ENI ISG PoC Report Template

1 General

The following normative disclaimer shall be included on the front page of a PoC report:

> *Submission of this ENI ISG PoC Report as a contribution to the ENI ISG does not imply any endorsement by the ENI ISG of the contents of this report, or of any aspect of the PoC activity to which it refers.*

2 ENI ISG PoC Report

2.1 PoC Project Completion Status

- Overall PoC Project Completion Status: completed

2.2 ENI PoC Project Participants

- PoC Project Name: Intent-based Cloud Management
- Network Operator/Service Provider: NTT Corporation

  Contact: Chao Wu (Chao.wu.ex@hco.ntt.co.jp)
- Manufacturer A: Intel

  Contact: Emma Collins(emma.collins@intel.com)

  Haining Wang (haining.wang@intel.com)

  Chris Cavigioli (chris.cavigioli@intel.com)
- Manufacturer B: Intracom Telecom

  Contact: Anastopoulos Nikos(nanastop@intracom-telecom.com)
- Manufacturer C: NTT- AT

  Contact: Takaaki.Tanaka(takaaki.tanaka@ntt-at.co.jp)

2.3 Confirmation of PoC Event Occurrence

- **Demonstration on ETSI ENI #20 plenary meeting**

Figure1 Demonstration of UC#1 IBCM for VDI service

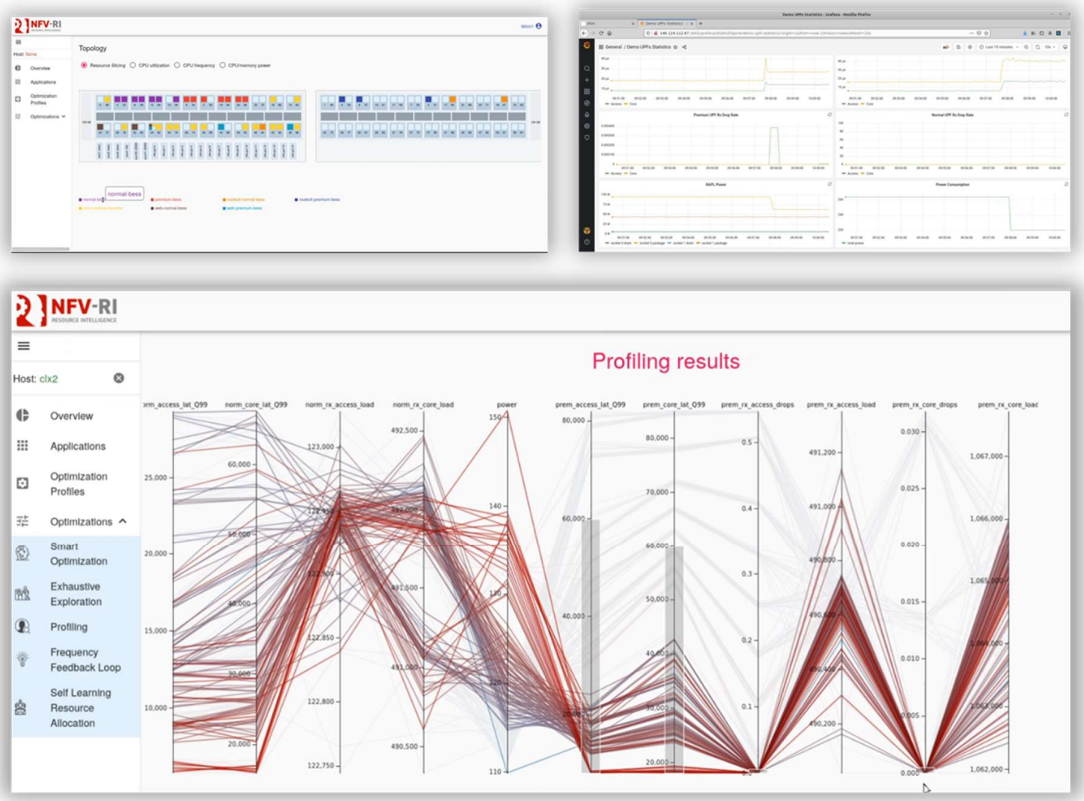
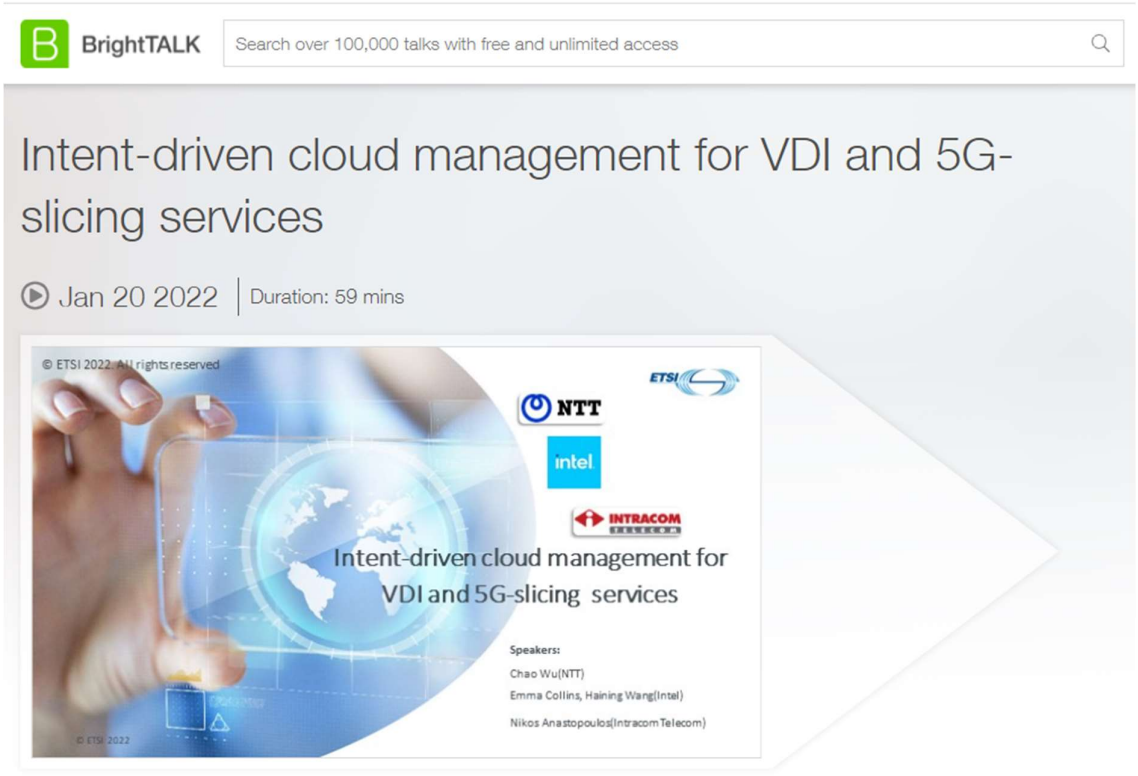


