Closed-Loop Automation Solution for Enhancing 5G Service Availability using Telemetry Insight

Adopting Intel advanced telemetry technology to automatically take intelligent remediation actions for telecom operators.

Key Benefits

-   Easing the path to network transformation

-   Maximizing service availability

-   Providing actionable insights with no human intervention

-   Ensuring QoS and performance

-   Optimizing automated workload placement

Executive Summary

As the network evolves rapidly over time in complicated and stringent manners, one of the challenges that telecom operators are facing is to reduce potential service downtime, ensuring the maximum service availability and timely event handling to deliver high Quality of Service (QoS) and guarantee Service Level Agreement (SLA) for customers. By applying automation to the network infrastructure, telecom operators are capable of managing 5G infrastructure without human intervention. This brief is to introduce an automation platform that leverages Intel technology Telemetry Insight Provider (TIP) and Intel technology Telemetry Aware Scheduling (TAS) to realize Service Management and Orchestration (SMO) and demonstrate how QCT can help telecom operators to enhance service availability as well as improve customer satisfaction.

Solution Introduction

Closed-loop automation is the process of continually monitoring real-time network conditions, workload requirements, resource capabilities, and service availability to determine the optimum workload placement for faster and more efficient delivery of services, as shown in Figure 1.
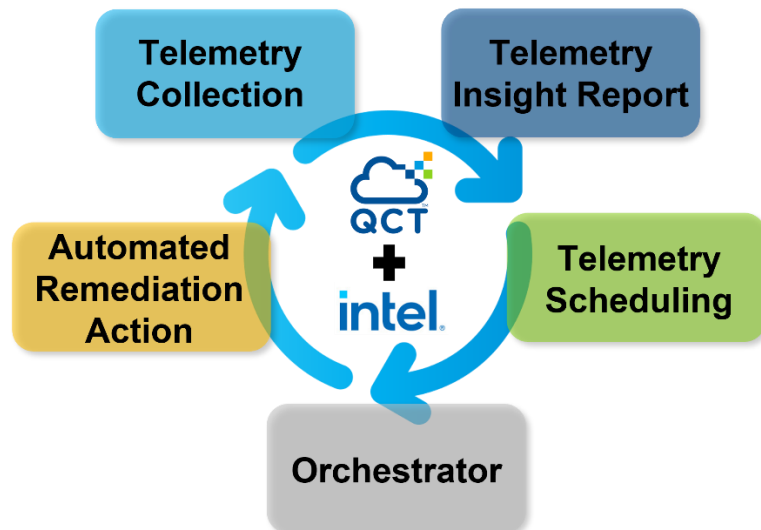

Figure 1. Closed-Loop Automation.

To enhance scheduling capabilities on modern cloud infrastructure, a cloud-native platform that leverages Intel technology TIP and TAS for resiliency and service healing has attracted extensive attention. By pairing up Intel technology TIP and TAS onto the cloud-native platform, it not only provides operational metrics for the platform insights, including health, utilization, congestion, and configuration check but also empowers the automated remediation actions and intelligent placement of workloads based on those platform insights. This solution brief showcases the use case of fault management, with 5G Core (5GC) as a service running on the top of the cloud infrastructure as seen in Figure 2.
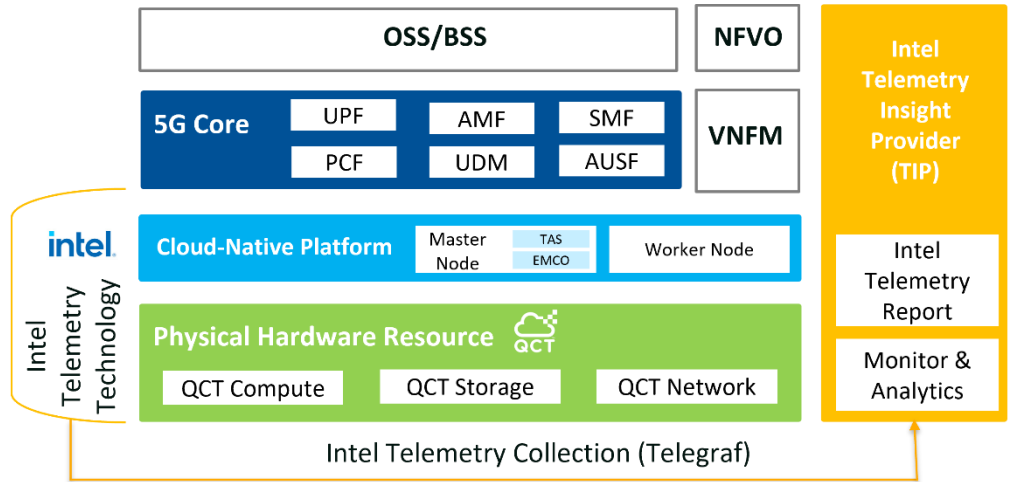
Figure 2. Solution Architecture.

