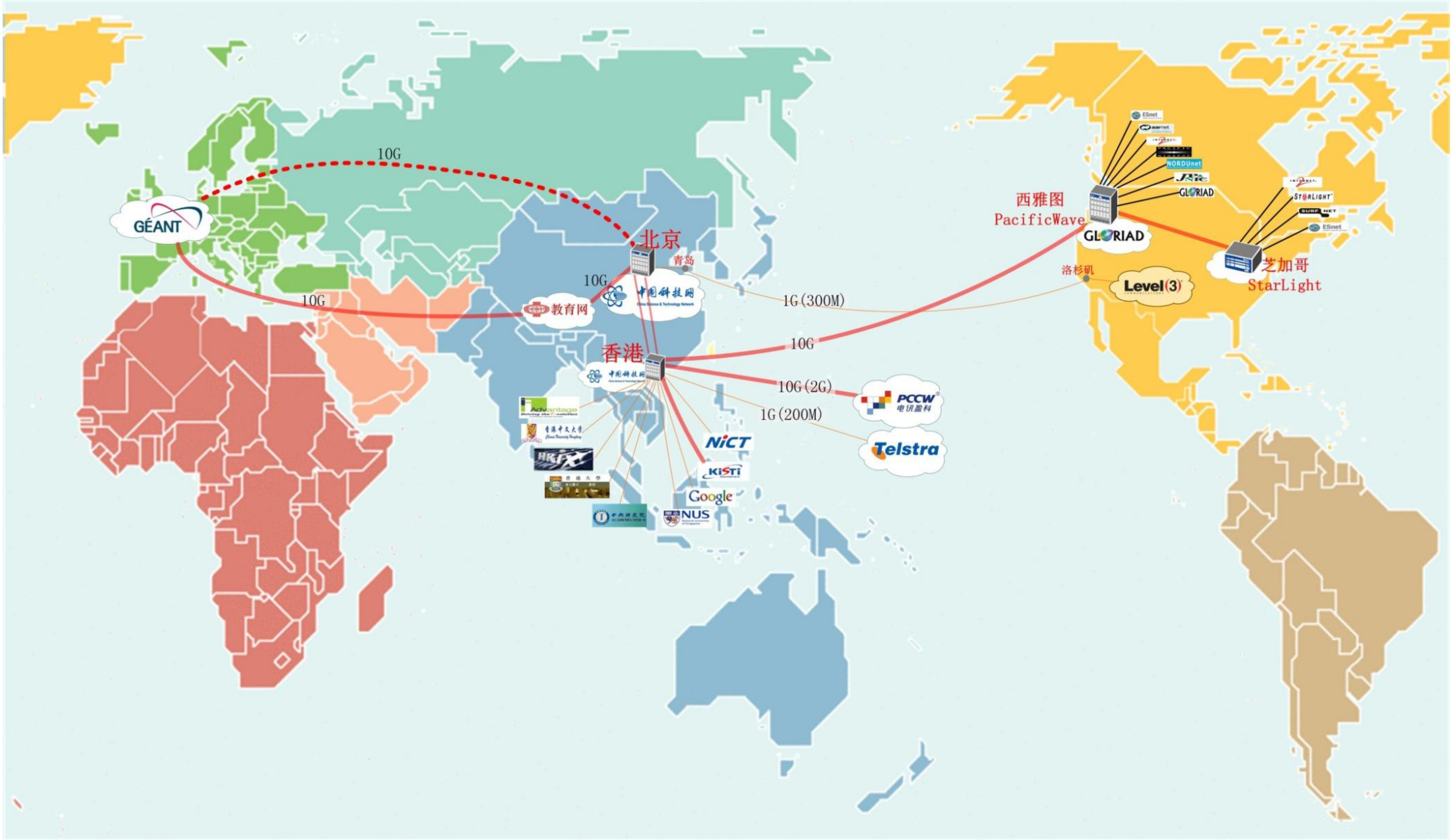
Before: We are CSTNet
China Science & Technology Network (CSTNET)


10G
GÉANT
北京
青岛
10G
10G
教育网
中国科技网
1G (300M)
香港
中国科技网
10G
10G (2G)
1G (200M)
PCCW
电讯盈科
Telstra
NiCT
KISTI
Google
NUS
西雅图
PacificWave
GLORIAD
洛杉矶
Level(3)
芝加哥
StarLight
ESnet
NORDUnet
SURFnet

