

Observability – Network Telemetry Reporting

Intel® Platform Telemetry Insights reports software translates platform telemetry into networking and operational data, and provides insights on platform reliability, utilization, congestion, and configuration issues. These insights can be used to notify NetOps and trigger remediation actions as part of an observability solution in closed loop systems.



Executive Summary

One of the challenges for comms service providers is ensuring a robust, reliable network with the ability to recover quickly and efficiently from downtime scenarios. While monitoring networks, the sheer volume and variety of telemetry data can seem overwhelming. It is important to note that telemetry data in the right context enables CSPs and cloud-native service providers to measure, audit, and visualize infrastructure health across servers, cores, workloads, containers, server clusters, and data centers. Comms and cloud service providers are accelerating their network transformation by using automation to efficiently manage their network operations. Telemetry is critical for observability, service assurance, and closed loop automation but also has important applications in managing power and infrastructure utilization and efficiency. Automation helps to manage growing and changing networks, fix problems faster, and adhere to customer SLAs.

To perform automation effectively, it requires end-to-end monitoring of software, services, and the hardware on which these services are running within the network. This enables full-stack observability and service assurance in which Intel® Platform Telemetry Insights can play a critical role.

Intel Platform Telemetry Insights uses Intel platform telemetry that is available across the range of Intel processors* from Intel Atom® processor to Intel® Xeon® Scalable processor and spans a vast number of domains including utilization, power consumption, fault detection, and performance. To offer meaningful insights from this platform telemetry, Intel has created Intel Platform Telemetry Insights, a portfolio of reports that provides actionable data about the status of the server in traditional and cloud-native environments. Whether servers are at the Central Office, in the cloud (IoT), or at the edge, Intel Platform Telemetry Insights can help bridge the gap between infrastructure and service layer observability.

These insights can be used in several ways. For example, one could combine these insights with performance data about how the software and services are operating, allowing for a more holistic view of the network function, or possibly use the insights to trigger a remediation action in an automated system. This document introduces Intel Platform Telemetry Insights reports and shows how they can be used effectively in an automated environment to influence network behavior.

This document is part of the [Network & Edge Platform Experience Kits](#).

* The telemetry available is dependent on the features exposed on the platform.

Introduction

Intel fine-grained platform telemetry, which enables several derived insights, is made available via open-source projects [collectd](#) and [Telegraf](#). There are plug-ins available in these projects that expose telemetry from many of the Intel platform and CPU features (e.g., PMU, Intel® Resource Director Technology (Intel® RDT), RAS, Data Plane Development Kit (DPDK), power). These telemetry agents are available to run on most Linux OSes, which has been the focus of the work to date.

Intel Platform Telemetry Insights is a layer of licensed software provided to our customers and partners that uses this fine-grained telemetry and provides meaningful information and actionable data across single or multiple servers.

These insights can also be correlated with telemetry and insights from other layers of the stack to provide full stack observability.

Solution Description



Figure 1. Categories of Intel® Platform Telemetry Insights Reports

Intel Platform Telemetry Insights can be grouped into four categories:

1. Platform health insights
2. Utilization insights
3. Congestion/overload insights
4. Platform configuration checks

These derived insights can be consumed by multiple management, orchestration, and control systems, including software-defined networking (SDN) controllers, virtual infrastructure managers (VIMs) including Kubernetes and OpenStack, root cause analysis (RCA) systems, virtual network functions manager (VNFM), network functions virtualization orchestration (NFVO), capacity planning, online and offline analytics systems, and many others.

Platform Health Insights

- Key to several systems including high availability, resiliency, root cause analysis, and software-defined networking systems.
- Provides clarity into the overall health of the platform and the individual subsystems of compute, memory, storage, and network interfaces.
- Key in correlating network conditions with platform processing conditions.
- Can be used to create predictive models and develop preventative maintenance solutions.

