A Fully Automated VNF Performance Benchmarking Solution for RHOSP13 based NFVI

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Lenovo Cloud Technology Center

Red Hat Summit 2019
Lenovo Performance Optimized NFVI Solutions

At Lenovo, we are creating a leading, open, optimized and independently validated NFV solution platform to deliver high value and performance oriented applications for CoSPs to serve their customers.
What we need from NFV Solutions

**Agility**
- Faster provisioning and time to market
- Effortless customer experience

**Performance**
- Optimized VNF networking performance
- Guaranteed SLA

**Low cost**
- Reduced cost of hardware, operations, etc
- Higher utilization

**Dynamic**
- Network on-demand, increased reliability, flexibility
- Analytics “big data”
Why do we need benchmarking the NFV solution

<table>
<thead>
<tr>
<th>Carrier Grade Conformance</th>
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<tbody>
<tr>
<td>Comprehensive information for CSP to plan, procure and deploy NFV</td>
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<table>
<thead>
<tr>
<th>Performance</th>
</tr>
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<tbody>
<tr>
<td>quantitative baseline on a specified infrastructure</td>
</tr>
<tr>
<td>Comparison of different solutions</td>
</tr>
<tr>
<td>NFV workload dimensions and stress vectors</td>
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<table>
<thead>
<tr>
<th>Automation</th>
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<tbody>
<tr>
<td>Setup the NFVI and testing environment</td>
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<tr>
<td>Provide quick validation of a known setup/configuration</td>
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<td>Collect various KPIs</td>
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<thead>
<tr>
<th>Agility</th>
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<tbody>
<tr>
<td>VNF onboarding</td>
</tr>
<tr>
<td>Onboard new HW or SW acerbation solutions</td>
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</tbody>
</table>

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Benchmark Platform Design Strategies

- Reproducible (reusable model-driven deployment & configuration templates)
  - Target environment
  - Testing environment
  - Benchmark results
- Build on Open Source solutions
- Full automation, Launch and validate the VNF solution on demand
- Dev-ops or CI/CD integration
- Store benchmarking data for future analysis
- Dashboard for easy visualization and comparisons
Benchmarking tools

**Phoronix Test Suite**

**OPNFV Yardstick/NSB**
- OPNFV QTIP
- OPNFV VSPERF
- OPNFV STORPERF

**OpenStack Rally**
**OpenStack Monasca**
**OpenStack Celometer**

Backed by [OpenBenchmarking.org](https://www.openbenchmarking.org)
Framework to manage 300+ test cases and benchmark utilities.
Profiles CPU, memory, storage, networking, and application workloads.
Pre-defined test suites available for sane benchmarking profiles
Extensible for custom test cases and suites
Defines a generic schema for gathering metrics

Backed by OPNFV
Native OpenStack VIM integration
Build-in TG and SUT configurations
Full automation – one click execution, data collection and visualization
Rich metrics – loss rate, throughput…
Integrated with data store and visualization

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NFVI Benchmarking Platform in a glance

**Workflows**
- Jenkins Master
- Jenkins workers

**Execution engines**
- PTS
- NSB

**Visualization & Analytics**
- Kibana
  - Elastic Search
  - LOC Analytics

**Data Store**
- PIM Profiles
- VIM Config
- Benchmarks

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CI/CD Pipeline

Changes on target cloud:
- PIM layer
  - New hardware
  - Driver, firmware upgrade
- VIM layer
  - Configuration changes
  - Software upgrade
- VNF
  - New VNFs
  - Software upgrade

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Examples of Test Suites

- ArrayFire (GPU/CPU)
- Lzbench (CPU)
- R Benchmark
- MixBench
- OctaneBench (NVIDIA CUDA)

- Stream (RAM)
- MBW
- RAMSpeed SMP

- AIO-Stress
- Iozone
- FS-Mark

- NSB-Prox Baremetal
- NSB-Prox-DPDK-L3FWD
- Trex-SRIOV-L3FWD
- iPerf
- NetPerf
- Sockperf

- PlaidML
- MariaDB
- NGINX Benchmark
- Memcached
- SysBench
- Tensorflow

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## Structured KPI Data

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<thead>
<tr>
<th>Table</th>
<th>JSON</th>
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</thead>
<tbody>
<tr>
<td>_id</td>
<td>g9a8K2oBct0Qic59vEnH</td>
</tr>
<tr>
<td>_index</td>
<td>phonix_test_result</td>
</tr>
<tr>
<td>_score</td>
<td>1</td>
</tr>
<tr>
<td>_type</td>
<td>doc</td>
</tr>
<tr>
<td>data_average</td>
<td>292.05</td>
</tr>
<tr>
<td>data_max</td>
<td>292.736</td>
</tr>
<tr>
<td>data_min</td>
<td>291.453</td>
</tr>
<tr>
<td>data_raw</td>
<td>292.736:291.653:291.761</td>
</tr>
<tr>
<td>environment</td>
<td>RHOS External Ceph</td>
</tr>
<tr>
<td>group_identifier</td>
<td>External Ceph - Ephemeral Volume - 4-17/2019</td>
</tr>
<tr>
<td>hostname</td>
<td>pts-test-localdomain</td>
</tr>
<tr>
<td>run_identifier</td>
<td>RHOS External Ceph Test pts/c-ray Build #283</td>
</tr>
<tr>
<td>run_identifier_scale</td>
<td>RHOS External Ceph Test pts/c-ray Build #283</td>
</tr>
<tr>
<td>system_hardware</td>
<td>Processor: 4 x Intel core (skylake irix) @ 2.20GHz (4 cores), Motherboard: Red Hat openstack compute (1.1.0-2.0.17 RIos), Memory: 1 x 8192 MB RAM, Disk: 23GB, Graphi cs: cirrusdriMB</td>
</tr>
<tr>
<td>system_software</td>
<td>OS: CentOS Linux 7, Kernel: 3.10.0-957.el7.x86_64 (x86_64), Compiler: GCC 4.8.5 20150623, File-System: xfs, Screen Resolution: 1024x768, System Layer: KVM</td>
</tr>
<tr>
<td>test_description</td>
<td>Total Time - 4K, 16 Rays Per Pixel</td>
</tr>
<tr>
<td>test_proportion</td>
<td>LIB</td>
</tr>
<tr>
<td>test_scale</td>
<td>Seconds</td>
</tr>
<tr>
<td>test_suite</td>
<td>pts/c-ray-1.2.0</td>
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<tr>
<td>test_title</td>
<td>C-Ray</td>
</tr>
<tr>
<td>timestamp</td>
<td>April 17th 2019, 06:23:54.000</td>
</tr>
<tr>
<td>vm_count</td>
<td>1</td>
</tr>
</tbody>
</table>

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Dashboard of benchmarking results

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Examples of Test Suites
Examples of Test Suites
Demo Use Case: VIM configuration SR-IOV vs DPDK vs Bare Metal
Demo Use Case: VIM configuration SR-IOV vs DPDK vs Bare Metal
### Summary

#### Performance
- Multi-dimensional
- Across all layers NFV architecture

#### Automation
- Reproducible anytime, anyplace

#### CI/CD
- Find issue before production deployment

#### Tool sets
- Open Source
- PTS + NSB + Rally + …
Thank you!