ETSI GS ENI 001 V2.1.1 (2019-09)

Experiential Networked Intelligence (ENI); ENI use cases

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Reference

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This Group Specification (GS) has been produced by ETSI Industry Specification Group (ISG) Experiential Networked Intelligence (ENI).

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1 Scope

The present document specifies a collection of use cases from a variety of stakeholders, where the use of an Experiential Networked Intelligence (ENI) system can be applied to the fixed network, the mobile network, or both, to enhance the operator experience through the use of network intelligence. The present document is a revision of ETSI GR ENI 001 [i.1]. It identifies and describes additional use cases and scenarios. It also gives the baseline on how the studies in ENI can be applied as solutions of the identified use cases in accordance with the ENI Reference Architecture.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at https://docbox.etsi.org/Reference.

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Not applicable.

2.2 Informative references

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NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI GR ENI 001 (V1.1.1): "Experiential Networked Intelligence (ENI); Use Cases".

[i.2] NGMN Alliance: "Description of Network Slicing Concept", Version 1.0, January 13, 2016.

NOTE: Available at https://www.ngmn.org/fileadmin/user_upload/160113_Network_Slicing_v1_0.pdf.

[i.3] 3GPP TR 23.799 (V14.0.0): "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Study on Architecture for Next Generation System Release 14", December 2016.

[i.4] A. Morton, AT&T Labs: "Considerations for Benchmarking Virtual Network Functions and Their Infrastructure", July 2017.

[i.5] ETSI TS 132 101 (V11.4.0): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Telecommunication management; Principles and high level requirements (3GPP TS 32.101 version 11.4.0 Release 11)".

[i.6] ETSI TS 128 530 (V15.1.0): "5G; Management and orchestration; Concepts, use cases and requirements (3GPP TS 28.530 version 15.1.0 Release 15)".

[i.7] ETSI GR NFV-EVE 012 (V3.1.1): "Network Functions Virtualisation (NFV) Release 3; Evolution and Ecosystem; Report on Network Slicing Support with ETSI NFV Architecture Framework".

[i.8] ETSI GS ENI 002 (V1.1.1): "Experiential Networked Intelligence (ENI); ENI requirements".

[i.9] ETSI GS ENI 005: "Experiential Networked Intelligence (ENI); System Architecture; Release 1".

[i.10] ETSI GR ENI 004: "Experiential Networked Intelligence (ENI); Terminology for Main Concepts in ENI".

[i.11] IETF RFC 6645: "IP Flow Information Accounting and Export Benchmarking Methodology".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI GR ENI 004 [i.10] apply.

3.2 Symbols

Void.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AI	Artificial Intelligence
AP	Access Point
API	Application Programming Interface
BBU	Baseband Unit
BRAS	Broadband Remote Access Server
BSS	Business Support System
CCO	Capacity and Coverage Optimization
CGN	Carrier Grade Network address translation
CPRI	Common Public Radio Interface
CPU	Computing Processing Unit
C-RAN	Centralized RAN
DC	Data Centre
DDOS	Distributed Denial Of Service
DHCP	Dynamic Host Configuration Protocol
D-RAN	Distributed RAN
E2E	End-to-End
ENI	Experiential Networked Intelligence
FTP	File Transfer Protocol
IDC	Internet Data Centre
INFP	Intelligent Network Failure Prevention
IP	Internet Protocol
KPI	Key Performance Indicator
MANO	Management and Orchestration
MEC	Multi-access Edge Computing
MIMO	Multiple Input Multiple Output
MPLS	Multi-Protocol Label Switching
NF	Network Function
NFV	Network Function Virtualisation
NFVI	NFV Infrastructure
NGFI	Next Generation Fronthaul Interface
NGMN	Next Generation Mobile Networks
NSI	Network Slice Instances

OPEX	OPerational EXpenditure
OS	Operating Systems
OSS	Operations Support System
PHY	PHYsical layer
QoE	Quality of Experience
QoS	Quality of Service
RAM	Random Access Memory
RAN	Radio Access Network
RAU	Remote Aggregation Unit
RCC	Radio Cloud Centre
RF	Radio Frequency
RRU	Remote Radio Units
RSRP	Reference Signal Received Power
SDN	Software Defined Networking
SD-WAN	Software-Defined Wide Area Network
SLA	Service-Level Agreement
TCP	Transmission Control Protocol
UE	User Equipment
VM	Virtual Machines
VNF	Virtualized Network Functions
WAN	Wireless Access Network
WLAN	Wireless Local Area Network

4 Overview

4.1 Background

Operators see human-machine interaction as slow, error-prone, expensive, and cumbersome. For example, operators are worried about the increasing complexity of integration of different standardization platforms in their network and operational environment; this is due to the vast differences inherent in programming different devices as well as the difficulty in building agile, personalized services that can be easily created and torn down. These human-machine interaction challenges are considered by operators as barriers to reducing the time to market of innovative and advanced services. Moreover, there is no efficient and extensible standards-based mechanism to provide contextually-aware services (e.g. services that adapt to changes in user needs, business goals, or environmental conditions).

These and other factors contribute to a very high OPerational EXpenditure (OPEX) for network management. Operators need the ability to automate their network configuration and monitoring processes to reduce OPEX. More importantly, operators need to improve the use and maintenance of their networks. In particular, this requires the ability to visualize services and their underlying operations so that the proper changes can be applied to protect offered services and resources (e.g. ensure that their Quality of Service (QoS) and Quality of Experience (QoE) requirements are not violated). If such visualization could be provided, then operators would be better able to maintain their networks.