Utilization Insights

- Utilization information (power) is key to being able to identify opportunities to save energy as part of a sustainability program. This information enables end users to detect platforms that are underutilized/idle and make decisions to rebalance traffic or minimize stranded resources.
- Can be used to detect platforms trending to resource exhaustion before a workload experiences issues that could have a negative impact on customer experience.
- Helps the network operator to make decisions about meeting workload service level agreements (SLAs).

Congestion/Overload Insights

- Overload/congestion reports detect exhaustion of platform resource capacity across compute, interfaces, and virtual switching.
- Notifies when specific points of congestion are detected on the platform, which could potentially result in service impacts such as packet loss.

Platform Configuration Checks

- Allows platform configuration errors to be detected early in the platform configuration cycle.
- Can be included in lifecycle and preventative maintenance workflows resulting in fewer faults and increased uptime.
- Can be run as periodic checks or as part of a targeted root cause analysis workflow.

Technologies Implemented

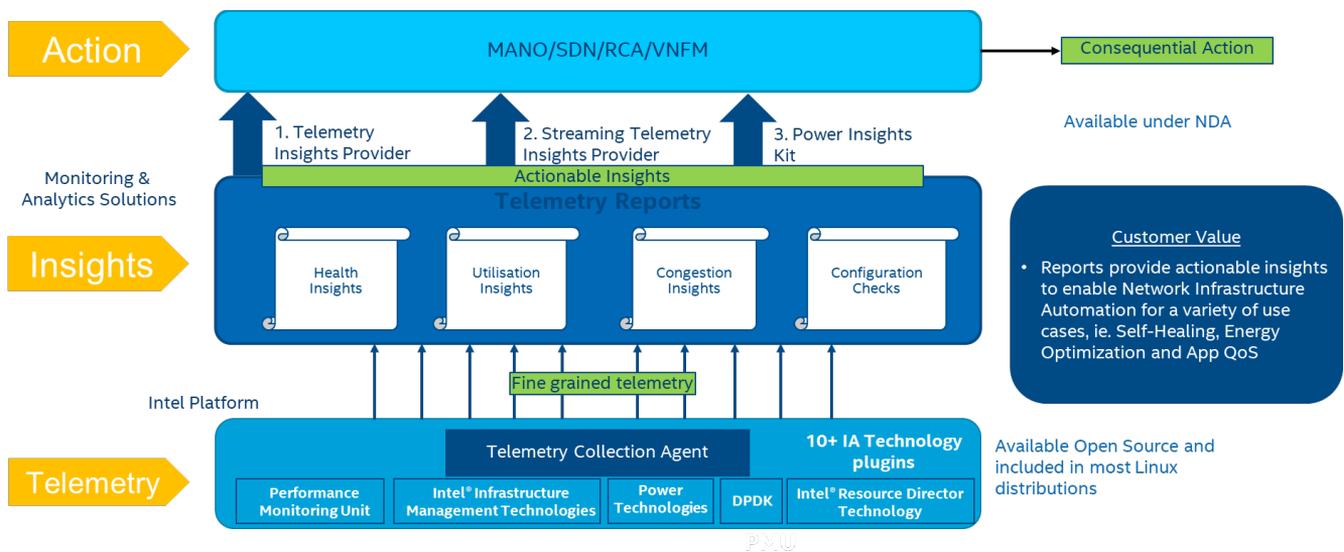


Figure 2. Intel® Platform Telemetry Insights Data Flow

Figure 2 shows how the reports use Intel server telemetry provided by Collectd¹ and Telegraf² via Intel plugins to pass data to a monitoring solution, for example Prometheus, that forms the input for the reports. Figure 2 shows Collectd³ and Telegraf⁴ sending Intel platform telemetry to a monitoring solution, for example Prometheus. The insights are derived from this telemetry.

Intel® Platform Telemetry Insights reports select specific metrics for each type of report and apply appropriate formulas to generate operational and networking insights as output. They can also be run on the data collected at defined intervals of network operations ranging from seconds to days.

