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Experiential Networked Intelligence (ENI); ENI requirements

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Foreword

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

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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1 Scope

The present document captures the requirements of how intelligence is applied to the network and applications in different scenarios to improve experience of service provision and network operation. Also, how intelligence enables dynamic autonomous behaviour and adaptive policy driven operation in a changing context. The ENI requirements are based on the ENI use case document and identified requirements from other SDOs. These requirements will form the base for the architecture design work.

The present document includes:

- Requirements derived from API descriptions
- Requirements derived from System Architecture
- Requirements derived from new use cases

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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The following referenced documents are necessary for the application of the present document.

Not applicable.

2.2 Informative references

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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: "Experiential Networked Intelligence (ENI); ENI use cases".

[i.2] ETSI TS 102 165-1 (V5.2.3): "CYBER; Methods and protocols; Part 1: Method and pro forma for Threat, Vulnerability, Risk Analysis (TVRA)".

[i.3] ETSI GR ENI 004: "Experiential Networked Intelligence (ENI); Terminology for Main Concepts in ENI".

[i.4] ETSI GS NFV-MAN 001 (V1.1.1): "Network Functions Virtualisation (NFV); Management and Orchestration".

[i.5] Service Operations Specification MEF 55: "Lifecycle Service Orchestration (LSO): Reference Architecture and Framework".

[i.6] Regulation (EU) 2016/679 of the European Parliament and of the Council on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation).

[i.7] ETSI GR ENI 003: "Experiential Networked Intelligence (ENI); Context-Aware Policy Management Gap Analysis".

[i.8] ETSI TS 101 158: "Telecommunications security; Lawful Interception (LI); Requirements for network functions".

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

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.3] apply.

3.2 Symbols

Void.

3.3 Abbreviations

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

AI	Artificial Intelligence
API	Application Programming Interface
BP	Back Propagation
CAP	Context Aware related Policy
CAPEX	CAPital EXpenditure
DC	Data Collection

NOTE: Used in the context of servers.

DCA	Data Collection and Analysis
DSL	Domain-Specific Language
EMS	Element Management System
ENI	Experiential Networked Intelligence
GDPR	General Data Protection Regulation
GPM	General Policy Management
IoT	Internet of Things
IP	Internet Protocol
IT	Information Technology
KPI	Key Performance Indicator
LI	Lawful Interception
LSO RA	Lifecycle Service Orchestration - Reference Architecture
LSO	Lifecycle Service Orchestration
MANO	MANagement and Orchestration
MEC	Multi-access Edge Computing
MEF	Metro Ethernet Forum
MOP	Mode Of Operations
NFV	Network Functions Virtualisation
NPD	Network Planning & Deployment
OPEX	OPerational EXpenditure
OR	Operational Requirements
PR	Performance Requirements
RA	Reference Architecture

RR	Resilience and Reliability
SDN	Software Defined Networking
SLA	Service Level Agreement
SOM	Service Orchestration and Management
SP	Security and Privacy
SP.2A	Security and Privacy 2A
SP.2B	Security and Privacy 2B
SVM	Support Vector Machine
TCO	Total Cost of Ownership
TVRA	Threat, Vulnerability and Risk Analysis
VNF	Virtualised Network Function
WAN	Wide-Area Network

4 Introduction

4.1 Categorization of the requirements

The present document structure addresses the requirements in the following areas:

1) Service and network requirements:
   - General requirements
   - Service orchestration and management
   - Network planning and deployment
   - Network optimization
   - Resilience and reliability
   - Security and privacy
2) Functional requirements:
   - Data collection and analysis
   - Policy management
   - Data learning
   - Interworking with other systems
   - Mode of operations
   - Model training and iterative optimization
   - API requirements
3) Non-functional requirements:
   - Performance requirements
   - Operational requirements
   - Regulatory requirements

5 Service and network requirements

5.1 Overview

The requirements in this clause are addressed from service and network point of view and are derived directly from the related use cases.

5.2 General requirements

This clause captures the requirements that are general and independent from other requirements categorized in other specific clauses.

[GR.1] The ENI framework shall use history data, context, and decisions taken to learn, process and provide responses to events, whether generated from devices or from management systems.

[GR.2] The ENI framework shall use context information as part of the computations that result in recommendations, advisement, predictions, and decisions that are used to assist other network systems, e.g. orchestration and management systems.

NOTE: As an example, MANO (from ETSI GS NFV-MAN 001 [i.4]) or the LSO RA (from MEF [i.5]) are different types of orchestration and management systems.

