5G network management software system evaluation service

China Academy of Information and Communications Technology

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1. CAICT

- As a scientific research institution directly under the Ministry of Industry and Information Technology, China Institute of Information and Communication Research has played an important role in the development of China's information and communications industry in terms of strategy, planning, policy, standard, test and certification.
- Tyr Systems Laboratory has an authoritative professional third-party testing organization with laboratory certification (CNAS) and qualification certificate (CMA).
- The laboratory has rich practical experience, first-class expert technical team and professional testing tools in the field of business platform software testing, 5G network technology and test verification.

As a member of IMT-2020 5G expert group, CAICT has actively promoted 5G standardization and test verification, has formulated more than ten 5G related technical standards and test specifications, and has actively participated in the 5G test of operators.

2. Services

Evaluation Service of Business and Network Management Software system

1. Network management system

2.slides
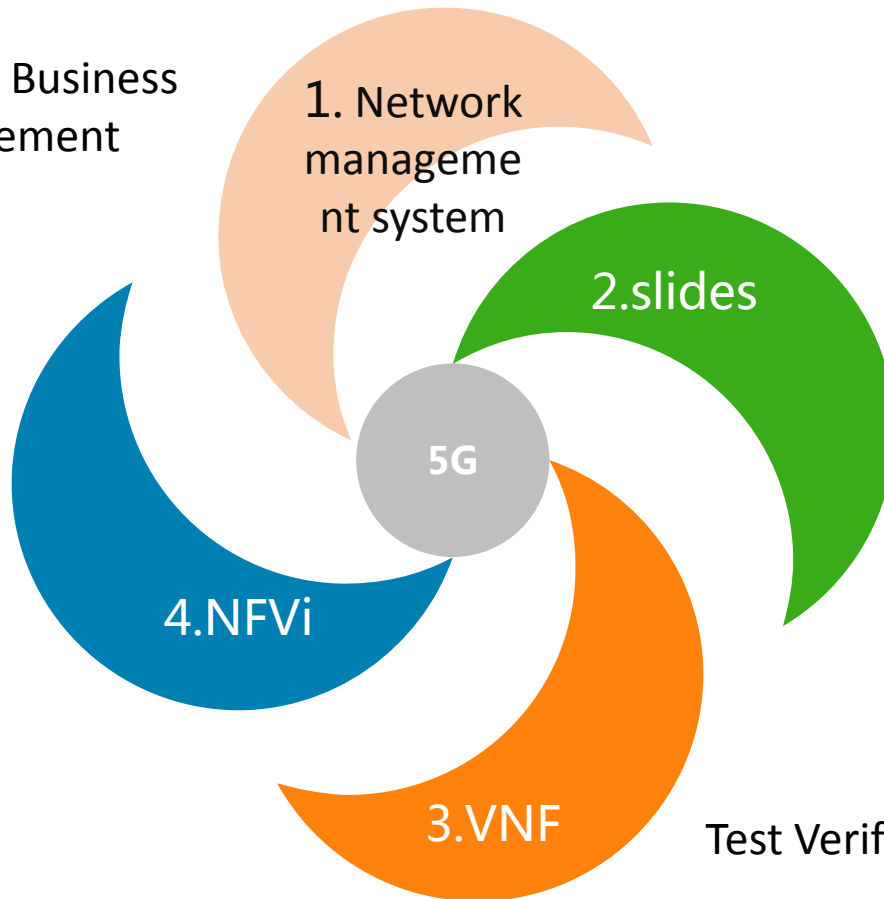
Service quality Evaluation Service based on 5G slicing

