Virtualizing 5G Infrastructure using Cloud VIM

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NFV ETSI Standard

T-MANO
Cloud VIM
In line with SK Telecom’s unified orchestration strategy, T-MANO provides control and management of the entire life-cycle of network infrastructure resources, functions, end-to-end network.
T-MANO in Action: Dynamic End-to-End Network Slicing

End-to-end Network Orchestration

- **North-Bound I/F (Service Orchestration, NG-OSS, BSS)**
- **E2E Network Slice Life-Cycle Mgmt.**
- **Local Network Slice (DC #i) NFV Orchestrator**
  - **Generic VNFM**
  - **Transport Infra. Orchestrator**
  - **Common VIM**

- **South-Bound Interface (Local NFV Orchestrator, Transport Infra Orchestrator, PNF/VNF)**
  - **Config. Plug-ins**
  - **Open API**

- **Local NS LCM**

- **Service Orchestration** (Service Life-cycle mgmt., Service Adaptation, Service Exposure)

- **BSS** (Order Life-cycle mgmt., Sales, Marketing, CEM, Billing)

- **E2E Network Slice Catalog**

- **E2E Network Slice Life-Cycle Mgmt.**

- **Transport SDN**

- **Local (DC #j) NFV Orchestrator**
  - **Generic VNFM**
  - **Common VIM**

- **TNaaS**

- **Status (Inventory Mgmt., Collection, E2E Assurance, Analytics, Controls)**

**Legend:**
- LCM: Life-Cycle Management
- NS: Network Slice
- VNF: Virtualized Network Function
- VNFC: VNF Component
- VIM: Virtualized Infra Manager
- DC: Datacenter
- MANO: Mgmt. and Orchestration
- VNFC: VNF Component
- PNF: Physical Network Function (Non-virtualized Legacy Function)
- VL: Virtual Link
- VM: Virtual Machine

**Notes:**
- **Day-0 Configuration (Deployment)**
- **Day-1/N Configuration (Service Config.)**

**Dynamic End-to-End Network Slice**
Cloud VIM

Cloud features: **Virtual Networks, Containers, CI/CD**

Carrier grade performance: **Data Plane Acceleration** (Smart NIC, DPDK, SR-IOV)
Virtual Networks
• SONA: SDN based Virtual Network Solution

Containers
• TACO: All Containerized OpenStack
• SONA: supports container networks

CI/CD
• TACO/SONA CI/CD

Data Plane Acceleration
• Smart NIC, SR-IOV, DPDK
SONA (Simplified Overlay Networking Architecture)

- ONOS based **Virtual Network Management** solution
- Multi-Tenancy support with VxLAN and VLAN
- Scalable Gateway, Fully Compatible with OpenStack
TACO (SKT All Container OpenStack)

- Developed by SK Telecom, leveraging Container and Kubernetes
- Community Version with Continuous Integration / Delivery System
SONA: Kubernetes Network Management

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SONA

Neutron

Kuryr-kubernetes

Kubernetes

OVS

Kuryr CNI

Pods

VM

Container

Container
SONA: Kubernetes Network Management

- Ingress
- Service
- SONA CNI
- OVS
- Pods
- VM
- Container
- DPA
- SR-IOV
• **Continuous Integration (CI)**
  – Full ONOS build and unit tests
  – Full static code analysis
  – SONA build and unit tests
  – Integration test
    • OpenStack API invocation test
    • OpenStack scenario test
  – ONOS/SONA failure/recovery test

• **Continuous Delivery (CD)**
  – Trigger docker image build webhook
  – Docker image with pre-built SONA

$ docker pull opensona/onos-sona-nightly-docker
SONA CI/CD Flow

Source

GitHub
- jenkins-sona-verify
- onos-sona-repo-build
- onos-sona-bucktool
- sona-nightly-docker
- rally + tempest

Registry
- onos-sona-repo-build
- sona-nightly-docker
- rally + tempest

Jenkins
- fetch pipeline script
- fetch builder container
- test gerrit patch?
  - Yes
    - fetch SONA review
    - Extract SONA merge w/ ONOS stable source
    - patch SONA
    - build SONA
    - run SONA unit test
  - No
    - fetch latest SONA
    - start integration test
    - fetch rally container
    - initialize OpenStack env.
    - deploy ONOS & install SONA
- Yes
  - pass?
- No
  - trigger build
  - send noti.

CI/CD
Smart NIC, OVS DPDK, SR-IOV

Please check out the detail in the next talk from Daniel, who is SKT’s DPA expert.
Conclusion

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Function A (Multi-datacenter-scale / Cloud-native VNF)

Function B

Function C

Virtualization Layer using Cloud VIM

Physical Resource Pool (common)

SDN Leaf-Spine Fabric

Data Plane Acceleration

High Performance I/O

IDS

Firewall