[GR.3] The ENI architecture shall be flexible enough to support extensibility.

5.3 Service orchestration and management

This clause captures requirements related to the ENI framework service provisioning, e.g. how to compile the service intent and orchestrate the service atoms and work flows, as well as automatic service on boarding.

[SOM.1] The ENI framework shall invoke policies based on models that describe and/or define traffic behaviour, such as SLAs (e.g. past or current telemetry).

[SOM.2] The ENI framework shall support the closed loop control model when different orchestration and management systems are used.

NOTE 1: As an example, MANO (from ETSI GS NFV-MAN 001 [i.4]) and LSO RA (from MEF [i.5]) are different types of orchestration and management systems.

[SOM.3] The ENI framework should not directly manage, control or orchestrate physical or virtual entities, either at the infrastructure level or service level.

NOTE 2: ENI framework may interact with the Orchestration system, EMS or OSS/BSS to influence the state of the resources or services.

5.4 Network planning and deployment

This clause captures requirements related to network planning and deployment, e.g. how to allocate network resources to VNFs, or automatic VNF on boarding.

NOTE 1: The network resources that can be managed are not limited to the requirements addressed in this clause.

[NPD.1] The ENI framework shall recommend allocation or retrieval of network resources, e.g. virtual machines, bandwidth, IPv4 addresses and IPv6 prefixes to end users or service flows, in an intelligent way to improve the efficiency of resource utilization. This ENI framework function may be implemented in a centralized and/or distributed manner, according to what is defined in ETSI GR ENI 004 [i.3] and according to ETSI GS ENI 005 [i.9].

[NPD.2] The ENI framework shall assist the network equipment to use the resource pools that are used for resource allocation (e.g. virtual machines, bandwidth, IP addresses), in an intelligent way in order to improve the efficiency of resource utilization.

[NPD.3] The ENI framework should dynamically and intelligently compute and recommend the required network resources, including both IPv4 and IPv6 resources as well as other resources.

[NPD.4] The ENI framework shall compute the network resources required to dynamically and intelligently deploy a given network service efficiently.

[NPD.5] IT resources to enable network services shall be managed within the ENI framework.

NOTE 2: Similar capabilities within the data centre are outside the network scope of this phase of ENI.

[NPD.6] The ENI framework shall be capable of understanding the context that a set of devices is operating within.

[NPD.7] The ENI framework shall be capable of performing the proper planning and deployment of resources to ensure that applicable deployed policies are not violated.

[NPD.8] The ENI System shall identify different types of rollouts for different types of resources that lead to the upgrade of virtualised software-based resources.

[NPD.9] The ENI System shall, in an efficient and dynamic manner, combine network slices, slice/service prioritization and resource allocation concepts, e.g. in order to resolve resource allocation conflicts between competing network slices deployed on top of a shared infrastructure.

5.5 Network optimization

This clause captures requirements related to network optimization, e.g. how to adjust the network configurations to improve its efficiency and performance, as well as the user experience of the service.

[NO.1] The ENI framework shall collect and process the necessary data according to specific algorithms in order to achieve network optimization.

NOTE: Data collection and processing algorithms for systems will be specified in the functional architecture.

[NO.2] The ENI framework shall meet or exceed all performance requirements when improving the target performance.

[NO.3] The ENI framework shall support central optimization, local optimization and distributed joint optimization, according to what is defined in ETSI GR ENI 004 [i.3].

[NO.4] The ENI framework shall support an adaptive optimization process where changes in the environment are reflected in the results of the optimization.

[NO.5] The ENI framework shall use prioritization and other scheduling and traffic shaping techniques to prevent SLA violations related with priority services.

[NO.6] The ENI framework shall use AI (e.g. Machine Learning) to identify traffic type and support traffic handling and QoS assurance for specific type of traffic.

[NO.7] The ENI framework shall support traffic type identification in different granularity levels, including application types, action types (e.g. sending pictures, voice calls, etc.).

[NO.8] The ENI framework shall support dynamic policy adjustment for a specific flow based on traffic identification results.

5.6 Resilience and reliability

This clause captures requirements related to resilience and reliability of the network, including fault diagnosis and prediction, high availability and back up, conflict detection, and rolling back to previous policies and status.

[RR.1] The ENI framework shall intelligently recommend allocation or retrieval of IP addresses without causing route oscillation.

[RR.2] The ENI framework shall intelligently recommend allocation or retrieval of IP addresses without causing any interruption in the offered services.