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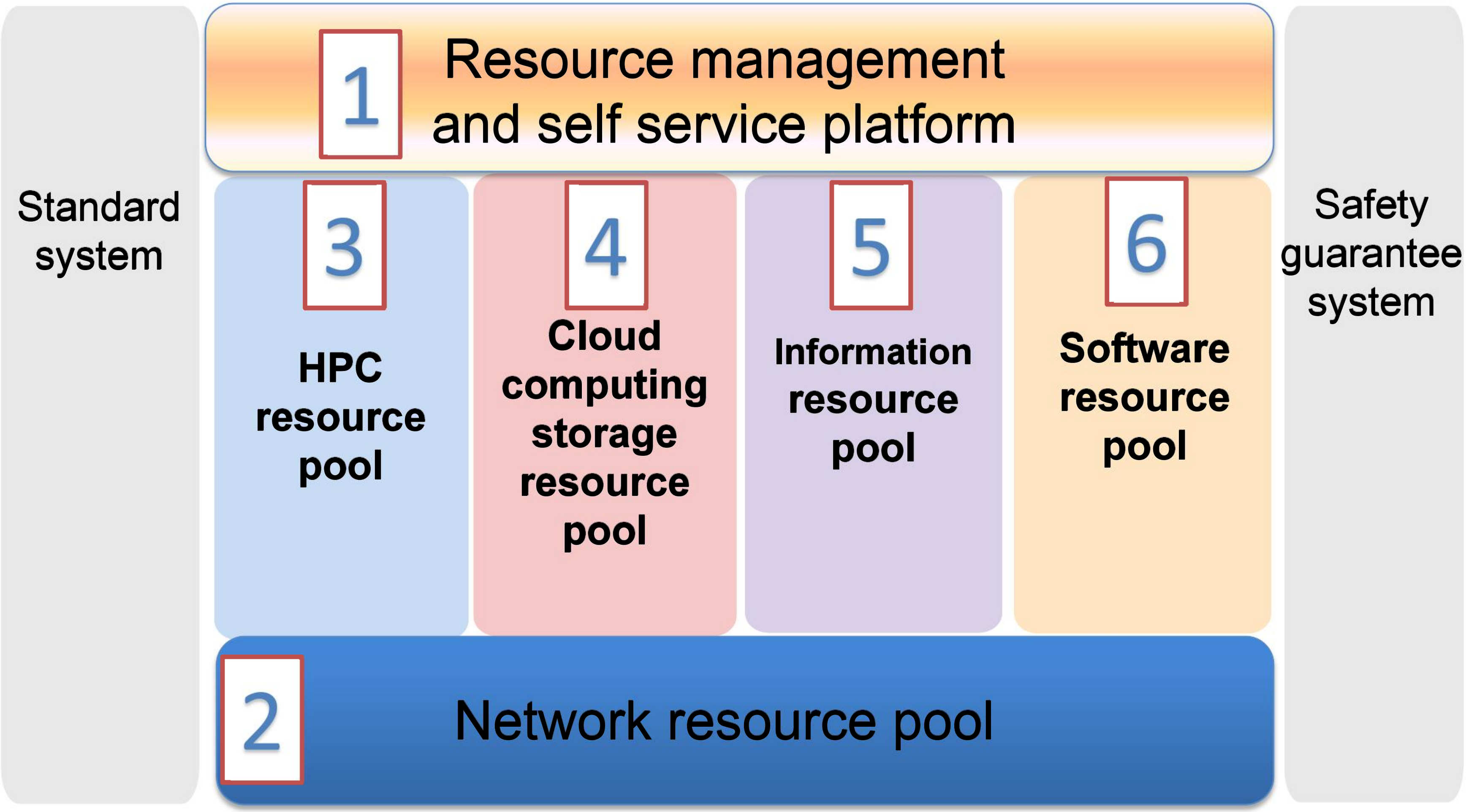
From CSTNet to CSTCloud