Figure 2 Demonstration of UC#2 IBCM for NFV service

- **Presentation on the Bright talk (Jan 20,2022)**



2.4 PoC Goals Status Report

PoC Project Goal #1: Identify representative scenarios of intent-based cloud management.

Goal Status: Met

We have identified 2 important use case as follows.

UC #1 Intent-based Cloud Management for VDI service

UC #2 Intent-based Cloud Management for NFV workloads

- Brief introduction of UC#1

Preconditions: In a VDI service, virtual desktop environments are implemented as VM instances on public/private cloud hosts. VDI users conduct their daily work in the virtual desktop instances.

Problem with conventional approach: In order to maintain users' QoE , VDI administrators need to determine and adjust the number of VMs to be placed on the each host appropriately. However, this decision requires a

high level of skill and experience. Improper decision can lead to poor user experience or low resource efficiency.

Objective: IBCM automatically calculates the optimum number of VMs that does not deteriorate the user experience. Thus realizes reduction of human cost and resource cost.

- Brief introduction of UC#2

Problem description

As a mobile network operator, owning and operating NFV Infrastructure at the Core or at the Edge, I need to find ways to run NFV and Edge workloads in the most resource-efficient manner, while always maintaining Service-Level Objectives ("intents")

Objectives

Automatic & intent-based discovery of resource allocations for workloads on NFVI servers

Dynamic adaptation of resource allocations to accommodate runtime changes

Minimization of resources allocated to each workload to reduce energy footprint

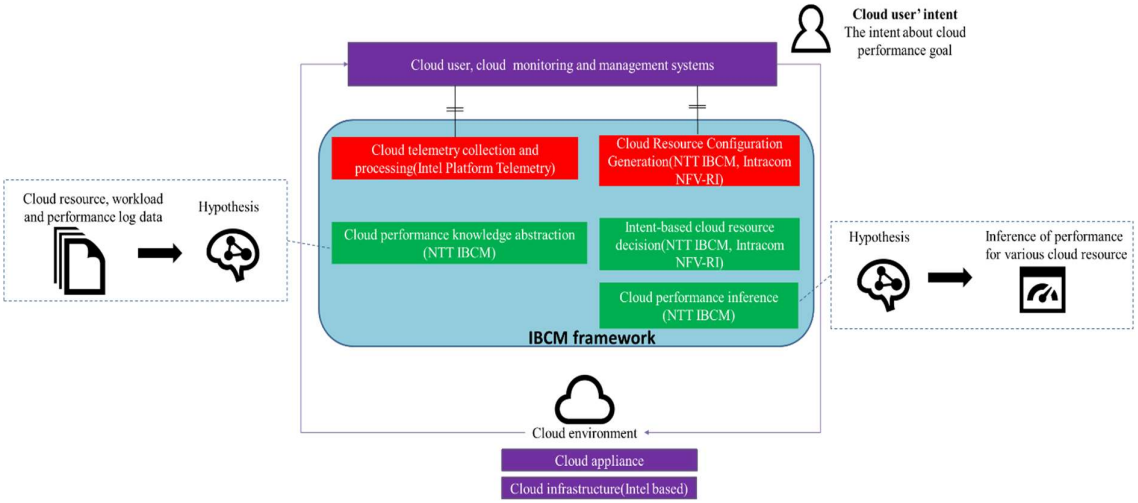
Safe and dense colocation of workloads to further improve energy footprint

Minimization of time needed to discover optimal resource allocations

 PoC Project Goal #2: Demonstrate intent-based cloud management's application in one or multiple identified scenarios, i.e., demonstrate the use of intent and AI algorithms to enable autonomous cloud resource decision according to the cloud performance goal (intent), and assess its for cloud service OPEX reduction.

Goal Status: Met

We have demonstrate intent-based cloud management's application for VDI service (UC#1) and NFV workloads (UC#2). The overall architecture we applied for the demos are as follows.



- Demonstration for UC#1

In the implementation, we have collected the VDI performance log data using platform telemetry and build the IBCM model. By using IBCM, the VDI operator firstly specifies the intent through the GUI, then IBCM checks if the current resource configuration meets the intent, if not, IBCM calculates the number of instances to be

allocated to the host that meet the intent, and show the expected performance. The result is fed back to the operator for confirmation. The decision is transformed into machine-readable resource orchestration template and handed to VDI resource management system for implementation.

- Demonstration for UC#2

In the demonstration, we showed how IBCM can help a CSP automatically adjust the resources of two collocated 5G User Plane Functions (UPFs) to meet different packet latency and packet drop service-level intents, according to the priority of their corresponding 5G slice ("premium"/ "normal"). To affect such performance metrics, low-level CPU resources like frequency, last-level cache capacity and memory bandwidth had to be considered. The demo considered three scenarios, starting from the simplest one and reaching up to a highly complicated: a) static provisioning of resources to efficiently handle the UPFs' peak traffic load, b) dynamic adaptation of resources, in line with the UPFs' current traffic load, and c) dynamic adaptation of resource in line with load, and under the presence of best-effort workloads. In all cases, IBCM successfully managed to keep the latency and packet drop intents always satisfied, by using the least amount of resources.