Test Verification Service for NFVi

4.NFVi

5G

3.VNF

Test Verification Service for VNF

（1）Evaluation Service of Business and Network Management Software system

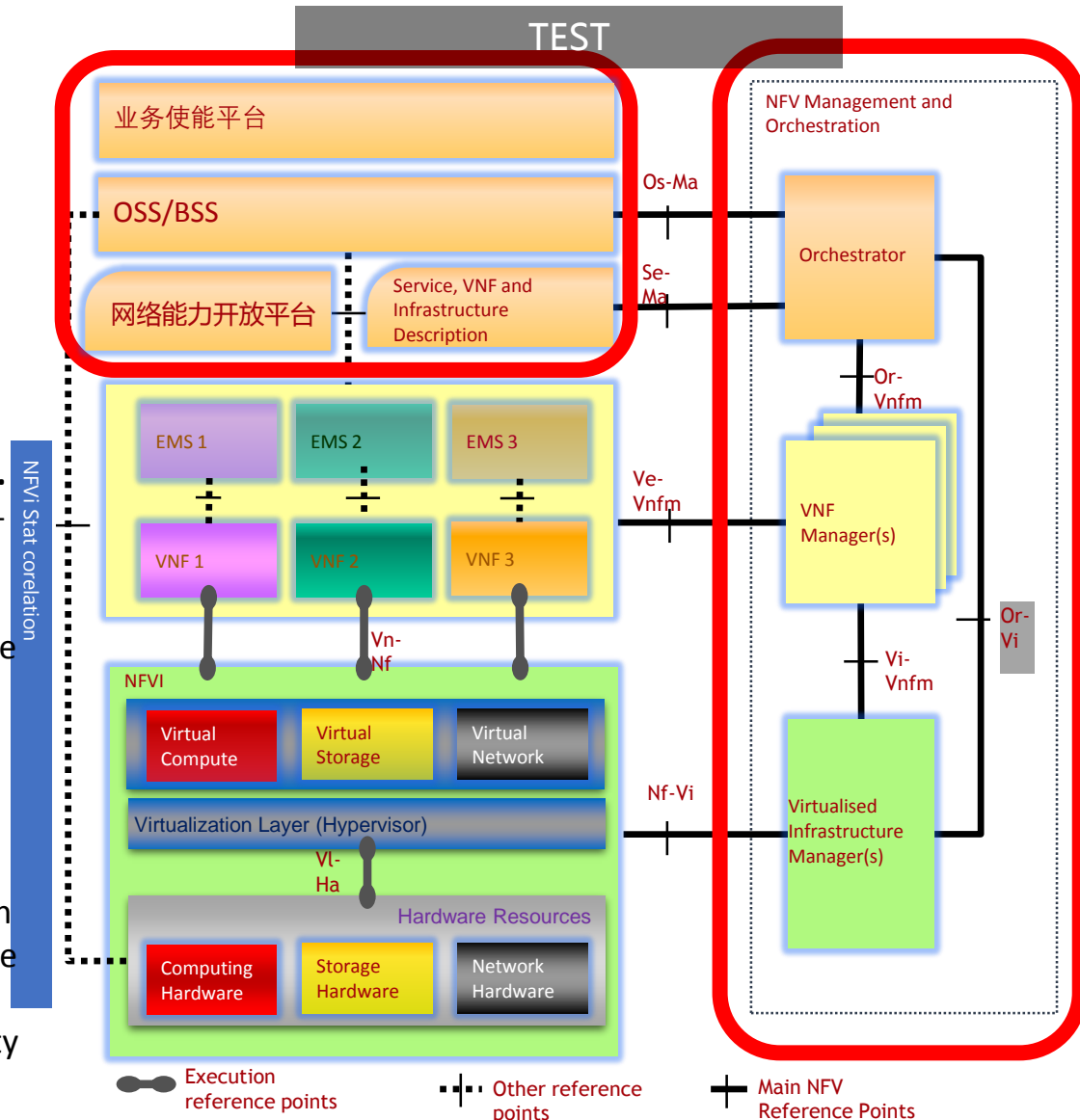## Problem

Complexity of Network Management.
MANO is a new virtualization management and orchestration function introduced by 5G. New modules such as network capability open platform increase the complexity of network management.

Compatibility of interaction between modules.
The three-layer decoupling of cross-layer, cross-domain and cross-vendor increases the compatibility of the interaction between different modules, and it is difficult to guarantee the overall performance and reliability of the network.

Diversification of Business slicing.
The three categories of 5G services, as well as network slicing and other technologies, result in the diversification of the functions of the service enabling platform, and also put forward higher requirements for the performance and reliability of the service enabling platform.

TEST

业务使能平台

OSS/BSS

网络能力开放平台 | Service, VNF and Infrastructure Description

Os-Ma

Se-Ma

NFVI Stat corelation

EMS 1 | EMS 2 | EMS 3

VNF 1 | VNF 2 | VNF 3

Ve-Vnfm

Vn-Nf

NFVI

Virtual Compute | Virtual Storage | Virtual Network

Virtualization Layer (Hypervisor)

Vl-Ha

Hardware Resources

Computing Hardware | Storage Hardware | Network Hardware

Nf-Vi

NFV Management and Orchestration

Orchestrator

Or-Vnfm

VNF Manager(s)

Or-Vi

Vi-Vnfm

Virtualised Infrastructure Manager(s)

Execution reference points

Other reference points

Main NFV Reference Points

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（1） Evaluation Service of Business and Network Management Software system

