TELEMETRY REPORTS & CLOSED LOOP AUTOMATION

OPNFV Virtual Event

April 2020
Agenda

- Intel Telemetry
- Telemetry Insights
- Platform Resiliency Demo
**SCALE EFFICIENCY WITH DATA-DRIVEN, CLOSED LOOP AUTOMATION**

*Intel Platform Telemetry as part of intelligent, closed loop solutions that are reactive, proactive and predictive, delivering new levels of efficiency for IT and network infrastructure.*

- **Automated Action**
- **Telemetry Analysis**
- **Software and Services Telemetry**
- **IA Platform Telemetry**

*Fine-grained Hardware, software and network insights feeding operational intelligence and automation*
INTEL TELEMETRY OVERVIEW
INTEL TELEMETRY COLLECTION AND PUBLICATION

Telemetry Collection

Collectd

Collectd South Bound Plugins

Compute | Networking | Memory | Storage | Acceleration

Platform

Telemetry Consumption

Open stack | Kubernetes

Collectd North Bound Plugins

ONAP

Monitoring /Analytics Systems

Platform/NFVI

MANO

Telemetry Publication

Kubernetes
INTEL TELEMETRY COVERAGE

Enterprise and Network Management Tools

Virtualised Compute
Virtualised Network
Virtualised Storage

Hypervisor

Common / Standard Open APIs

SNMP API
Redfish
SYSLOG
Kafka
VES Plugin
Prometheus

Intel® Run Sure Technology
Resilient System Technology
RAS
MCA
PCIe AER
Resilient Memory Technology
SDDC
DDC+1
Mirroring

Intel® RDT
Intel® Node Manager
NIC counters
Intel® Management Engine
IPMI

vSwitch counters
PMU counters
Intel® Rapid Storage Technology
RAID
Hypervisor/Container Counters

Intel® Rapid Storage Technology
GPU
FPGA
QAT

Open Platform Collector

Collectd

Intel® Infrastructure Management Technologies

OpenStack
Kubernetes

VIM

NFVI
## Use Case Overview

<table>
<thead>
<tr>
<th>Category</th>
<th>Use Case</th>
</tr>
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</table>
| **Service Healing** | Reliability Aware Workload Placement *  
• Improved Placement decisions using Platform Reliability Counters  
• Ensures reliable platform selection |
| | Predictive Fault Detection *  
• Improves reliability by detecting recoverable faults  
• Move workload and traffic before outage |
| | Reliability Aware Auto-Scaling [Scale Out] *  
• Improved Scaling decisions using Platform Reliability Counters  
• Ensures reliable platform resource selection |
| **Energy Optimisation** | Green Story/Energy Efficiency  
• Improved IDLE power consumption  
• Electricity OPEX  
• Runtime power management based on policy |
| | Performance/Watt Improved  
• Improved Performance in same Power Envelope CLX |
| | Power Aware Workload Placement |
| **Application QoS** | • Optimum resource sharing in a multi-tenant environment  
• Improve SLA management |

### Platform Feature Telemetry
Using IA Platform Telemetry to Address Business Use Cases
PLATFORM TELEMETRY REPORTS

Q1 2020
Platform Metrics - Challenge

- How can we up-level platform metrics to help networks run more efficiently? i.e., “what does a high number of cache misses infer for the platform?”
- Difficult for analytics solutions to derive what action to take when monitoring platform metrics due their fine grained nature
- Show value of Intel Platform metrics, what are the actionable insights that MANO/VNFM/SDN controller can act on?
- Solution needs to be easily consumed into existing environments/deployments
SOLUTION – AUTOMATION TELEMETRY REPORTS

✓ Provide the capability to easily decipher platform metrics
✓ Provide ‘actionable data’/insights that management/orchestration systems can make decisions on
✓ Show the value of IA platform in a monitored environment
Use of Telemetry Reports

Consequential Action

Intel Platform

VNF

NFVI

Hypervisor

Other collectors.. Collectd

OS

IA Platform Features

NFVO

VIM

VNFM

Telemetry Reports

Monitoring and Analytics Solution

Intel Telemetry Deliverables

End to End Telemetry Collection
ETSI NFV & Telemetry Reports

- ETSI NFV TST specifications provide infrastructure metrics essential for testing the NFV infrastructure
  - Metrics provided by TST001 help evaluate infrastructure characteristics
  - Metrics listed by TST008 provide key operational metrics at various NFVI layers
  - However not all metrics could be obtained out of the box
- Additional derivation necessary to leverage hardware metrics in a meaningful way
  - Derived metrics need to be calculated to match metrics from TST specs
- Telemetry reports help derive metrics that align with TST spec
# Telemetry Reports - Examples