The output of the reports can be read by an operator or consumed by other management systems. Customers can feed the insights generated by the reports into their monitoring systems, which are then processed by online or offline automated systems. Intel® Platform Telemetry Insights reports are currently developed to run on Prometheus⁵ and InfluxDB⁶. However, they can be easily adapted to run on other open-source or commercial monitoring, service assurance, and analytics solutions.

¹ <https://collectd.org/>

² <https://www.influxdata.com/time-series-platform/telegraf/>

³ <https://collectd.org/>

⁴ <https://www.influxdata.com/time-series-platform/telegraf/>

⁵ <https://prometheus.io/>

⁶ <https://www.influxdata.com/>

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Network operators can also use the output from the reports for visualization purposes.

Intel® Platform Telemetry Insights is comprised of three components: Telemetry Insights Provider (TIP), Streaming Telemetry Insights Provider, and the Power Insights Kit.

Telemetry Insights Provider

Telemetry Insights Provider provides insights into platform health, resource utilization, congestion, and platform configuration checks. These insights are provided in batch mode and distill IA metrics into networking and operational metrics and allow the integration of insights into automated control and orchestration systems to trigger remediation actions. See [Figure 3](#).

Streaming Telemetry Insights Provider

Streaming Telemetry Insights Provider gives real-time platform insights in a streaming environment. This is where telemetry is collected from the platform, insights calculated, and results made available to the end-user in one continuous stream. Streaming Telemetry Insights Provider is built as a Kafka Streams application, where it subscribes to a telemetry stream in a Kafka cluster in one real-time continuous stream. In addition to the real-time insights, the Streaming Telemetry Insights Provider also delivers alerts when KPI thresholds are exceeded. All insights provided fall into the four categories of health, utilization, congestion, and platform configuration. See [Figure 3](#). Note that similar insights can be found in Telemetry Insights Provider and Streaming Telemetry Insights Provider; they are just two different methods of delivery.

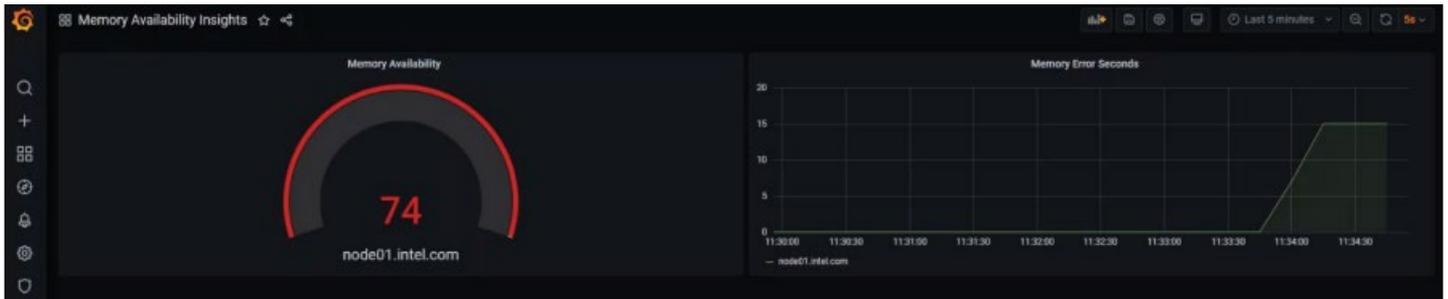


Figure 3. Grafana Dashboard Visualizing Two Memory Report

[Figure 3](#) illustrates a simple Grafana dashboard visualizing two of the memory health reports: availability and errors per second. Errors can be documented and indicated visually in this instance.

Power Insights Kit

Power Insights Kit is a stand-alone deliverable that includes containerized tools to collect, manage, and visualize your power telemetry and insights. It gives the user both an individual server and a cluster wide view of what power is being consumed by the CPU, memory, and the overall systems. It also provides estimated savings (in watts, CO₂, and \$) that could be obtained if CPU power management technologies were enabled. For more information on the Power Insights Kit, contact your Intel representative. See [Figure 4](#).