- Using professional testing tools, the automatic test script is written to simulate the real business scene, and the function and interface of the network management system are automatically tested and the performance is tested.
  Through the test, the functional compliance, protocol consistency, business success rate, response time, throughput and other indicators are obtained, and the multi-dimensional test report is generated.
  This scheme can not only effectively verify whether the service and network management software system meet the requirements, but also effectively improve the efficiency of iterative testing of China Telecom business and network management software version upgrade.
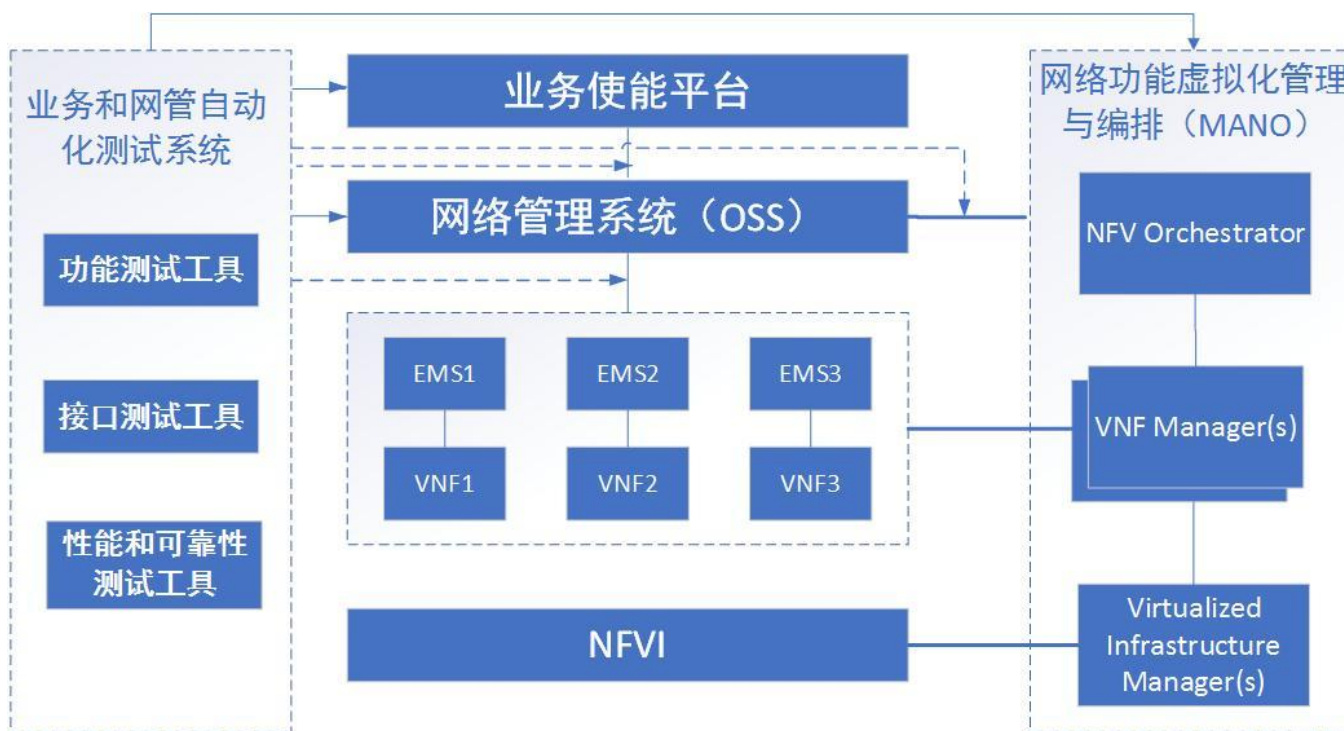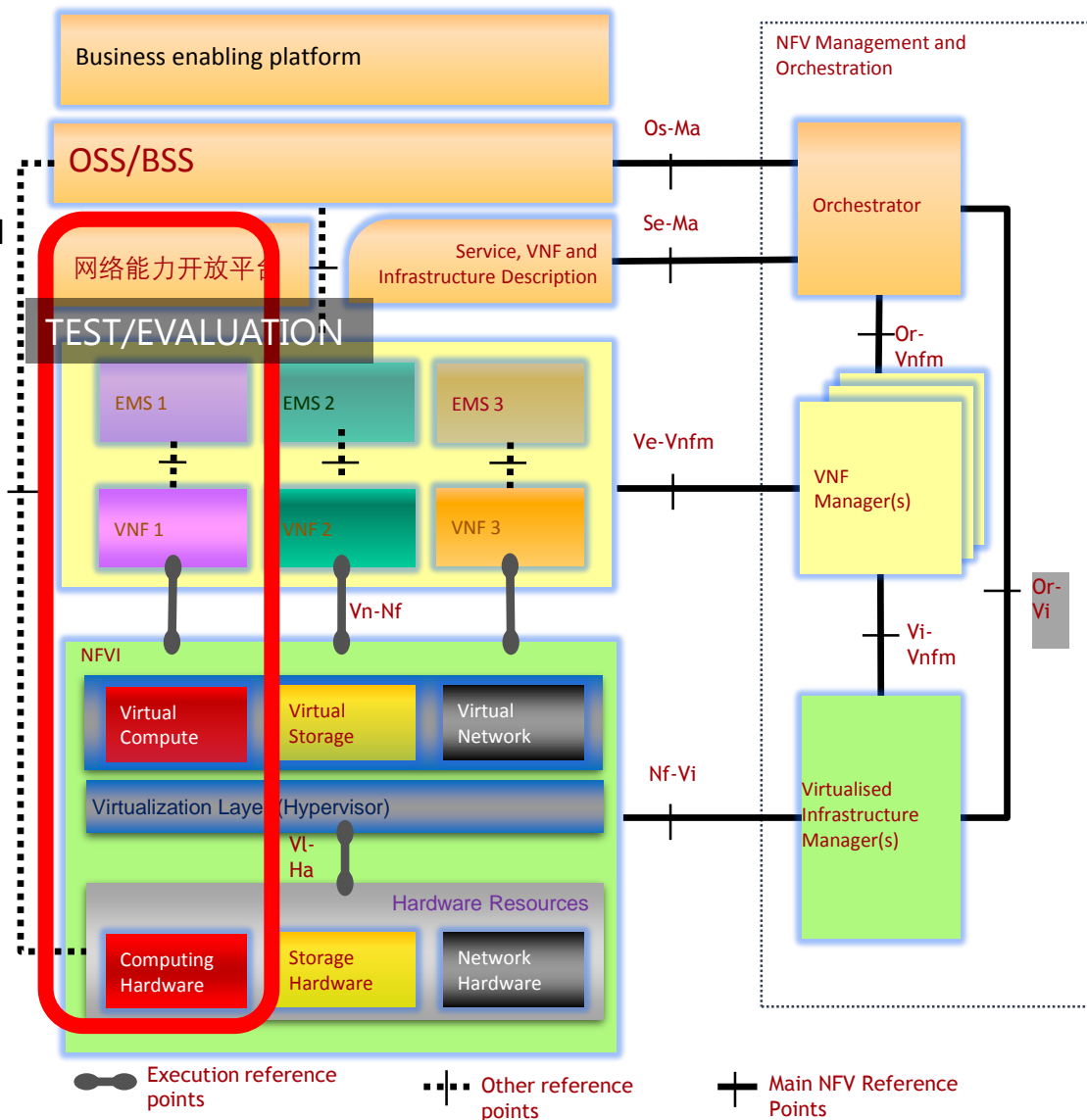
Problem