<table>
<thead>
<tr>
<th>Report Type</th>
<th>Value to the customer</th>
<th>IA Specific Features</th>
<th>Report Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platform Health Reports</td>
<td>Used as inputs to drive corrective actions taken in management layers including VNFM/Kubernetes/SDN controller/ NFVO including failover and other service reliability related actions.</td>
<td>RAS, QPI, Intel® QuickAssist Technology Intel® QAT, NVME</td>
<td>Processor, Memory, Accelerator, Non-volatile Storage, Network Availability</td>
</tr>
<tr>
<td>Platform Utilization Reports</td>
<td>Used by management system/VIM for workload placement decisions</td>
<td>Intel® QAT, Intel® RDT, SST</td>
<td>Processor, Power, Memory BW and Cache, Network interface, Open vSwitch Utilisation</td>
</tr>
<tr>
<td>Platform Configuration Check Reports</td>
<td>Used by management system/VIM detect misconfigured platforms</td>
<td>QPI, NUMA</td>
<td>Cross Socket Balance, NUMA alignment, Port Config checks</td>
</tr>
<tr>
<td>Platform Congestion Report</td>
<td>Used by management system/VIM detect overloaded platforms</td>
<td>Intel® QAT, Intel® RDT</td>
<td>CPU, IO, Intel® QuickAssist Technology (Intel® QAT), Open vSwitch congestion</td>
</tr>
</tbody>
</table>
SPLUNK DEMO
Splunk Demo - Deployment Architecture

Forwarder node - uCPE

NFVi Hardware

NFVi OS

Platform Si Features

NFVi Software

SD-WAN

Firewall

Collector node uCPE or cloud

Closed-loop security/platform resiliency
PLATFORM RESILIENCY DEMO
Intel Platform Resiliency Prototype

Showing how Intel Platform Telemetry can **augment** a Platform Resiliency Solution

A “Host Health Indicator” is determined from multiple Intel Platform Telemetry metrics

Host Health Indicator triggers Intelligent Scheduling decisions using Kubernetes Telemetry Aware Scheduler

Remediation actions taken at the VIM layer that have Service impacts will be indicated
Platform Resiliency Prototype – Critical Scenario

Disclaimer: * Other names and brands may be claimed as the property of others.
Platform Resiliency Prototype – Minor alert Scenario

Disclaimer: * Other names and brands may be claimed as the property of others.
Streaming Analytics w/ Kafka

**Challenge**

- Ability to provide near real-time closed loop based on streaming telemetry

**Resolution**

- Streaming analytics calculates host health indicator based on streaming telemetry
- Streaming analytics provides live analysis of data even before storing in a time series database.

**Application**

- Kafka and KSQL provides analytics outcome using customized schema registry
Host Health Indicator Calculation

**Collected Data**

- **IPMI Metrics**
  - Fan Speed (Fan Speed value from the list of available sensors)
  - Temperature (Temperature value from the list of available temperature sensors)

- **PMU Metrics**
  - Cache-misses (of the cores of interest)

- **RDT Metrics**
  - Memory Bandwidth (of interested cores)
  - LLC Occupancy (of interested cores)

- **RAS Metrics**
  - Corrected Memory Errors

**Critical**
- $< 'X'$
- $> 'X'$, $< 'Y'$
- $> 'Y'$

**Major**
- $< 'X'$
- $> 'X'$, $< 'Y'$
- $> 'Y'$

**Green**
- $> 'X'$
- $< 'X'$, $> 'Y'$
- $< 'Y'$

**PMU: Performance Monitoring Unit**

**RDT: Intel Resource Director Technology**

**RAS: Reliability Availability Serviceability**

**IPMI: Intelligent Platform Management Interface**
FURTHER INFORMATION
OPNFV BAROMETER

Barometer Strategy:

• Ensure platform metrics/events are accessible through open industry standard interfaces.
• Demonstrate platform & network technologies can be monitored, consumed and actioned in real time

One Click Install:

• Easy install/configuration for customers
• One command to install Collectd/Influxdb/Grafana

Three container approach for Collectd:

• Stable Container: latest stable branch
• Master Container: up to date with master
• Experimental Container: cherry pick features of interest
Barometer Home: [https://wiki.opnfv.org/display/fastpath/Barometer+Home](https://wiki.opnfv.org/display/fastpath/Barometer+Home)

Metrics/Events through Barometer (not on Collectd site): [https://wiki.opnfv.org/display/fastpath/Collectd+Metrics+and+Events#CollectdMetricsandEvents-Metrics](https://wiki.opnfv.org/display/fastpath/Collectd+Metrics+and+Events#CollectdMetricsandEvents-Metrics)

Barometer “One-click” install: [https://wiki.opnfv.org/display/fastpath/One+Click+Install+of+Barometer+Containers](https://wiki.opnfv.org/display/fastpath/One+Click+Install+of+Barometer+Containers)
Further Demo Resources


Under Automation section you will find:

Power Savings demo: https://networkbuilders.intel.com/closed-loop-platform-automation-power-savings-demo


Some background information on the work we are doing around managing resources (cache and memory bandwidth in this case) to provide optimum VNF performance:

Further Resources

Learn more from these helpful sites:

https://networkbuilders.intel.com/network-technologies/serviceassurance

https://wiki.opnfv.org/display/fastpath/Barometer+Home

https://wiki.openstack.org/wiki/Telemetry

https://01.org/openstack/blogs/2015/openstack-enhanced-platform-awareness-white-paper

TST001: https://www.etsi.org/deliver/etsi_gs/NFV-TST/001_099/001/01.01.01_60/gs_NFV-TST001v010101p.pdf

TST008: https://www.etsi.org/deliver/etsi_gs/NFV-TST/001_099/008/02.04.01_60/gs_nfv-tst008v020401p.pdf
COLLECTD 101 MATERIALS

• Collectd 101
  • https://wiki.opnfv.org/display/fastpath/Collectd+101
• Write simple read plugin
  • https://wiki.opnfv.org/display/fastpath/Collectd+how+to+implement+a+simple+plugin