Key Technology

Intel Technology Telemetry Insight Provider (TIP)

Intel TIP provides operational metrics and insights on platform availability, utilization, overload, and configuration issues, as shown in Figure 3. These insights can be used to notify users and provide key inputs for remediation actions by automated control systems — as part of an observability solution in closed-loop systems. The report for each insight can be generated independently and leveraged by end-users to trigger corrective actions in domains where needed.
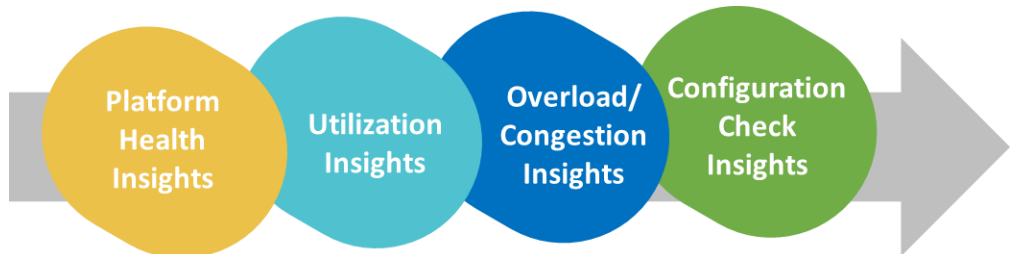

Figure 3. Categories of Telemetry Reports.

Intel Technology Telemetry Aware Scheduling (TAS)

Intel TAS is an add-on component to the Kubernetes scheduler that consumes platform metrics and makes intelligent scheduling decisions. Scheduling and de-scheduling decisions are made through a defined policy, enabling rule-based decisions on pod placement based on telemetry inputs.

Intel Edge Multi-Cluster Orchestration (EMCO)

To distribute services flexibly and automatically, Intel EMCO is a distributed application orchestrator, which can be leveraged on QCT Cloud-Native Platform to interact with edge clients on the automation of applications and service deployment across multiple clusters.

Cloud-Native Platform

Cloud-native platform is a system for automating deployment, scaling, and management of containerized applications. On this platform, Intel OpenNESS framework can also be adopted to enable the highly-optimized manageability of applications and network functions across the different networks.

Telegraf

Telegraf is an open-source plugin-driven server agent, which can be adopted to collect and report metrics. Telegraf has plugins to source a variety of metrics directly from a system. It is a daemon that can run on any server and collect a wide variety of resource metrics such as CPU and memory utilization.