Standard system

1 Resource management and self service platform

3 **HPC resource pool**

4 **Cloud computing storage resource pool**

5 **Information resource pool**

6 **Software resource pool**

2 Network resource pool

Safety guarantee system

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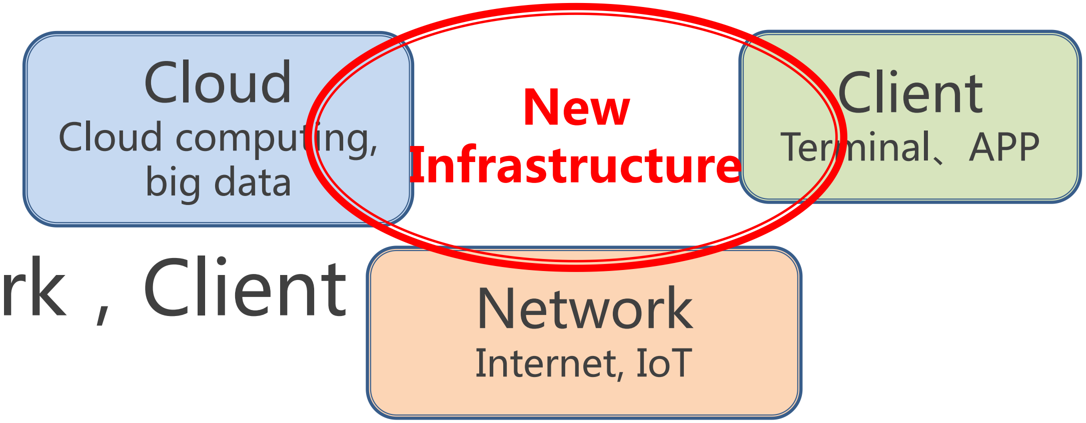
New infrastructure

- 3 factors
  - Cloud，Network，Client



Cloud
Cloud computing, big data

New Infrastructure

Client
Terminal、APP

Network
Internet, IoT

- Features
  - Integration, unified operation, whole life cycle （Devops）
