ENI ISG - PoC Proposal

1 PoC Project Details

1.1 PoC Project

PoC Number (assigned by ETSI): PoC#18

PoC Project Name: Intent-driven Operating for User-Centric Cloud-Network Convergence Services

PoC Project Host: China Telecom

Short Description:

This PoC will provide an intent-based cloud private line (CPL) service, which can connect cloud service users to edge or cloud data centres, and edge or cloud data centres to each other, with deterministic connection performance. In the service, user's intents of using computing resources are also taken into account. In this PoC, we will demonstrate intent translation (NLP models) and intent instance creation to fulfil users' intent. In particular, in the proposed CPL service, this PoC aims to verify that when the network state changes or the users' intent changes, the intent requirements can still be satisfied by the ENI system. The closed-loop automation mechanism continuously validates and monitors the conditions of the network against the intent specification to ensure compliance with the intent.

This PoC refers to GS ENI 005 System Architecture, GR ENI 015 Processing and Management of Intent Policy, GR ENI 017 Overview of Prominent Control Loop Architectures, and GS ENI 030 Transformer Architecture for Policy Translation. The service in this PoC is developed on ONAP, and its implementation aligns with the ENI standards.

Related outputs can contribute to ENI 001 (Use cases), ENI 002 (Requirements), ENI 004 (Terminology) and ENI 015 (Intent Processing and Management), making this PoC a general reference for similar scenarios.

1.2 PoC Team Members

Table A.1

	Organization name	ISG ENI participant (yes/no)	Contact (Email)	PoC Point of Contact (see note 1)	Role (see note 2)	PoC Components
1	China Telecom	yes	Zhen Li liz779@chinatelecom.cn Dong Wang wangd5@chinatelecom.cn	X	network operator	Design, development and integration of intent-driven user-centric cloud-network convergence services
2	Huawei	yes	Henry Yu henry.yu1@huawei.com		infrastructure provider	Design and development of cloud-network convergence environment
3	AsiaInfo	yes	Lei Shi shilei8@asiainfo.com		infrastructure provider	Deployment of demo environment
4	Beijing University of Posts and Telecommunications (BUPT)	yes	Xiqing Liu liuxiqing@bupt.edu.cn Shi Yan yanshi01@bupt.edu.cn Yaohua Sun sunyaohua@bupt.edu.cn		university	Enhancement of network AI model and algorithm for network optimization
5	Xidian University	no	Chungang Yang cgyang@xidian.edu.cn		university	Design of intent-driven services and enhancement of intent translation based on NLP model.

NOTE 1: Identify the PoC Point of Contact with an X.
NOTE 2: The Role will be network operator/service provider, infrastructure provider, application provider or other as given in the Definitions of ETSI Classes of membership.

All the PoC Team members listed above declare that the information in this proposal is conformant to their plans at this date and commit to inform ETSI timely in case of changes in the PoC Team, scope or timeline.

1.3 PoC Project Scope

1.3.1 PoC Goals

This PoC will demonstrate aspects of various requirements identified in GS ENI 002, including: General requirements, Data Collection and Analysis, Service orchestration and management, Data learning, Model training and iterative optimization, Policy Management, etc.

This PoC will demonstrate the use of AI based data analysis to translate intents in the cloud-network convergence services.

The PoC will demonstrate in a testbed environment how ENI system can be used to support intent policy in the cloud-network convergence services. The detailed goals include:

- **The PoC will** demonstrate that the intent instance can be created to meet the intent requirements of the users.
- **The PoC will** demonstrate that the ENI system can still meet the intent requirements of the user, when the network state changes or the users' intents changes.

1.3.2 PoC Topics

PoC Topics identified in this clause need to be taken for the PoC Topic List identified by ISG ENI and publicly available. PoC Teams addressing these topics commit to submit the expected contributions in a timely manner.

