C/U Separated and Modular Architecture for NFV

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C/U Separated Requirement for Multi-tier DC Scenario

Different processing character
Different affect on user experience

Elastic Cloud Service™

Enterprise
Family
Personal
Wifi
4G
2/3G

Edge DC

Internet

Central DC

Optical Metro
Optical Backbone

Aggregation
Core IP

Management Layer
Service Layer
Bearing Layer

MICT-OS™
Integrated Telecom Operation & Maintenance System

Elastic Cloud Service™

Cloud UniCore
iVAS

Cloud UniCore-U
iVAS-U

Elastic Bearing/UAN

Different processing character affect on user experience

Elastic Cloud Service™

Elastic Cloud Service™

Different processing character affect on user experience
vCN Architecture – TCSA

TCSA (Telecom Cloud Service Architecture)

Application layer
- Mobility Management
- Authentication
- Session Management

Common layer
- Load Balance
- Signaling processing
- Interface processing

Data layer
- Subscription Data
- Service Data
- Resource Data
- Link Data

CNC (Common Network Component)

Packet Forward
Codec

Highlights
- **High performance**: all modules are active and carry traffic, higher resource utilization.
- **Better experience**: ISSU and seamless elasticity
- **Easy O&M**: fast upgrading and deploy new SW version
- **Better expansion**: easier to introduce new applications
- **Second-level elasticity**: VM disaster redundancy and migration without data migration
- **Higher reliability**: 0 service loss/N+K distributed disaster redundancy

- Stateless design + low coupling
- Separation from control plane and user plane
- Componentization

Service data: separated + distributed
Service Componentization & the Deployment Flexibility

**Scenario 1**: operator market, large-scale network, legacy traditional/cloudlization / multi vendor hybrid network

- TCSA architecture, more reliable and easy for expansion.
- Virtualized NE adopts standard interface for interconnection, construct with traditional network

**Scenario 2**: enterprise network market, small-size network, cloudlization network

- Shared by CDB/CNC, more compact and save resources
- Internal interfaces among service logic components, higher efficiency

**Scenario 3**: large capacity, low cost, multi-tier DC deployment

- Function componentization, deploy according to requirements and meet precise customized requirements.
- Distributed deployment, high efficiency of service processing.
Seconds level Elasticity

Legacy elasticity service and data is migrated simultaneously, with slow speed, interrupted service and bad experience

Highlights

- **Seconds level elasticity**: Service and data separation, when service layer VM scales in or out, there is no need for complicated data migration, new VM directly acquires the latest subscriber data from CDB, the elasticity shortens from traditional minutes to second.

- **0 service interrupted**: Real-time synchronization of CDB data, after VM handover, VM directly acquires the latest data from CDB via Push or Pull, thus to guarantee service continuity and improves subscriber experience.
Cloud Redundancy Solution Guarantees High System Reliability

Legacy 1+1 redundancy solution

- Discontinuous service: if active module fails, service will be interrupted.
- Resources with low efficiency: backup module is only used for backup, which cannot be fully used.

Cloud redundancy solution

1 to 1 backup VM module is not required, when one or more VMs fail, the subscribers access to other VM modules to continue the service processing

Benefits:
- No loss of service: if the rest of the processing module resources meet existing service requirements, one or more service processing modules failure do not result in service interruption.
- High efficiency use of resources: service processing modules are all in active status, resources are fully used.
C/U Separated Architecture of vEPC

(EPC-C logical)
- Mobility Management
- Session Management
- Authentication...

Common Component
- Load Balance
- Signaling processing
- Interface processing

CDB
- Cloud Database

OCS/PCRF/HSS

Other MME/GW

Service IF:
- EPC-U
  - TC-U
  - DPI
  - TCP-OPT
  - Stat.
  - Policy Enforcing

Management IF:
- SGi/S1-U/S5-U/X3

<table>
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<tr>
<th>Interface</th>
<th>Usage</th>
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<td>Service</td>
<td>Loading flow policies of traffic processing</td>
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<td>Management</td>
<td>Configuration, KPI, alarming...</td>
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**vEPC CU Separation Improves transportation Efficiency**

**Solution:**
- CU separation, centralized control plane, distributed forwarding, select user plane based on the following strategies:
  - Load (load balance)
  - Location (near offload)
  - APN (service guide)

**Benefits:**
- Centralized O&M, control plane function is centralized, fast deployment reduces TCO.
- Centralized management of context and resource control plane, fast self-heal of forwarding point, better reliability.
- Control plane coordinates the subscriber to optimize seamless service path during mobile procedure, with better experience.

About 90Mbps Inter DC transportation is required for 300K subs (based on CMCC traffic model).
VoLTE NFV PoC with China Unicom

**Multi-vendor NFV environment**
- **NFVO**: ZTE (vManager), HP (NFV Director)
- **VNFM**: ZTE (vManager);
- **VNFs**: ZTE (vEPC & vIMS);
- **EMS**: ZTE (NetNumen U31)
- **VIM**: ZTE (TECS), HP (Helion);
- **HW**: HP (BL460c Gen9); ZTE (ZXCloud E9000).

**PoC**
- **E2E VoLTE service verification**: LTE service, Voice service, billing
- **NS&VNF life cycle management**: registration, deployment, expansion, hot migration, upgrade;
- **Elastic scalability**: manual and automatic Scale-in & Scale-out;
- **User plane acceleration technology**: DPDK, SR-IOV;
- **vGW based iSDN**: separate control plane and user plane;
Cloud Works – Break Bottleneck of Service Development & Innovation

**Problem**

- Still service development mode of customized demand development between operator and system provider
- Long period, high cost, single cooperation channel

**Solution**

- Construct NFV PaaS platform based on component service
- Components provide open API interface, development new service based on flexible GUI/template combination and 3rd party integration

**Highlight**

- Any 3rd part can freely combine service component in the component library, not depending on system provider
- 3rd part customized component supports new service expansion
Cloud Works – Hour-level New Service Development & Deployment Platform

**Hour-level New Service Development**

- Voice
- SMS
- Sec
- Video
- LB
- DB

**Developer**

- Customer A
- Customer B

**Auto test script**

- Network connection test
- NS function test
- VM performance test
- VNF performance test
- NS performance test

**Automatic Function Performance Verification**

- Test VM

**Lifecyle Execution**

- SLA Library
- Event Trigger
- Self-healing
- Migration
- Shrinkage and expansion

**Monitoring**

- Network KPI
- VM Load
- VNF KPI
- NS KPI

- Policy Engine
- Statistic Report
Cloud Works Helps Operator to Build Carrier-class Open Ecosystem with RCS

ZTE Cloud Works

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Cloud Works:  Carrier-class open ecosystem

- Convenient for the operator to quickly launch new services for enterprise customers
- Open API to partners, diversified services
Thank you