  - Dynamic scheduling
  - Flexible, on-demand
  - Intelligent

Service evolving

- Before: only a network provider

- Future: flexible network user can control directly

How To evolve?

- How to Transform CSTNet into CSTCloud ?

Implement SDN Technology to make network more flexible to schedule resource service.

How To Implement SDN?

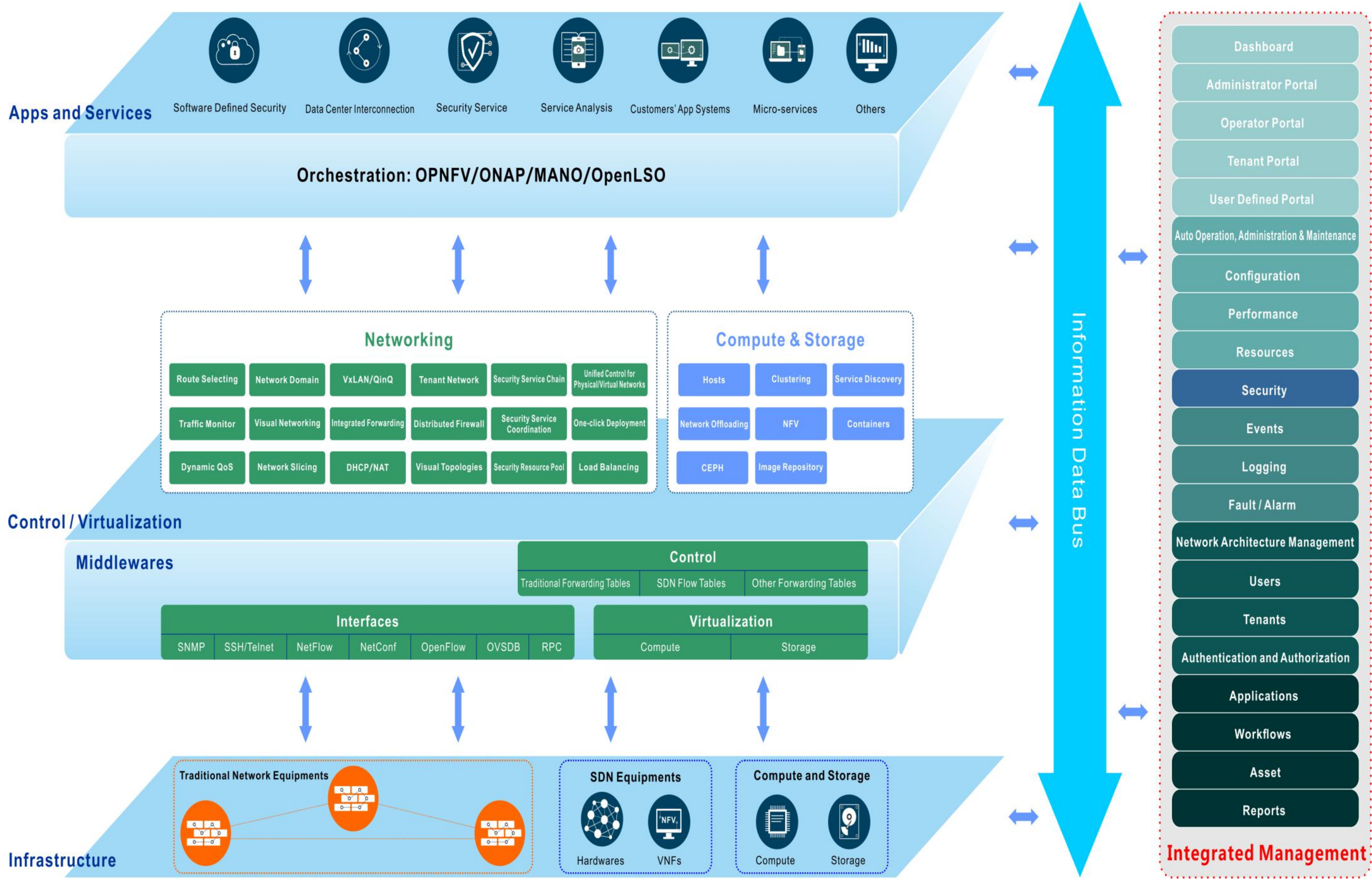
- Not only DCI.
- Not only Openflow.
- Not only VxLan …………
- It is a complex system rebuild a wide area network notonly a datacenter network

