FEATURE BRIEF

Service Assurance for Virtualized Networks featuring
Intel® Infrastructure Management Technologies

Telemetry Ingestion into OpenStack*

Intel® Platform Service Assurance

Ingesting Platform Service Assurance telemetry into OpenStack enables automatic discovery and reaction to network events.

In today's highly virtualized environments, telemetry from across various layers of a Cloud deployment, including various features of hardware platform, virtual machine management, and network and storage, increases the complexity tremendously in identifying the right set of metrics to be monitored and analyzed while configuring the right collection interval of various metrics.

OpenStack telemetry involves reliable collection of data related to the usage of physical and virtual resources in a deployment, the persistence of that data for subsequent retrieval and analysis, and the triggering of relevant actions when defined criteria are met. OpenStack provides a wide variety of interfaces or agents to accomplish these tasks (see sidebar).

OpenStack provides a variety of telemetry services:

Ceilometer*: an OpenStack telemetry service.

Gnocchi*: a time-series database & resource indexing service.

Vitrage*: a root cause analysis service.

Watcher*: a resource and optimization service.

Aodh*: an alarming service with integration into collectd, systems, a systems statistics collection mechanism.

Feature Description

Meeting service assurance needs that are tailored for the workload requires continuous monitoring, ingestion, and assimilation of telemetry from underlying platform hardware and virtualized environment. Network Function Virtualization (NFV) environments specifically require comprehension of platform data for fault tolerance, resiliency, compute capacity, noisy neighbor detection, network capacity, redundancy, high availability and most importantly adherence to the Fault, Configuration, Accounting, Performance, and Security (FCAPS) model. Collectd is used as the metrics collection agent of choice to provide these platform metrics to export the data into OpenStack services like Ceilometer, Vitrage, Aodh, and more.

Collectd is a mature system statistics collection mechanism widely used across the industry. It consists of a core daemon and set of read/write plugins to collect/push telemetry respectively. Its pluggable architecture enables collection of chosen metrics with read plugins. Write plugins push data into northbound layers, such as databases or OpenStack services, and send them over the network.

OpenStack's telemetry data collection service Ceilometer, provides APIs to efficiently poll and collect a wide spectrum of data and platform metrics with agents. Its collector interface obtains platform metrics, while its notification agent handles events and notifications. Ceilometer's compute and central agents focus on metering data.

The huge amount of data generated by collectd and OpenStack services requires a time series database that can handle arrays of numbers indexed by time over a date-time range. Gnocchi fills this gap by providing time-series database as a service (TDBaaS) offering APIs to query the database directly. Gnocchi is ideally suited for OpenStack Ceilometer as it provides Representational State Transfer (REST) API and its asynchronous processing daemons are stateless and scalable, allowing additional workers to be added easily to help manage increased workloads.

Closed Loop Platform Automation via OpenStack Services

While processing a huge amount of telemetry, OpenStack's alarming service Aodh provides an alarms and notifications triggering mechanism based on threshold evaluation of collection samples by actively listening, evaluating, and notifying the relevant services. Root cause analysis service Vitrage and/or resource optimization service Watcher come into play in analyzing the data, alarms, and events. These services take relevant actions and trigger appropriate changes across the cluster, essentially providing closed loop platform automation across the OpenStack deployment.

Using a simple condition-action pair and entity graph model, OpenStack Vitrage provides insights into the root cause of various problems across the cluster and deduces them even before they are directly detected by organizing and analyzing various alarms and events and notifications. Vitrage has direct integration with collectd, which allows it to leverage the advanced platform hardware telemetry provided by collectd to root cause and deduce problems within the cluster. After discovery of an issue, the service provides features like auto-healing and end-to-end failure analysis.

In the service assurance context, Watcher is a service that provides resource optimization framework by collecting the metrics via Ceilometer. It applies out-of-the-box optimization routines, set by the administrator, and interfaces with the OpenStack control plane via Advanced Message Queuing Protocol (AMQP) messages, to take appropriate actions.

Configuration

Collectd plays a very important role in exporting critical platform metrics to OpenStack services that can impact latency, jitter, and throughput of corresponding workloads. There are existing plugins that support interoperation of collectd and OpenStack services:

- collectd-openstack-plugins: repository of collectd plug-ins for publishing telemetry data to OpenStack services
- collectd-gnocchi plugin: collectd output plug-in used to send metrics to Gnocchi
- collectd-aodh plugin: collectd plug-in to raise alarms in Aodh
- collectd-vitrage: integration to export collectd metrics as a data source to Vitrage

Feature Dependencies

Most of the OpenStack services including Ceilometer, Vitrage, and AODH, are already integrated with collectd. Collectd needs to be installed and enabled as the collector of choice in the relevant OpenStack service configuration files. Relevant python packages need to be available as plugins and are implemented in Python*.

Several OpenStack projects, for example, Open Platform Network Functions Virtualization (OPNFV)*, already use collectd metrics and events:

- OPNFV Doctor: a fault maintenance and management project that detects faults and can initiate failover to provide continuity of support.
- OPNFV Network Services Benchmarking (NSB): part of the OPNFV Yardstick that offers a framework for characterization and benchmarking of Network Function Virtualization Infrastructure (NFVI), Virtual Network Functions (VNF), and network services using OpenStack.

REFERENCES

TITLE	LINK
Ref 1: Enhancing Service Assurance for Virtualized Networks with Intel® Platform Technologies	https://s3.us-east-2.amazonaws.com/networkbuilders-cdn/whitepaper-enhancing-service-assurance-for-virtualized-networks-with-intel-platform-technologies.pdf
Ref 2: collectd	https://collectd.org/
Ref 3: OpenStack Ceilometer telemetry service	https://docs.openstack.org/mitaka/install-guide-rdo/common/get_started_telemetry.html
Ref 4: collectd-openstack-plugins	https://github.com/openstack/collectd-openstack-plugins
Ref 5: OpenStack Gnocchi	https://wiki.openstack.org/wiki/Gnocchi
Ref 6: OpenStack AODH	https://docs.openstack.org/aodh/latest/install/get_started.html
Ref 7: OpenStack Vitrage	https://wiki.openstack.org/wiki/Vitrage
Ref 8: OpenStack Vitrage- collectd integration	https://github.com/openstack/vitrage/blob/master/etc/vitrage/datasources_values/collectd.yaml
Ref 9: OpenStack Watcher	https://wiki.openstack.org/wiki/Watcher
Ref 10: collectd plugin-list	https://collectd.org/wiki/index.php/Table_of_Plugins
Ref 11: collectd-gnocchi plugin	https://pypi.org/project/collectd-gnocchi/
Ref 12: collectd-aodh plugin	https://github.com/openstack/collectd-openstack-plugins/blob/master/etc/collectd.conf.d/collectd-aodh-plugin.conf
Ref 13: OPNFV Doctor	https://wiki.opnfv.org/display/doctor/Doctor+Home
Ref 14: OPNFV NSB	https://wiki.opnfv.org/display/yardstick/Network+Service+Benchmarking

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