The associated challenges may be stated as:

a) automating complex human-dependent decision-making processes;

b) determining which services should be offered, and which services are in danger of not meeting their Service-Level Agreement (SLA)s, as a function of changing context;

c) defining how best to visualize how network services are provided and managed to improve network maintenance and operation; and

d) providing an experiential architecture (i.e. an architecture that uses various mechanisms to observe and learn from the experience an operator has in managing the network) to improve its understanding of the operator experience, over time.

The aforementioned challenges will require advances in network telemetry, big data mechanisms to gather appropriate data at speed and scale, machine learning for intelligent analysis and decision making, and applying innovative, policy-based, model-driven functionality to simplify and scale complex device configuration and monitoring.

4.2 Overview of the ENI System

4.2.1 Brief Description

The ENI system is an innovative, policy-based, model-driven functional entity that understands the configuration and takes actions in accordance with changes in context, such as the environment, the dynamic demand of the resources, and the varying service requirements. By exploiting emerging technologies, such as big data analysis and artificial intelligence mechanisms, and also by automating (where possible) complex human-dependent decision-making processes, the ENI system enables intelligent service operation and management, and provides the ability to ensure that automated decisions taken by the system are correct and are made to increase the stability and maintainability of the network and the applications that it supports.

Examples of the possible functionalities of an ENI system are given in Figure 4-1.

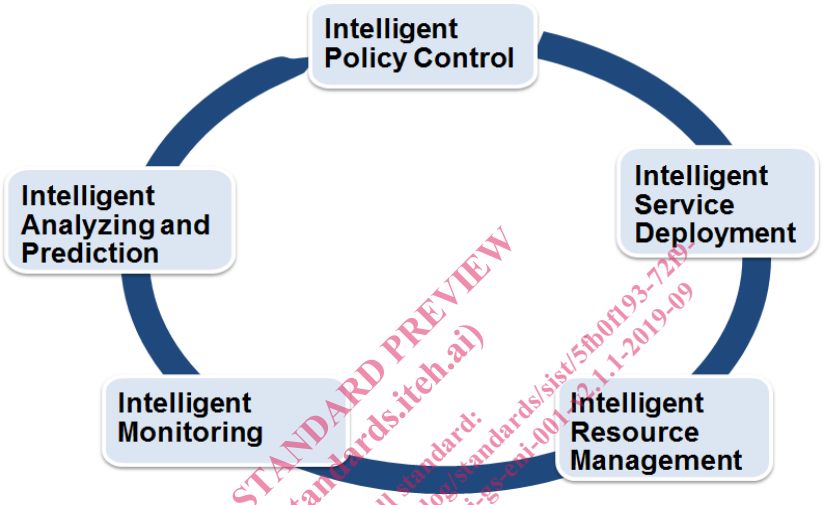

Figure 4-1: Example of functionalities of ENI system

4.2.2 Expected Benefits

ENI system delivers enhanced customer experience by allowing operators to understand the operating status of their network and networked applications in near-real-time, and reconfigure their network. The ENI system automatically collects network status and associated metrics, faults, and errors, and then uses artificial intelligence to ensure network performance and quality of service are met at the highest possible efficiency (e.g. with the minimum required resources). An ENI system can also be used to find bottlenecks of service and/or failure of network. Both of these benefits are done on-demand, in response to changing contextual information.

The ENI system helps to increase the value of services provided by an operator to its customers by rapidly on-boarding new services, enabling the creation of a new ecosystem of cloud consumer and enterprise services, reducing Capital and Operational Expenditures, and providing efficient operations.

5 General use cases

5.1 Introduction

This clause describes the use cases and scenarios identified by the ENI ISG. Each use case includes a description of how an ENI system can be applied, and the benefits it provides. Examples to show how the mapping of the Reference Architecture of ENI, specified in [i.9], can be done through a few different use cases, are also given. It is noted that such mapping, including the reference points and roles of functional blocks, is not the specification of the implementation of these use cases, but should only be seen as examples and based on the current ENI Reference Architecture [i.9]. It is also noted that the applicability of each functional block in terms of what is its role in the overall implementation of the Use Case can only be seen as an example, based the current ENI Reference Architecture [i.9]. When the reference Architecture [i.9] changes, and overall doubts have been solved by architecture experts, text on quotes and particular interpretation of the contents may be modified.

A list of the use cases included in the present document are categorized into the following four categories (Table 5-1):

1) Infrastructure Management: This category of use cases covers the processes related to the management of the network infrastructure (e.g. adjustment of allocated and provided services, maintenance, capability specification, and planning). In particular, it is about using policies for managing the network infrastructure, enabled by placing analytics in the control loop and using the results of the analytics as part of the input to policy-based management of the infrastructure.

2) Network Operations: Use cases described in this category are concerned with running the network, where the runtime contexts of the network are extracted and analysed, and the management operations are performed and optimized dynamically at runtime.

3) Service Orchestration and Management: This category of use cases relates to the service and order management, covering processes such as activation using the operator's business channels or customer portals. It is about providing differentiated SLAs for different applications, including vertical applications, through the application of machine learning in an intelligent entity, i.e. ENI. For example, services can be differentiated based on level (e.g. gold vs. silver vs. bronze classes of service) as well as based on the type of application within a level (e.g. a video streaming service has a different service than FTP, even though both are applications that a particular customer has).

4) Assurance: Use cases described in this category are concerned with the functionality of network monitoring, trending, and prediction, as well as taking policy-based actions using knowledge learned from the network to facilitate network maintenance. This includes service runtime operations dedicated to guarantee continuous service delivery.