OPNFV Project

Research Group, Okinawa Open Laboratory
Syuya NAKAMA
3 FEB 2017
### PJ Proposal

<table>
<thead>
<tr>
<th>Item</th>
<th>Content</th>
<th>Remarks</th>
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<tbody>
<tr>
<td>Purpose</td>
<td>Contribute OPNFV Test Lab for community</td>
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<td></td>
<td>Provide test Infrastructure for VNF (Virtual Network Function: Virtual Network Appliance) on OPNFV</td>
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<td>Promote and cooperate with community to spread OPNFV</td>
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<tr>
<td>Goal</td>
<td>Provide VNF Test infrastructure on OPNFV for users</td>
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<td>Gain recognition in domestic market and Japan OPNFV User group</td>
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<tr>
<td>Necessities</td>
<td>product</td>
<td>Unit Price</td>
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<tr>
<td></td>
<td>Server</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Switch</td>
<td></td>
</tr>
<tr>
<td>Duration</td>
<td>APR 2016 – MAR 2017</td>
<td></td>
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<tr>
<td>Way of control</td>
<td>Weekly meeting, slack</td>
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<tr>
<td>Way for information sharing</td>
<td>Google Docs to share design, plan, and discuss documents</td>
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<tr>
<td>Role</td>
<td>PO</td>
<td>TORII(NEC)</td>
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<tr>
<td></td>
<td>PM</td>
<td>HAYASHI (NES)</td>
</tr>
<tr>
<td></td>
<td>member</td>
<td>NAKAMA (NES), HAYASHI(NES), KOBAYASHI (ADOC/up to MAY), Annette CHEN (III), Eric CHANG (III), James CHIANG (III)</td>
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</table>
OPNFV Project

1. Development of VNF Test Infrastructure
   - Motivation
   - About VNF Test Infrastructure
   - Providing VNF Test Infrastructure
   - Demonstration

2. Community Activities
   - Join OPNFV as Associate Member
   - Build OPNFV Test Lab
   - Domestic OPNFV community activities
   - Function Proposal for OPNFV Functest

3. Lecture in OOL Events
4. Share knowhow to build OPNFV infrastructure with III (Taiwan)
5. Further activities
1. Development of VNF Test Infrastructure

- Motivation
- About VNF Test Infrastructure
- Providing VNF Test Infrastructure
- Demonstration
Motivation

Introduction

Okinawa Open Laboratory continue development of VNF Test Automation with Open Source Software

Start research to realize VNF Test Automation System on OPNFV

Why OPNFV?

- OPNFV is known as open NFV platform
- OPNFV must be a de facto standard by close relationship with OpenStack
Functest Project on OPNFV

- About Functest
  - One of test projects in OPNFV
  - Functional Test suite for IaaS built by OPNFV
  - Integrated with Open Source Software completely

- Current Functionality of Functest
  1. Deploy and Ping for VMs on IaaS automatically
  2. Test with OpenStack components like Tempest and Rally
  3. Test L2 function on OpenDaylight, L2/L3 function ONOS etc..

NOT Supported Test for VNF(route r)
Environment to execute Functest

- Functest
  - Container base and Easy to prepare test
  - Methods to control OpenStack
  - Completely Open Source Software

Possible to integrate VNF Test Infrastructure based on Functest?
Develop VNF Test Infrastructure with Functest

■ Develop Development of VNF Test Infrastructure based on Functest with full open source

Challenge to develop VNF Test Infrastructure based on Functest

■ Realized functions in OOL based on Functest
  Functional test and Performance test for VNF
  ▪ Functional Test
    Connectivity test of routers with BGP and OSPF
  ▪ Performance Test
    Measurement of Throughput, Jitter and Packet Loss Rate
1. Development of VNF Test Infrastructure

- Motivation
- About VNF Test Infrastructure
- Providing VNF Test Infrastructure
- Demonstration
Architecture of VNF Test Infrastructure

1) Deploy the test topology

2) Do testing
3) Collect results

Add Functest on VNF Test infrastructure (Python module)

Functest

OSS/BSS

Orchestrator/
VNF Manager

Cloudify
tosca

Blue Print

VIM

openstack

KVM

standard hardware

NFVI

OvS

Open vSwitch
Functional Test

- **Configuration**
  - VNF under test (VyOS Router)
  - Reference VNF (VyOS Router)
  - Inter-connectivity (BGP, OSPF)

- **DUT VNF**: VyOS (ver1.1.7)
- **Test items**: Interconnectivity test: BGP, OSPF

- **BGP**
  - Peering status
  - Number of advertised route
  - Send Route information properly
  - Receive end Route information properly
  - Collect routing table or not

- **OSPF**
  - Neighbor information
  - OSPF convergence status
  - Routing table is collect or not
  - Retrieve Interface information
to confirm Routing information
- Interconnectivity test between VNF under test and Reference VNF
Conduct test on OpenStack