How To Implement SDN?

- It is a Intergrated Operation System

- Provide institute service to schedula their data transportation across a long distance and operation their service flexible.

2 Network Resource Pool Network Operation & Management System



Apps and Services

Software Defined Security
Data Center Interconnection
Security Service
Service Analysis
Customers' App Systems
Micro-services
Others

Orchestration: OPNFV/ONAP/MANO/OpenLSO

Control / Virtualization

Networking

Route Selecting
Network Domain
VxLAN/QinQ
Tenant Network
Security Service Chain
Unified Control for Physical/Virtual Networks
Traffic Monitor
Visual Networking
Integrated Forwarding
Distributed Firewall
Security Service Coordination
One-click Deployment
Dynamic QoS
Network Slicing
DHCP/NAT
Visual Topologies
Security Resource Pool
Load Balancing

Compute & Storage

Hosts
Clustering
Service Discovery
Network Offloading
NFV
Containers
CEPH
Image Repository

Middlewares

Control

Traditional Forwarding Tables
SDN Flow Tables
Other Forwarding Tables

Interfaces

SNMP
SSH/Telnet
NetFlow
NetConf
OpenFlow
OVSDB
RPC

Virtualization

Compute
Storage

Infrastructure

Traditional Network Equipments

SDN Equipments

Hardwares
VNFs

Compute and Storage

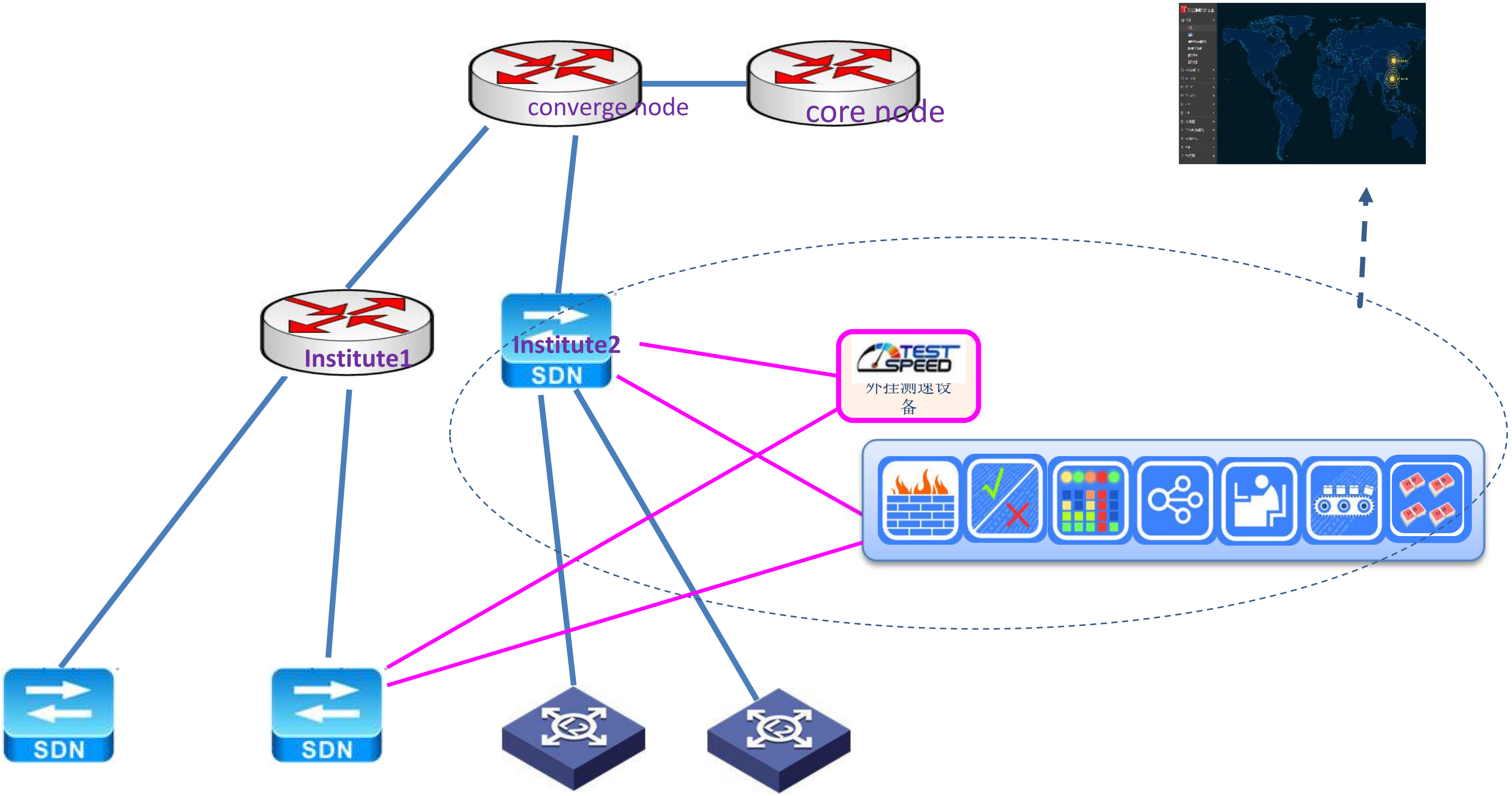
Compute
Storage

Information Data Bus

Dashboard
Administrator Portal
Operator Portal
Tenant Portal
User Defined Portal
Auto Operation, Administration & Maintenance
Configuration
Performance
Resources
Security
Events
Logging
Fault / Alarm
Network Architecture Management
Users
Tenants
Authentication and Authorization
Applications
Workflows
Asset
Reports