Network slicing covers a wide range of areas.
Network slicing spans access, transmission and core networks, and vertically involves NFVi, VNF and network management systems. Complex implementation mechanisms make slicing service quality assurance difficult.

Verification of different slice SLA.
In order to meet the user experience in different business scenarios, proprietary business slices are customized according to different SLA indicators, such as speed, delay, packet loss, disorder and so on. How to ensure that the SLA index of different service slices meets the requirements of slice design is a practical problem for operators in the future.

Business enabling platform

OSS/BSS

网络能力开放平台

TEST/EVALUATION

EMS 1　EMS 2　EMS 3

VNF 1　VNF 2　VNF 3

NFVI

Virtual Compute　Virtual Storage　Virtual Network

Virtualization Layer (Hypervisor)

Vl-Ha

Hardware Resources

Computing Hardware　Storage Hardware　Network Hardware

Vn-Nf

NFV Management and Orchestration

Os-Ma

Orchestrator

Se-Ma

Service, VNF and Infrastructure Description

Or-Vnfm

Ve-Vnfm

VNF Manager(s)

Or-Vi

Vi-Vnfm

Nf-Vi

Virtualised Infrastructure Manager(s)

● Execution reference points
┈┆┈ Other reference points
┼ Main NFV Reference Points

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（2） Service quality Evaluation Service based on 5G slicing