- Network topology on OpenStack

Run test after auto-deploy test topology for Functional test on OpenStack
Result of Functional test

Result is displayed per test item

- **BGP interconnectivity**

  ```
  vnf_test.ssh_client - INFO - SSH connect to 192.168.105.129.
  vnf_test.ssh_client - INFO - SSH connection established to 192.168.105.129.
  vnf_test.connector - INFO - Check bpe peer | OK |
  vnf_test.connector - INFO - Check bpe status | OK |
  vnf_test.connector - INFO - Check route advertise | OK |
  vnf_test.connector - INFO - Check route receive | OK |
  vnf_test.connector - INFO - Check route table | OK |
  run_tests - INFO - Test execution time: 04:04
  run_tests - INFO - Execution exit value: 0
  ```

  - Peering status
  - BGP status
  - Advertised route number
  - Received route number
  - Routing Table

- **OSPF interconnectivity**

  ```
  vRouter.ssh_client - INFO - SSH connect to 192.168.105.129.
  vRouter.ssh_client - INFO - SSH connection established to 192.168.105.129.
  vRouter.connector - INFO - init checker
  vRouter.connector - INFO - Checking the ospf neighbor | OK |
  vRouter.connector - INFO - Checking the ospf status | OK |
  vRouter.connector - INFO - Checking the routing entry | OK |
  vRouter.connector - INFO - Checking the ospf interface | OK |
  vRouter.connector - INFO - show ip ospf neighbor 200.200.200.2 | no-more
  ```

  - OSPF neighbor status
  - OSPF status
  - Routing Table
  - Interface status
Performance Test

- **Configuration**

  - **Packet Forwarding**

  Transmit
  
  Tester VM (Send)  
  
  VNF under test (VyOS Router)
  
  192.168.2.3/24
  
  Receive
  
  Tester VM (Receive)  
  
  192.168.3.3/24

- **VNF under test**: VyOS (ver1.1.7)
- **Test item**: Performance measurement
  
  - **Measurement items**
    - Throughput
    - Packet loss rate
    - Jitter

Use iPerf for measurement
- Measure packet forwarding performance for VNF under test
Conduct Test on OpenStack

- Network topology on OpenStack

Run test after auto-deploy test topology for Functional test on OpenStack
Result of Performance test

- Display Performance test result

```
INFO - ===================================================================
INFO - Performance test result
INFO - Input Parameter:
INFO -   client_ip=192.168.2.2, server_ip=192.168.3.3
INFO -   udp, packet_size=1470byte, bandwidth=1000M, port=10000, time=10, count=5
INFO -
INFO - Average:
INFO - Transfer  Bandwidth  Jitter   Loss rate
INFO - 967 MBytes  811 Mbits/sec  0.07 ms  0.1%
INFO -
INFO - Total:
INFO - number of tests =5
INFO -
INFO - Lost/Total Datagrams
INFO - 4847.0/3452460.0
INFO - ===================================================================
```

**Throughput, Jitter, Packet Loss Rate**
Summary

1. **Easy to build VNF Test Infrastructure**
   - Just run Docker container based on Functest, and finish preparation
     (Only OpenStack environment is necessary)

2. **Possible to change VNF under test and target**
   - Add VNF without changing source code of VNF Test Infrastructure
     (Provisioning for VNF is stored on command template)
   - Need VNF image and configuration template

3. **Possible to change Test topology**
   - Cloudify enables auto-deployment of test topology for each test
   - Add topology to create Blueprint loaded by Cloudify

We are writing Users Guide of Docker container, and want you members (especially, VNF users) to join and help us!
1. Development of VNF Test Infrastructure

- Motivation
- About VNF Test Infrastructure
- Providing VNF Test Infrastructure
- Demonstration
Providing VNF Test Infrastructure

- Provide Docker container embedded VNF Test Infrastructure
  - Use to Download (pull) from Docker Hub Repository name: oolorg/vnf_test
  - Maintain Users Guide (Link is put on repository of Docker Hub)

![Google search result for Docker Hub oolorg/vnf_test](image)

Google “Docker Hub oolorg/vnf_test”

Jump to this link
Providing VNF Test Infrastructure (Cont’d)

Repository of OOL on Docker Hub

Users Guide

Link for User’s Guide
1. Development of VNF Test Infrastructure

- Motivation
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Demonstration

- Demonstration of VNF Test Infrastructure
  - https://youtu.be/QWg-uNLhwdk
2. Community Activities

- Join OPNFV as Associate Member
- Build OPNFV Test Lab
- Domestic OPNFV Community Activities
- Proposal to add function for OPNFV Functest
OPNFV Associate Member