Integrated Management

Implementation: Topology


converge node
core node
Institute1
Institute2
SDN
TEST SPEED
外挂测速设备
SDN
SDN

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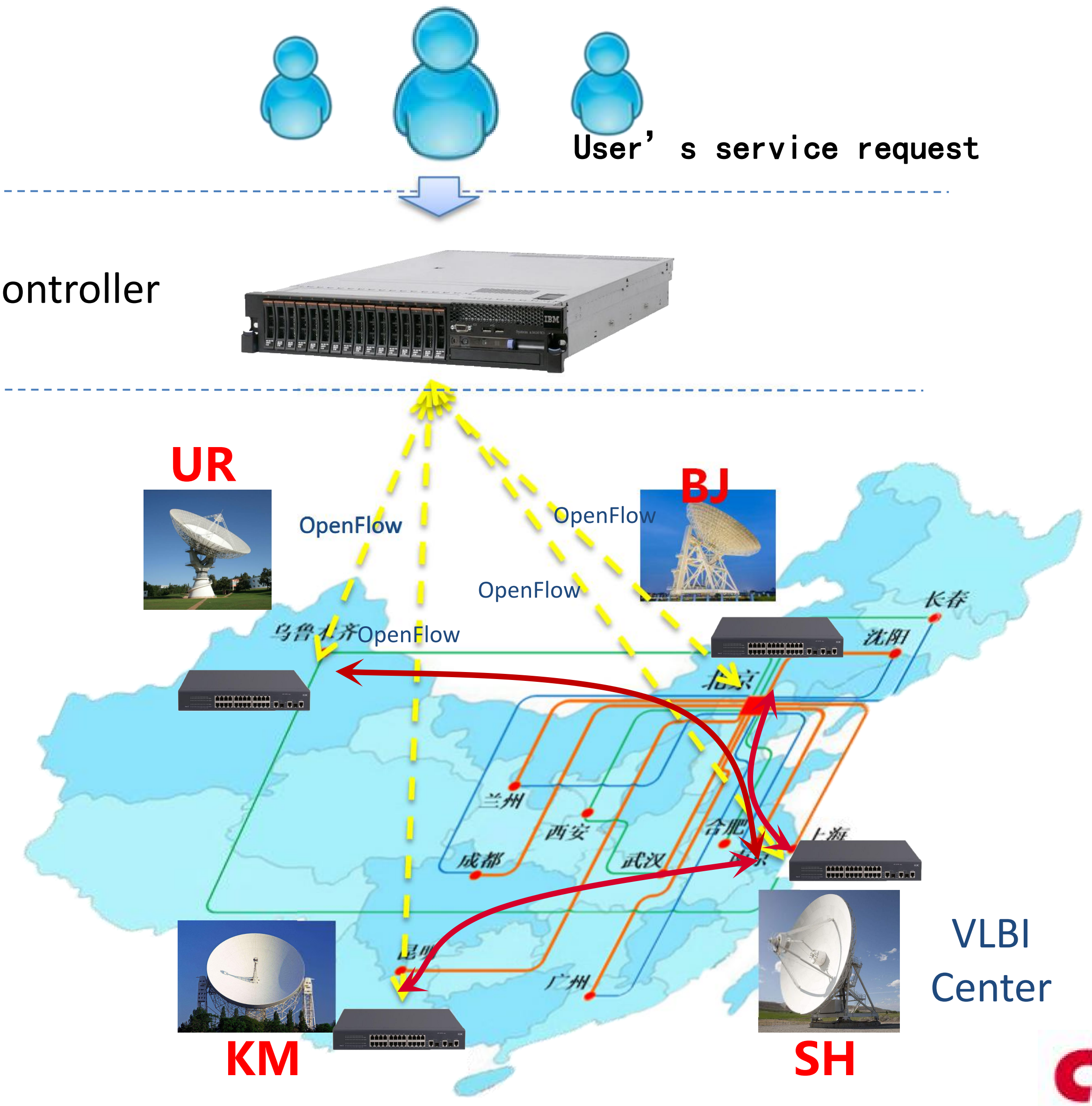
Dynamic Scheduling of Network Resources



User’ s service request

Controller

OpenFlow

OpenFlow

OpenFlow

OpenFlow

UR

BJ

KM

SH

VLBI Center

乌鲁木齐
北京
长春
沈阳
兰州
西安
成都
武汉
合肥
南京
上海
昆明
广州

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Features

- Support Openflow 1.3
- Support tranditional IP protocol
- Can divide network into slices to seperate IP flow and SDN testbed flow
- Testbed support ODL, ONOS

Milestone

- IP flow/openflow monitor and analysis system
- White Box Switch Customized for our equipement
- Shanghai\ Kunming branch implemented

Other related work

Support IHEP to conncect with LHCONE

- BGP with LHCONE established.
- IPv4 and IPv6 available
- provide two pairs of fibercables to connect IHEP, and the network flow can go through CSTNet into LHCONE

Conclusion

- Implement SDN not for SDN industry
- SDN is not only openflow, but a system
- “S” is the key to let user requirements drive the system
- “D” is the transformation of service model from static to dynamic
- “N” is not only in datacenter

Thanks

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