- The test instrument can simulate the terminal, wireless (optional) and service server, simulate a large number of users of different types of services to access the network through 5G signaling interaction, and generate service traffic.
  After the test, the key indexes such as service access success rate, service access time, service transmission rate, service throughput, service delay, DNS success rate, packet retransmission rate, packet disorder rate and so on are collected.
  Verify that the quality of business meets the SLA requirements in different slicing scenarios.
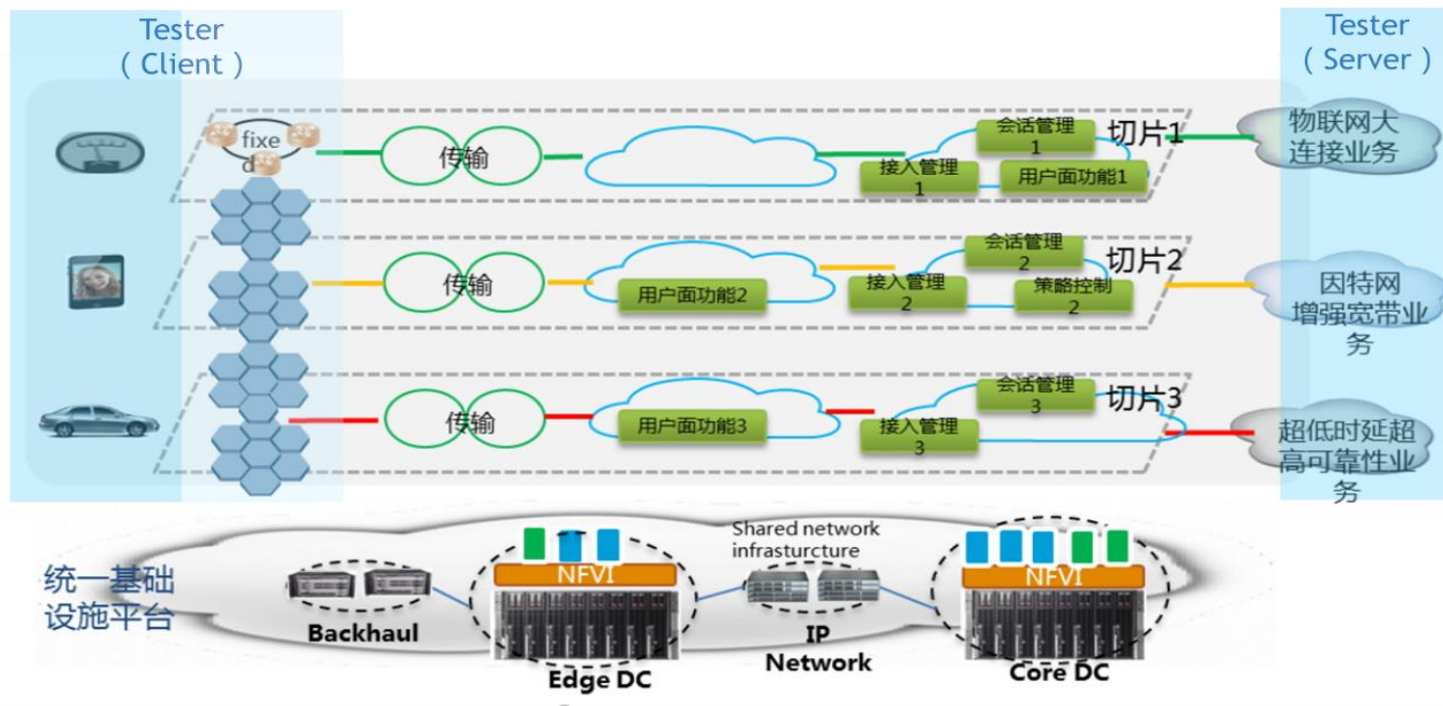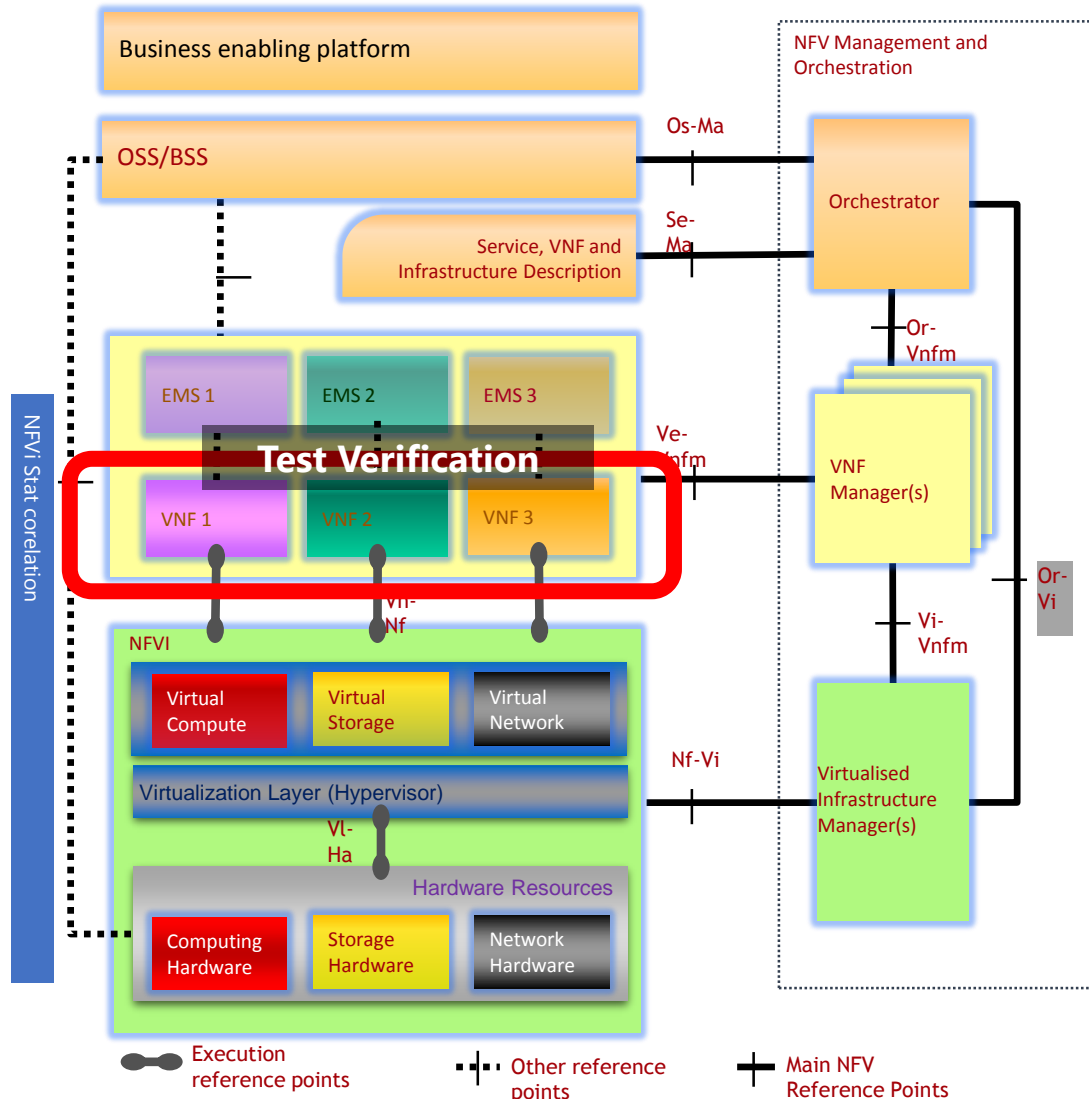
（3）Test Verification Service for VNF

problem

Complexity of network function.