Table A.2

PoC Topic Description (see note)	Related WI	Expected Contribution	Target Date
New use case for Intent-driven Operating for User-Centric Cloud-Network Convergence Services	ENI 001 Use Cases	Propose new use case on Intent-driven Operating for User-Centric Cloud-Network Convergence Services	03/2024
New requirements for Intent-driven Operating for User-Centric Cloud-Network Convergence Services	ENI 002 Requirements	Propose new requirements on Intent-driven Operating for User-Centric Cloud-Network Convergence Services	02/2024
Update the Terminology WI on Intent-driven Operating for User-Centric Cloud-Network Convergence Services	ENI 004 Terminology	Update definitions in Terminology WI	01/2024
New use case for Intent-driven Operating for User-Centric Cloud-Network Convergence Services	ENI 015 Processing and Management of Intent Policy	Contribute to new use case in ENI 0025 WI (Processing and Management of Intent Policy)	07/2023
NOTE: This column should be filled according to the contents of table 1.			

1.3.3 Other topics in scope

List here any additional topic for which the PoC plans to provide input/feedback to the ISG ENI.

Table A.3

PoC Topic Description	Related WI	Expected Contribution	Target Date

1.4 PoC Project Stages/Milestones

Table A.4

PoC Milestone	Stages/Milestone description	Target Date	Additional Info
P.S	PoC Project Start	June 2023	Presentation at ENI#26 plenary meeting
P.TP.1	PoC User Story finalization	July 2023	Finalization of the high-level description of the scenario.
P.C.1	PoC Expected Contribution 1	July 2023	Contribution to ENI 0025 WI
P.TP.2	PoC Test Plan 1	September 2023	AI based Intent translation and intent instance creation of the cloud-network convergence scenario.
P.D1	PoC Demo	September 2023	Demo at TMF Catalyst meeting
P.TP.3	PoC Test Plan 2	December 2023	Users' intent modification and fulfilment of the scenario.
P.C.2	PoC Expected Contribution 2	January 2024	Contribution to ENI terminology
P.D2	PoC Demo	February 2024	Demo at LFN Developer & Testing Forum
P.TP.4	PoC Test Plan 3	February 2024	Closed-loop to meet network state changes of the scenario.
P.C.3	PoC Expected Contribution 3	February 2024	Contributions to ENI requirement
P.C.4	PoC Expected Contribution 4	March 2024	Contributions to ENI use case
P.D3	PoC Demo	March 2024	Demo at an ENI plenary meeting.
P.R	PoC Report	May 2024	PoC-Project-End Feedback
P.E	PoC Project End	June 2024	Presented to ISG ENI for information

1.5 Additional Details

The ONAP use-case information about Operating for Cloud-network Convergence Services is available at the following links:

• https://jira.onap.org/browse/REQ-1411 (Intent-driven Operating for Cloud-network Convergence Services)

• https://jira.onap.org/browse/REQ-1413 (CCVPN Support for Cloud-Network Convergence in London Release)

2 PoC Technical Details

2.1 PoC Overview

Cloud private line (CPL) services connect cloud service users to edge or cloud data centres, and edge or cloud data centres to each other, with deterministic connection performance. They may represent point-to-point, point-to-multipoint, multipoint-to-point, or multipoint-to-multipoint connectivity service topologies, and may be implemented using connected or connection-oriented paradigm-supporting technologies. Data centres may be operated by the CPL service customer, by the CPL services provider, by some other service provider(s), or by any combination of these. CPL service traffic consists in machine-to-machine data flows with a range of characteristics. Some data flows are essentially continuous, may require low or medium bandwidths, and may be anywhere from relatively latency-insensitive to highly latency-sensitive (e.g., synchronous data mirroring). Other data flows may comprise block data transfers, of varying sizes and completion time requirements, may occur on

varying schedules, and may require small to very large bandwidths; they may also have varying latency sensitivities.

In the cloud-network convergence scenario, users have the need to use enough bandwidth as well as the computing resources. Due to real-time changes in data flow, with the purpose of intent assurance, the closed-loop mechanism should be employed to monitor the actual bandwidth usage and to adjust the maximum bandwidth to avoid traffic congestion.

This PoC is proposed to demonstrate the procedure of intent-based policy management in the cloud-network convergence scenario. As shown in Fig.1, this PoC consists of three parts.

- Intent translation and intent instance creation. The user (or intent consumer) expresses an intent of creating a cloud-network convergence service. This intent is then automatically fulfilled by provisioning the corresponding services and allocating the required resources.
- Intent interaction. The already fulfilled intent can be modified by the user (or intent consumer). The new intent can be automatically fulfilled by provisioning the corresponding services and allocating the required resources.