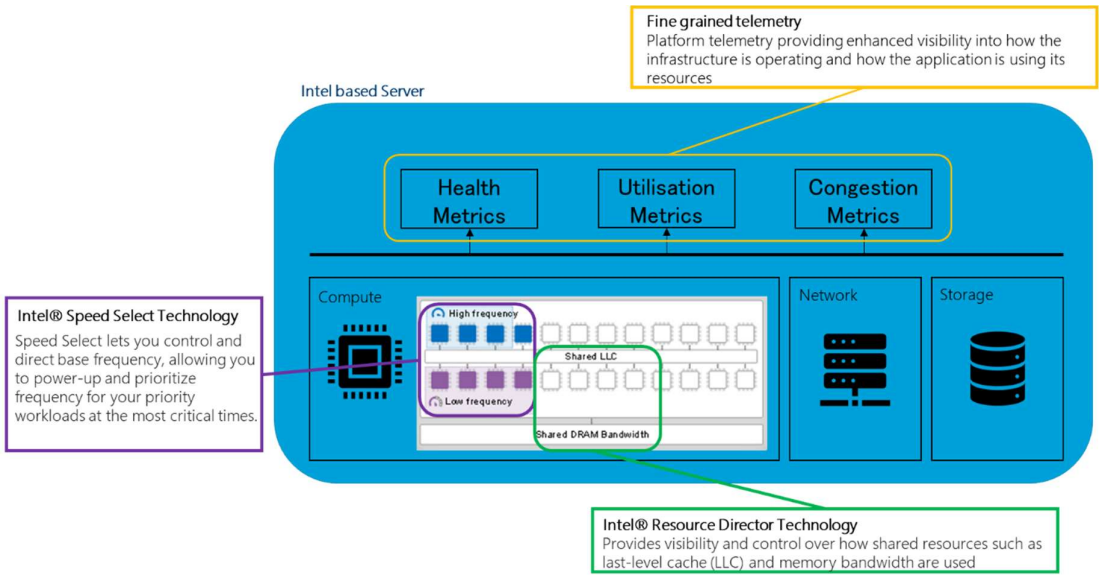
□ PoC Project Goal #3: Demonstrate telemetry collection for intent-based cloud management. Demonstrate the collection of multi-layer telemetry data from the cloud environment and using these telemetry data to train AI models for intent-based cloud management.

Goal Status: Met

Intel provides a wealth of telemetry from our platforms, giving insights into platform health, resource utilisation and congestion issues. Some of this telemetry is being used in the PoC to feed Intracoms IBCM so it can determine the optimum resources required to deliver the intended SLO's for the collocated workloads.

Once the optimum config is determined, the Intel technologies used to deliver the SLO's are Intel® Speed Select Technology, which lets you control and direct base frequency, allowing you to power-up and prioritize frequency for your priority workloads at the most critical times.

And Intel ® Resource Director Technology which provides visibility and control over how shared resources such as last-level cache (LLC) and memory bandwidth are used.



2.5 PoC Feedback Received from Third Parties (Optional)

Where applicable, provide in a free text, feedback received from potential customers, Ecosystem partners, event audience and/or general public.

We have received the following feedbacks from the audience in ENI plenary meetings and Bright talk.

- Question about other application scenarios of IBCM
  - We are currently applying IBCM to various cloud application including web conferencing, smart factory, etc.
- Question about how the parameters are decided in the intent
  - Currently the value of parameters for the intent is decided by the operator, e.g. the threshold of latency, response time. For future work, we are working on automatically abstracting the parameters and desired value.
- Question about whether workload prediction is included in IBCM
  - IBCM get the information of future workload with several approach: IBCM infers the future workload from the past workload patterns; IBCM calculates the future workload from the service reservation information, e.g., web conference reservation.

3 ENI PoC Technical Report (Optional)

3.1 General

3.2 PoC Contribution to ENI ISG

Use table B.1 to list any contributions to the ENI ISG resulting from this PoC Project.

Table B.1

Contribution	WG	WI/Document Ref	Comments
ENI(22)021_028r1	ENI ISG	ETSI GS ENI 001 Use Case	We have contributed the PoC use cases to ENI corresponding documents
ENI(22)021_009	ENI ISG	ETSI GS ENI 002 Requirements	We have contributed requirements abstracted from the PoC to ENI corresponding documents

3.3 Gaps identified in ENI standardization

3.4 PoC Suggested Action Items

3.5 Additional messages to ENI

Intent-based management has been discussed in various SDOs. It will be helpful for CSPs and vendors if the SDOs could collaborate to identify the common knowledge and the differences.

3.6 Additional messages to Network Operators and Service Providers

We encourage network operators and service providers to discuss about possible business scenarios of intent-based management, and how to enhance the application of intent-based management in the industry.