Use Case – Fault Management

By using insight reports obtained from specific metrics, the platform health can be monitored to identify issues that may influence the platform availability and then trigger the correct remediation to prevent service downtime. Take fault management as an example. Memory errors are defined as metrics for monitoring, with 5GC as a service running on top of the platform. In Figure 4, PCF and AUSF services respectively executed on Worker 1 and Worker 2 in the beginning, while the original nodes encounter an unexpected condition, workload can be re-scheduled to Worker 3 based on the metrics and pre-defined policy. Further, Intel technology TIP and TAS provide host insights to Kubernetes scheduling extension that triggers corrective healing actions on workloads and influences workload placement decisions. Without the workload placement, it will occur the 5GC network service outage and then lead to a customer complaint. In this project, we take memory error as an unexpected condition that will impact the 5GC service, telco operators can collect any metrics for monitoring and define the policy for the workload placement decision through Intel technology TIP and TAS to achieve the closed-loop automation that prevents the service downtime.
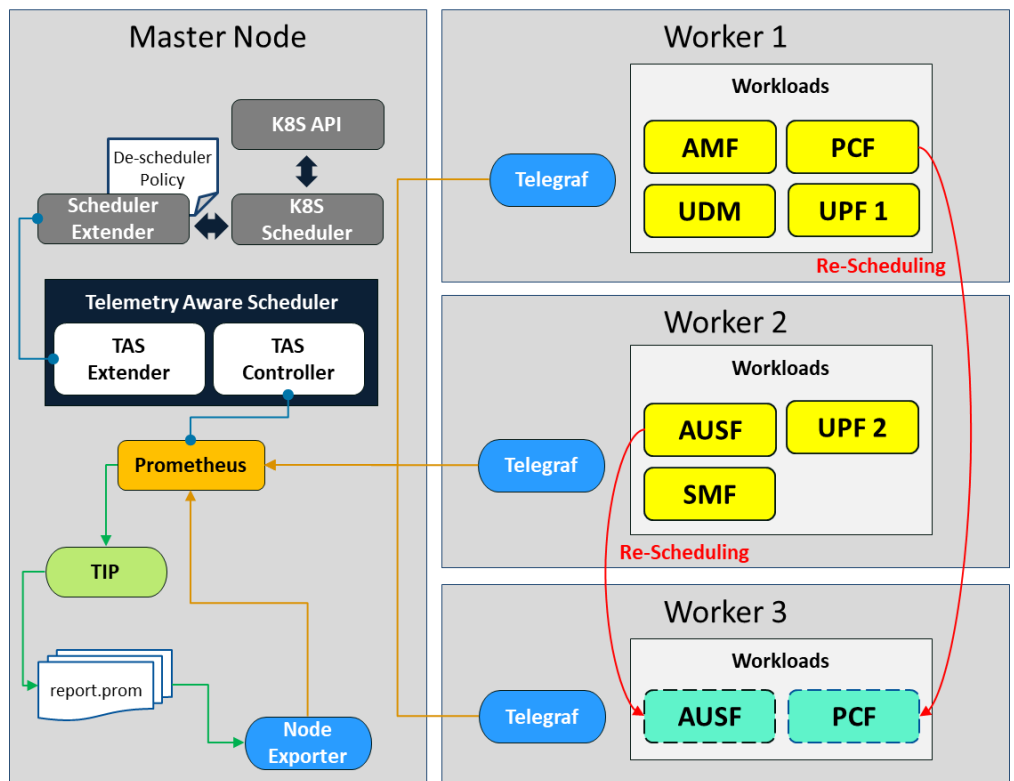

Figure 4. Fault Management Topology.

Hardware Configuration

QuantaGrid D53XQ-2U is the optimal system selected for NFVi solutions as it provides expansion slots to support scalable and flexible I/O options. The server features up to 10x PCIe 4.0 expansions that facilitates discovery and provisioning of networking, storage, and other peripherals to improve performance and manageability. In addition, 3rd Gen Intel® Xeon Scalable Processor is selected to optimize network performance and energy efficiency, delivering services with high throughput and low latency. The suggested server is the best-

suited infrastructure for telco operators who are looking for high-compute, low-latency, and high-throughput solutions, as shown in Table 1.

Table 1. Hardware Configuration.

Product Name: QuantaGrid D53XQ-2U Dimension: 447 x 87.4 x 780 (mm)		
Item	**Description**	**unit**
Processor	Intel® Xeon® Gold 6338N Icelake-SP 32 Core	2
Network Controller	Intel E810-CQDA2 (100G)	6
	Intel X710-DA4 OCP3.0 (10G)	1
Storage	Intel® SSDD3S4610Series SATAIII 1.92TB	2
Power Supply	1600W Platinum	3

Summary

The cloud infrastructure with high-quality network is indispensable nowadays; nevertheless, the network system becomes complicated and stringent due to the growing number of subscribers along with massive traffic throughput and variety of innovative 5G use cases. With the adoption of Intel technology TIP and TAS, the closed-loop automation solution provides actionable insights, maximizes service availability, and optimizes automated workload placement, enabling telecom operators to effortlessly achieve network transformation.

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ABOUT QCT

Quanta Cloud Technology (QCT) is a global data center solution provider. We combine the efficiency of hyperscale hardware with infrastructure software from a diversity of industry leaders to solve next-generation data center design and operation challenges. QCT serves cloud service providers, telecoms, and enterprises running public, hybrid and private clouds.
Product lines include hyperconverged and software-defined data center solutions as well as servers, storage, switches and integrated racks with a diverse ecosystem of hardware components and software partners. QCT designs, manufactures, integrates and services cutting-edge offerings via its own global network. The parent of QCT is Quanta Computer, Inc., a Fortune Global 500 corporation.
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