Intent guarantee. The Intent-based system monitors the parameters of the cloud-network convergence service (e.g., bandwidth usage), and automatically triggers the closed-loop actions (e.g., increase max bandwidth) in order to guarantee the intent.

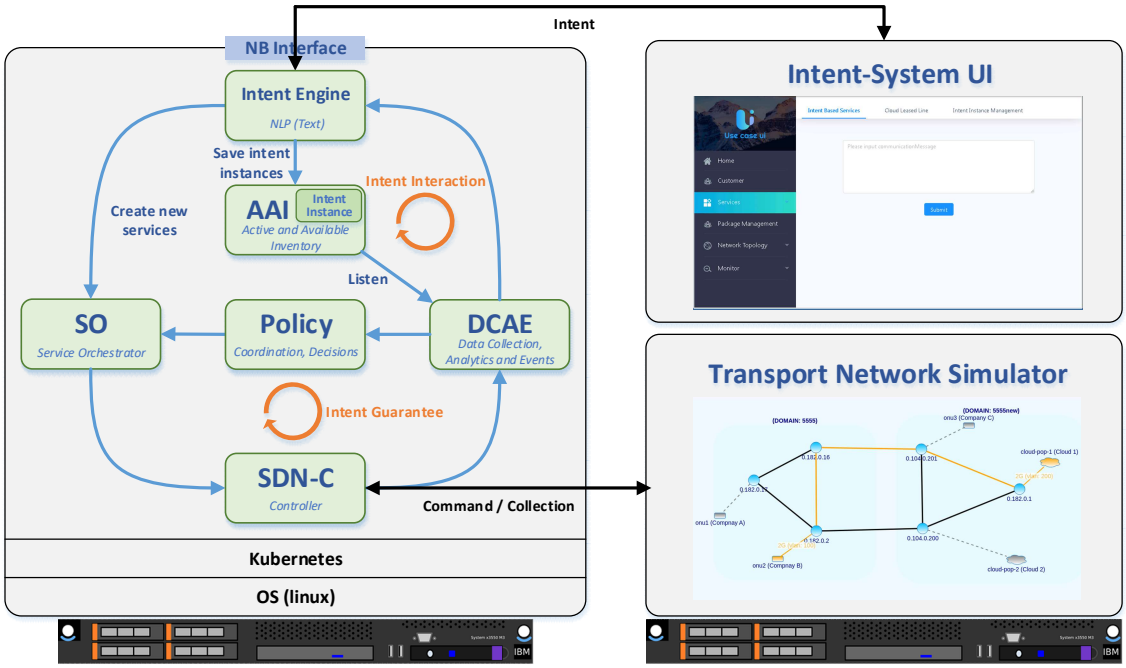

Figure 1: Modules of this PoC.

2.2 PoC Architecture

The diagram below shows the framework of the PoC mapping to the ENI reference architecture.