The 5G core network adopts the service-based architecture (SBA), network function to refine into each VNF, and provide services through the external interface. There are more than ten types of VNF in 5G core network, coupled with the interconnection requirements of different manufacturers, which puts forward higher requirements for protocol consistency and reliability of VNF.
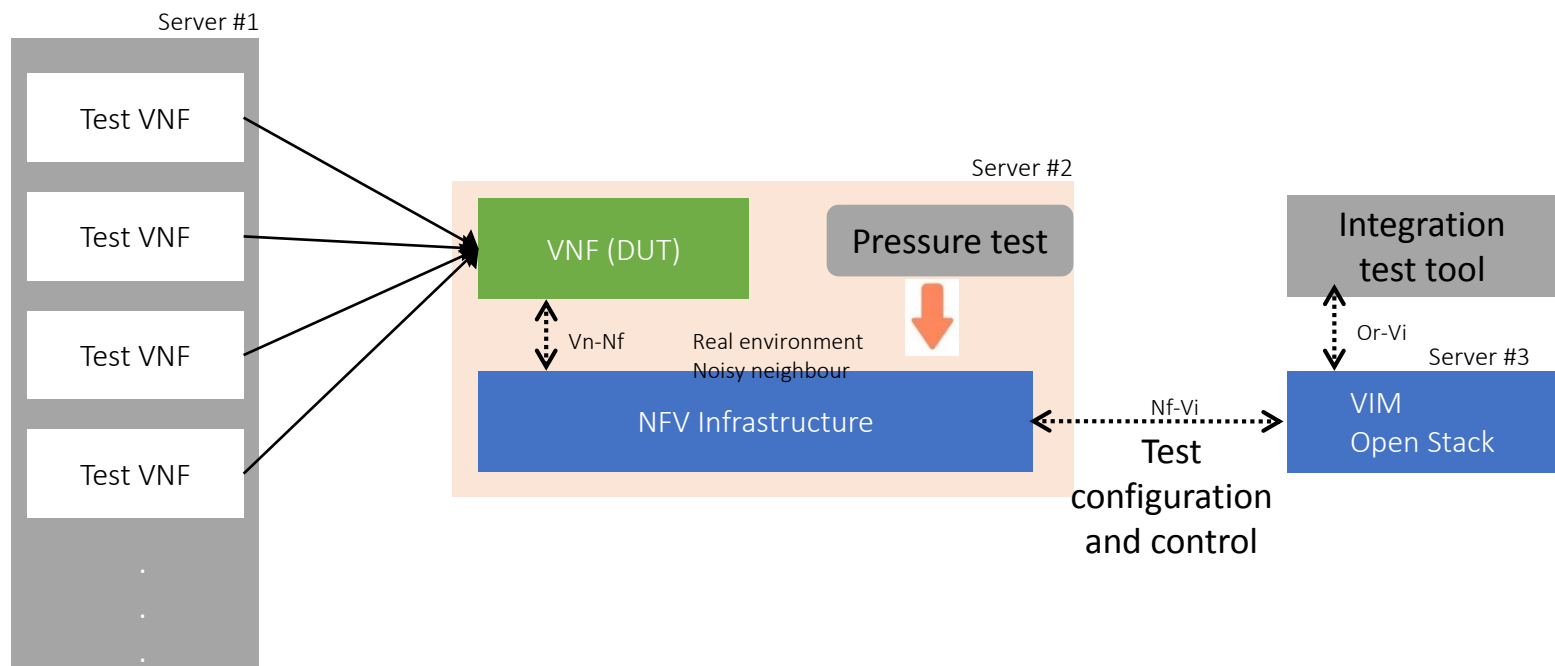
VNF performance.

Different control plane VNF requires a lot of message interaction, in the actual deployment, each VNF has its own performance constraints, and may have to compete for the same NFVi layer resources. User-side VNF to deal with a large number of user data, performance requirements are more important

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（3） Test Verification Service for VNF

- The testing tool can simulate and verify the function and performance of the tested VNF by simulating other VNF, that interact with the tested VNF. At the same time, the test can exert pressure on the underlying NFVi, such as computing, storage and network, to verify the function and reliability of the tested VNF in the hardware resource competition environment.
Through the test, the success rate, throughput and response time are obtained to verify the performance of the tested VNF.
You can also integrate test tools with VIM Openstack for scripting, test configuration, and test control.

Server #1

| Test VNF |
| Test VNF |
| Test VNF |
| Test VNF |
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.
.