- OOL Joined OPNFV as Associate Member at MAR 2016
2. Community Activities

- Join OPNFV as Associate Member
- **Build OPNFV Test Lab**
- Domestic OPNFV Community Activities
- Proposal to add function for OPNFV Functest
Build OPNFV Test Lab

- Japan’s first OPNFV Test Lab was built on MAY 2016 and registered to OPNFV community
- There are 4 server OpenStack and 3 server OpenStack to use verification or CI environment

Use for OOL activities
1) Controller Nodes
3) Compute Node

Use for CI of OPNFV community
- CI environment for “Doctor PJ” on OPNFV
- Realized by collaboration with PTL of Doctor PJ

Wiring diagram of server and switch

OpenVPN server and slave of Jenkins are registered to Test Lab of OPNFV
7. OOL (Okinawa Open Laboratory)  
OPNFV Testlab

7.1. Overview

Okinawa Open Laboratory provides the following facilities for OPNFV testing. The testlab is now located only at Okinawa in Japan. (We have plan to expand PODs and location.) The current deployed version by Fuel installer on the POD is Brahmputra. It supports functest, yardstick projects testing. You can connect to CI. On each node an OPNFV solution will be installed based on Pharos Lab project. On top of this infrastructure several VNFs will be deployed. We provide VPN(OpenVPN) to connect the testlab. You can check how to connect at “Access Procedure”.

7.2. Environment

The test lab POD is setup along the Pharos project guidelines. Servers are deployed in the the following configuration.

- 1 Jump server
- 3 Controller node
- 2 compute node

http://artifacts.opnfv.org/pharos/docs/labs/OOL.html
Verification Project with OPNFV Test Lab

- Functest and YardStick, both are test project of OPNFV, were verified and results were released to members at APR and JUN 2016 on Slack
- Introduced on SDN/Cloud seminar on OCT 2016
2. Community Activities

- Join OPNFV as Associate Member
- Build OPNFV Test Lab
- Domestic OPNFV Community Activities
- Proposal to add function for OPNFV Functest
Tokyo OPNFV User Group was established in AUG 2016 and the first OPNFV Meetup was conducted on 9 SEP 2016 at Tokyo

Present session “Run VNF on Functest”
Domestic OPNFV Community Activities

- Presentation on OPNFV Meetup Tokyo #1
2. Community Activities

- Join OPNFV as Associate Member
- Build OPNFV Test Lab
- Domestic OPNFV Community Activities
- Proposal to add function for OPNFV Functest
Proposal to add function for OPNFV Functest

OOL developed original VNF Test Infrastructure based on Functest

Original development to OpenSource

Propose VNF Test Infrastructure as one of functions of Functest
Proposal to add function for OPNFV Functest (Cont’d)

- Coming release of OPNFV (”D” Release)

Picked up as candidate of contribution of OPNFV ➔ Source code was contributed
Contribution activities for OPNFV

- Contributing for Refactoring of Doctor test case related with refactoring action of Functest

Update and Commit source code to contribute community
3. Lecture on OOL events
   - Lecture on SDN/Cloud Seminar
   - Session on OkinawaOpenDays2016
   - Exhibition on OkinawaOpenDays2016
平成28年度SDN/クラウドセミナー
【第1部】沖縄オープンラボラトリセッション
沖縄オープンラボラトリにおける研究最新動向
【第2部】人材育成セッション
必要とされるインフラエンジニアとは？実践的人材育成プログラムから見る、現状と活用法～

OPNFVプロジェクトについて
仲間 修也
2016/10/14

1. 沖縄オープンラボラトリセッション
・OPNFVプロジェクトについて：仲間 修也（OOL/NECソリューションイノベータ）
- **Presentation as General Track and Exhibition on OOL booth**

**Program**

**Exhibition**
4. Share knowhow to build OPNFV infrastructure with III (Taiwan)
Share knowhow to build OPNFV with III

- III completed to build OPNFV Infrastructure with knowhow provided by OOL and support by skype

Relationship of OOL and III got closer with cooperation

Eric, Annette and James building OPNFV infrastructure

Chatting on Skype
Share knowhow to build OPNFV with III

- OPNFV infrastructure on III
5. Further Activities
Further Activities

**Contribution activity for OPNFV Functest**
- Commit source code of VNF Test Infrastructure as one of functions of Functest
- Support refactoring of test case for Doctor Project on OPNFV

**Collaboration with III (Taiwan)**
- Verification of Functest will be conducted on OPNFV infrastructure on III
- Interconnection between III and OOL will be established
- Conduct VNF test with developed VNF Test Infrastructure on the inter-connected network between III and OOL
- Conduct PoC with inter-connected infrastructure of III and OOL (III plans PoC of vEPC based on OpenEPC)

And so on
Thank You!
ご清聴ありがとうございました