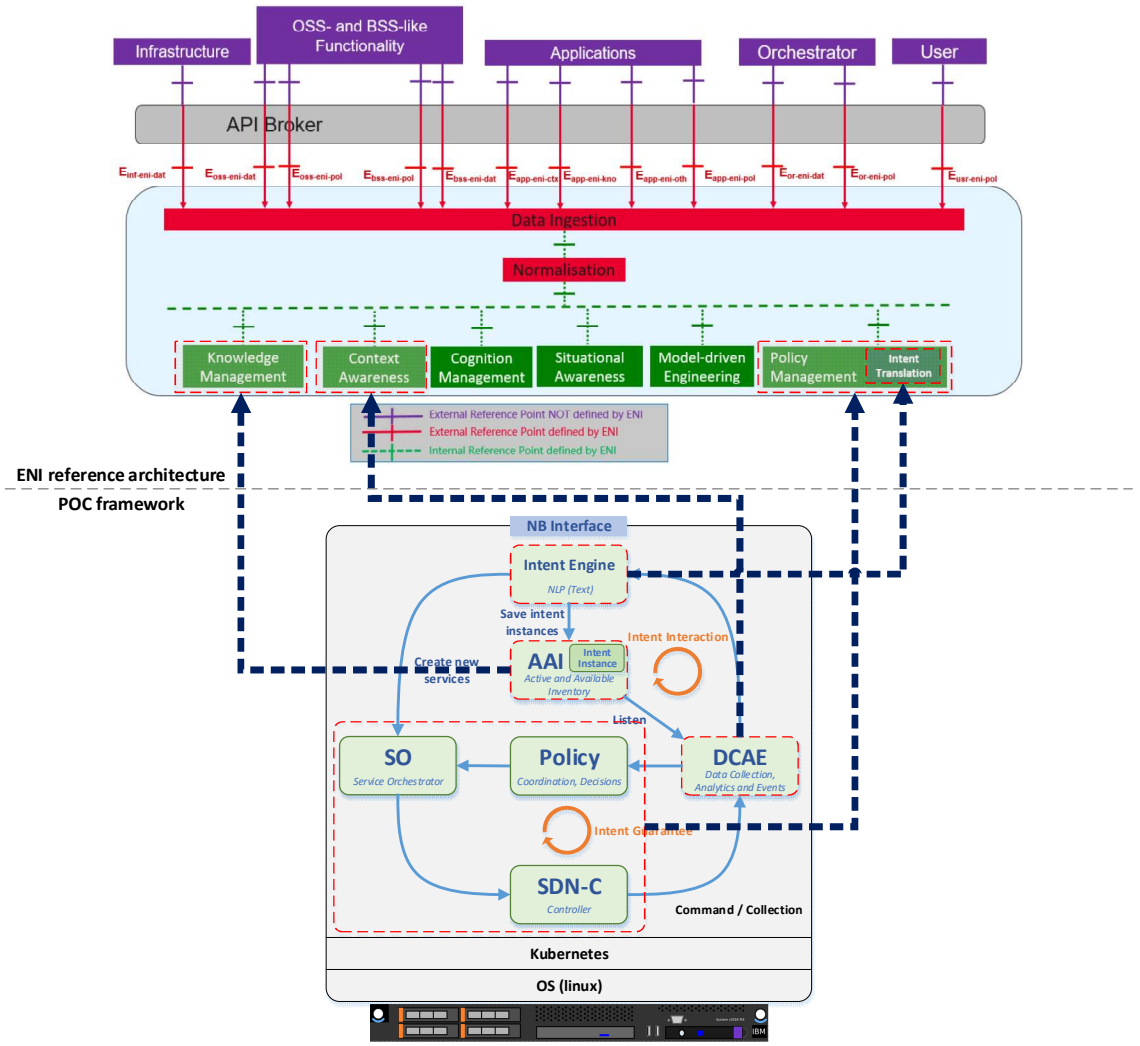

Figure 2: PoC architecture mapped to ENI reference architecture

The Intent Engine can be mapped to the Intent Translation functional blocks (FBs) of the ENI architecture. The flow is triggered by the user inputting the intent, which then triggers the intent translation process. To create the intent instance, SO module proceeds the intent orchestration process, followed by the traditional SDN orchestration and control performed by SO and SDNC, so that the user's intent is fulfilled.

DCAE can be mapped to Context-Aware management blocks, which monitors and validates the network state against the service level agreement (SLA) which is derived from the user's intent by the intent translation process. AAI can be mapped to Knowledge Management FBs of the ENI system, which is employed for collecting data and information from external sources.

Policy, SO, and SDN-C can be mapped to Policy Management FBs, which are used to send recommendations, commands, and associated data and metadata to external entities. Policy helps to make the closed-loop decisions based on the data insights received from DCAE and issues proper recommendations to SO to execute service changes to achieve the intent. In this cloud-network convergence scenario, the SO and SDNC decide which configurations (e.g., increase max bandwidth) should be applied to optimize the network performance.

References

1. ETSI GS ENI 001 (V3.2.1), "Experiential Networked Intelligence (ENI); ENI use cases".

2. ETSI GS ENI 002 (V3.2.1), “Experiential Networked Intelligence (ENI); ENI requirements”.
3. ETSI GR ENI 015 (V0.0.15), “Experiential Networked Intelligence (ENI); Processing and Management of Intent Policy”.
4. ETSI GR ENI 017 (V2.1.4), “Experiential Networked Intelligence (ENI); Overview of Prominent Control Loop Architectures”.
5. ETSI GS ENI 030 (V0.0.6), “Experiential Networked Intelligence (ENI); Transformer Architecture for Policy Translation”.