Server #2

VNF (DUT)   Pressure test

Vn-Nf   Real environment
Noisy neighbour

NFV Infrastructure   Nf-Vi

Integration test tool   Or-Vi   Server #3

VIM Open Stack

Test configuration and control

（4）Test Verification Service for NFVi

problem

Hardware IT.

The network hardware has changed from a special device to a general-purpose IT device, some of which are still cloud platforms. The performance and reliability of IT devices pose a great challenge to the communication network.

Nic acceleration.

User-side devices need to forward and process a large amount of user data at a high speed. Can acceleration technologies such as DPDK and SR-IOV meet the demand?

Compatibility between hardware and virtual layer.

Hardware IT devices and virtualization layers may come from multiple different vendors and their compatibility needs to be verified
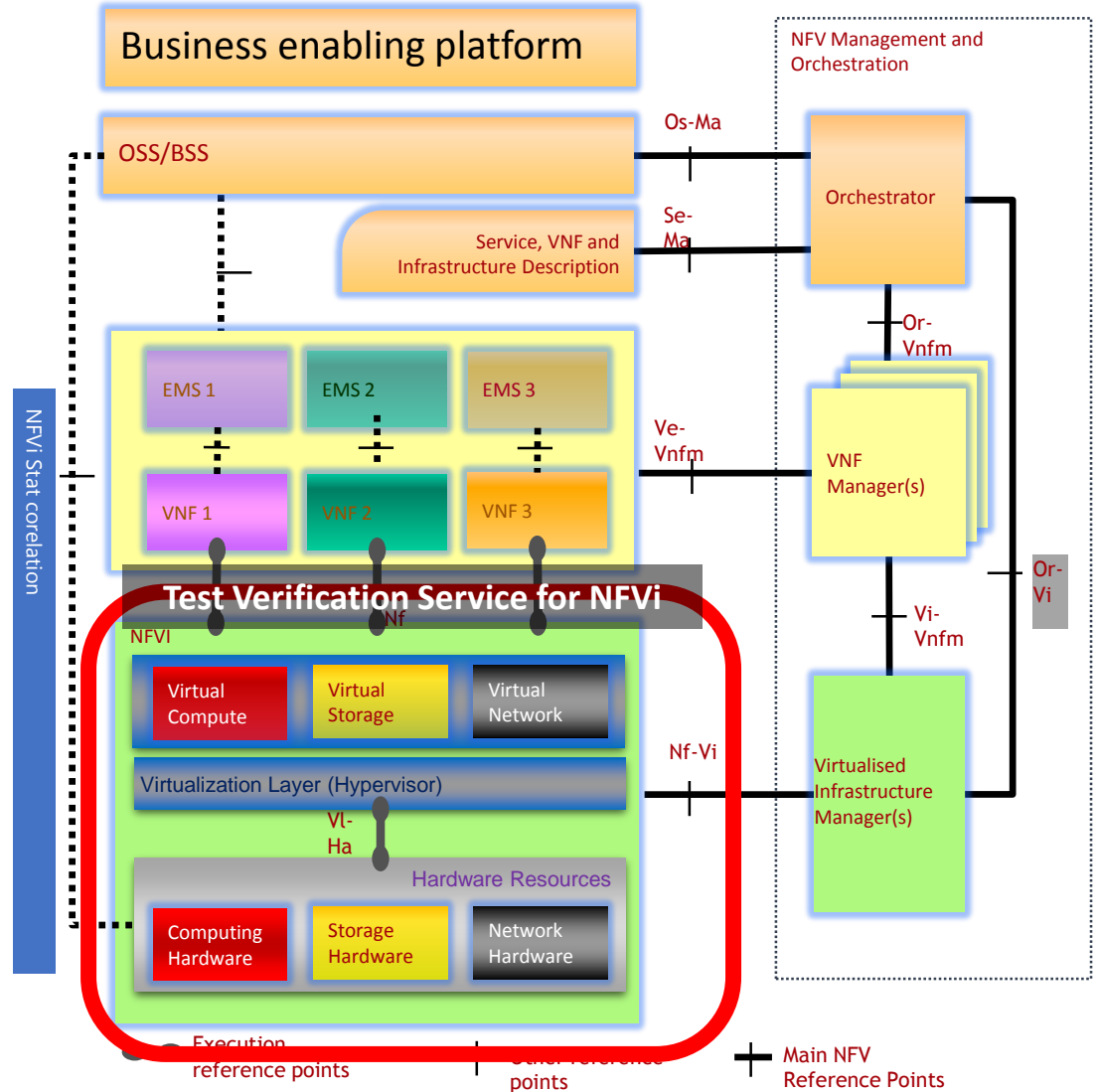
（4） Test Verification Service for NFVi