Figure 4. Grafana Dashboard of Cluster Power Consumption

Figure 4 illustrates a simple Grafana dashboard visualizing the Cluster Power Consumption Overview. This gives an overview of the telemetry collection of all the servers in the cluster.

Benefits of Intel® Platform Telemetry Insights

- ✓ Portfolio of telemetry reports available for use in monitored network infrastructure – health, utilization, congestion, and platform configuration insights.
- ✓ Portfolio of streaming telemetry reports available via real-time stream.
- ✓ Turning fine-grained server telemetry into meaningful actions within the network.
- ✓ Alerting available via real-time stream.
- ✓ Actionable insights provided to an array of consumers to take consequential action, management and orchestration (MANO), SDN controllers, RCA systems, and the like.
- ✓ Enables understanding of power consumption throughout clusters to aid sustainability goals.
- ✓ Enables full-stack cloud-native observability.

Intel® Platform Telemetry Insights aid in enabling visibility to be linked to observability in a cloud-native environment. Fault detection and correlation in cloud infrastructure is difficult. Without infrastructure visibility, it is even more complicated to ensure compliance with internal KPIs and customer SLAs. Intel Platform Telemetry Insights can aid in identifying, correlating, and resolving network faults *before* they impact SLAs. Intel Platform Telemetry Insights can provide actionable insights that are applicable across a range of environments, including Comms, IoT, and the edge. As part of a closed-loop automation solution, these insights can help to monitor and assess cloud-native events, in a host of domains, triggering actions that can “close the loop” for various automation use cases such as platform power optimization, platform reliability (e.g., low-latency IoT and edge connectivity), and orchestration, thus aiding in ensuring application QoS. For more information/demo on some of these use cases such as platform power, refer to our [Network & Edge Platform Experience Kits page](#).

Summary

The growing number of subscribers along with the increased packet throughput have increased the complexity of networks and created the need for additional services, and thus the need for more thorough cloud-native observability. As a result, being able to monitor the network infrastructure and enable full-stack linkage of visibility and observability to help ensure quality of service (QoS) is key to a holistic service assurance solution in a cloud native environment.

As part of this visibility, being able to monitor the power the network infrastructure is consuming also plays an important role in a CoSP’s journey towards net zero, helping identify opportunities to save energy and being able to provide key information for carbon reporting.

Intel® Platform Telemetry Insights offers actionable insights from its servers to provide health, utilization, overload, and configuration status that can feed not only service assurance solutions, but various decision-making components of the stack, including root-cause-analysis systems, resource orchestrators, and more.

Terminology

Table 1. Terminology

Abbreviation	Description
CNF	Cloud Network Function
CPU	Central Processing Unit
CSP	Communications Service Provider
DLB	Dynamic Load Balancer
DPDK	Data Platform Development Kit
IA	Intel® Architecture
MANO	Management and Network Orchestration
NDA	Non-Disclosure Agreement
NetOps	Network Operations
NFVI	Network Function Virtualization Infrastructure
NFVO	Network Function Virtualization Orchestrator
OS	Operating System
PMU	Performance Monitoring Unit
QAT	Quick Assist Technology
QoS	Quality of Service
RAS	Reliability, Availability, and Serviceability
RCA	Root-Cause Analysis
RDT	Resource Director Technology
SDN	Software Defined Network
SIP	Telemetry Insights Provider (TIP)
SLAs	Service Level Agreements
TDP	Thermal Design Power
VIM	Virtual Infrastructure Manager
VNFM	Virtual Network Function Manager

References

Table 2. References

Reference	Source
collectd	https://collectd.org/
Telegraf	https://www.influxdata.com/time-series-platform/telegraf/
Prometheus	https://prometheus.io/
InfluxDB	https://www.influxdata.com/
Grafana	https://grafana.com/

Document Revision History

Revision	Date	Description
001	January 2021	Initial release.

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Revision	Date	Description
002	April 2023	Updated document to reflect branding, Intel® Platform Telemetry Insights, and to describe the additions of Streaming Telemetry Insights Provider, alerting, and Power Insights Kit to Intel® Platform Telemetry Insights.



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