- Use authoritative stress testing tools to test the computing, storage, and network performance of IT hardware / or cloud platforms;
  Network performance test: the network data forwarding performance is tested based on RFC2544, including throughput, packet loss, delay, jitter and so on.
  On multiple virtual machines, the business stress test is carried out by using the VNF functional simulation instrument, and the NFVi platform computing and storage performance monitoring tools are used to verify the demand of user volume and business volume for NFVi resources.
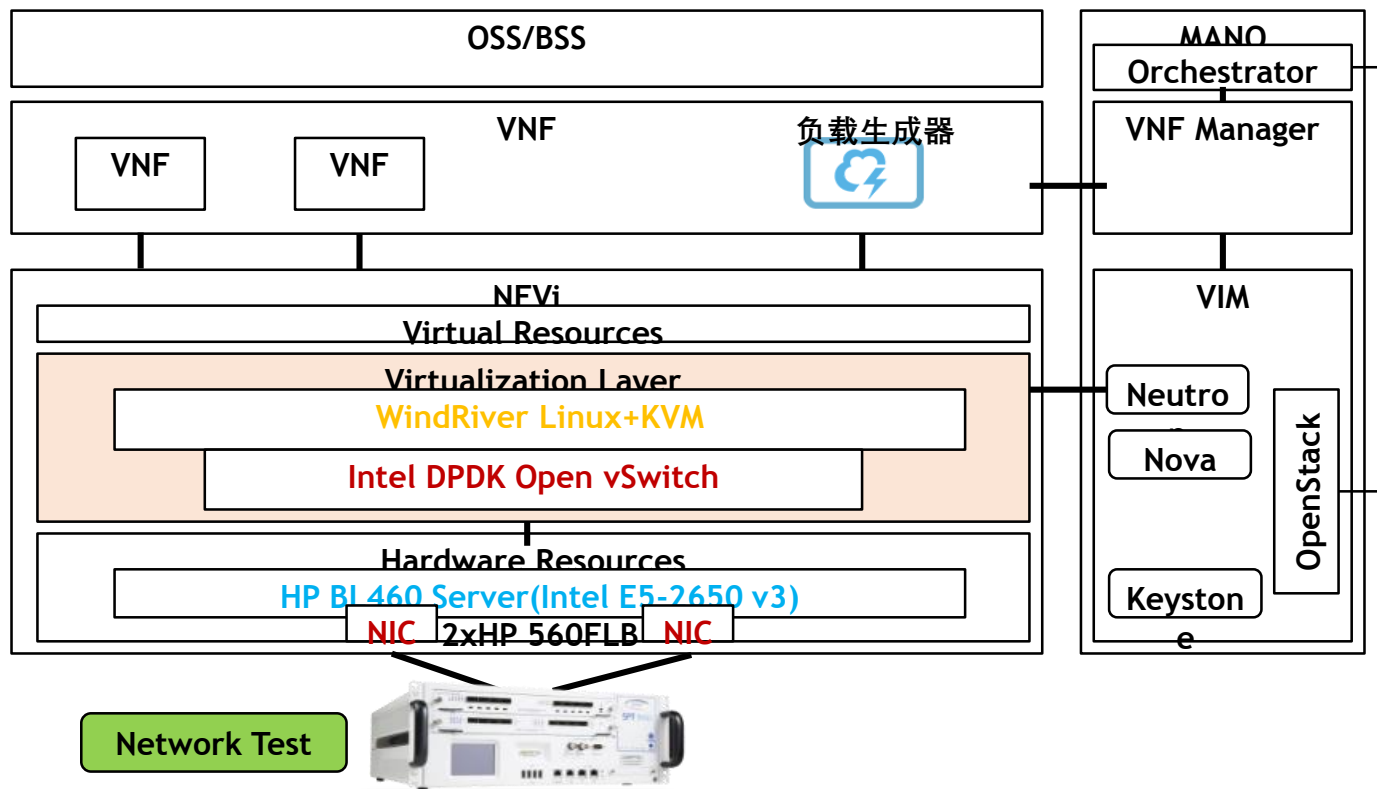
3. Expected objectives and results

◆ CAICT provides intelligent test and verification service for 5G network management operation, including the above four aspects, each of which is independent of each other and can be implemented separately.

    ---Evaluation Service of Business and Network Management Software system.

    ---Service quality Evaluation Service based on slicing.

    ---VNF Test Verification Service.

    ---NFVi Test Verification Service.

After the implementation of the project, a professional test report will be generated to assist provincial companies and manufacturers to find out the problems existing in the implementation and deployment of business and network management software system, network slice, VNF and NFVi in time, so as to provide technical support for subsequent upgrade and improvement.

◆ The test report can also be used as a certification basis for operators to apply for various awards.

4. You will benefit from it

- **Technical.**

  Upon completion of the project, China Telecom will work with China Telecom to develop communication industry standards suitable for 5G business enabling platform, network management system and NFVi, or assist operators in the development of relevant enterprise bids.

  Economics.

  Through the pilot operation in the early stage of the project, a standardized evaluation system and evaluation ability can be formed, which can verify the business enabling platform, network management system, MANO, network fragmentation quality, VNF and NFVi of the provincial companies of operators. Through evaluation and subsequent upgrading, operators can effectively improve the performance and reliability of business and network management software systems, improve the quality of 5G network in all aspects, and help enterprises to strive for greater economic and social benefits in the future.

Thank you！

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