

ENI Release 3 Definition

1. Overview

1.1. R3 definition

The ENI Release 3 targets encompass the set of functionalities/capabilities that may be considered as the sum of all the capabilities agreed in the scopes of the different WIs that compose the release.

It is the responsibility of each rapporteur to ensure that the capabilities/targets of their Work Items are fully addressed as initially agreed in the Work Item approval, with the support of at least four ETSI individual member companies, other ISG participant companies may also provide support for it.

The present document contains a list of the main capabilities of each WI in progress that together characterize the present ENI Release, i.e. they constitute the ENI R3 definition

1.2 Recalling what ENI does

The ETSI ENI ISG group is entitled to define and specify all the architectural and non-architectural concepts used to build a system, however as an adopted designing principle states it shall not prescribe an implementation. Those concepts, that are defined and specified in terms of Functional Blocks and associated capabilities, are supported by policy-driven closed control loops that use emerging technologies, such as big data analysis, analytics, and artificial intelligence mechanisms.

The output of those capabilities is used to adjust the configuration and monitoring of networks and networked applications by sending recommendations and/or commands to external assisted systems. The system dynamically updates its acquired knowledge to understand the environment, including the needs of end-users and the goals of the operator, by learning from actions taken under its direction as well as those from other machines and humans (i.e., as an experiential architecture).

1.3 Defining the term ENI Architecture documentation

The first Work Item whose scope dealt directly with Reference Architecture has been given the number DGS/ENI 005. The relevance of this Work Item and of its successors in Releases 2 and 3 has already been highlighted in the former paragraph. Therefore, it was decided to group the entire set of WIs in the architecture area, either for past (published) work or for current work in progress in this Release 3, and furthermore either related with stage 2 or stage 3 work, under the generic term **ENI Architecture documentation**. Former already published documents, which have nothing to do with R3 rather with R1 and R2, include deliverables as [GS ENI 005 v111](#), [GS ENI 005 v211](#), [GR ENI 016](#), [GR ENI 017](#) [GR ENI 018](#) [D-GS ENI 019](#) and [D-GS ENI 030](#).

In Release 3, the ENI 005 document represents only a part of the progressing work targets of the release. The Architecture documentation is constituted by the following WIs:

- [RGS/ENI-005v311 \(GS ENI 005\)](#) - System Architecture (Release 3),
- [DGR/ENI 009v121 \(GR ENI 009\)](#) - Data Mechanisms,
- [DGR/ENI 0022v111 \(GR ENI 012\)](#) - Reactive In-situ flow information Telemetry,
- [DGR/ENI-0025v311 \(GR ENI 015\)](#) - Processing and Management of Intent Policy,
- [DGS/ENI-0029v311 \(GS ENI 019\)](#) - Representing, inferring in interfaces and Proving Knowledge in ENI,
- [DGS/ENI-0030v311 \(GS ENI 030\)](#) - Transformer Architecture for Policy Translation.

2. Capabilities associated with each Work Item that compose Release

3

In this Clause, a description of the targets of each WI is provided, together with a short and sometimes implicit definition of its capabilities.

Note: capability lists are needed at least on the main Work-items, without these lists this may be discussed

The list of these WIs is as follows:

1. ENI 001 (WI RGS/ENI-001v321) Use Cases (Release 3): Rapporteur Da Wang (Asia Info)

The purpose of this specification is to specify 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 identifies and describes additional use cases and scenarios and gives the baseline on how the studies in ENI can be applied as solutions of some identified use cases in accordance with the ENI Reference Architecture and will substantially benefit the operators and other stakeholders.

2. ENI 002 (WI RGS/ENI-002v321) Requirements (Release 3): Rapporteur Haining Wang (Intel)

The purpose of this specification is to specify requirements derived from new ENI use cases, ENI PoCs, enhanced ENI architecture as well as from other features of ENI system. In Release 3, the present document will add ENI requirements abstracted from the following work:

- RGS/ENI-001v321 (GS ENI 001) – Use Cases (Release 3),
- RGS/ENI-005v311 (GS ENI 005) - System Architecture (Release 3),
- DGR/ENI-009v121 (GR ENI 009) - Data Mechanisms,
- DGR/ENI-0031v311 (GR ENI 031) - Construction and application of fault maintenance network knowledge graphs,
- ENI PoC#14 - Intent-based Cloud Management,
- ENI PoC#15 - PINet—Polymorphic Intelligent Network.

3. ENI 004 (WI RGR/ENI-004v311) General Terminology (Release 3): Rapporteur Yu Zeng (China Telecom):

The purpose of this report is to provide terms and definitions used within the scope of the ETSI ISG ENI. The purpose is to define a common lexicon for use across all deliverables of ENI. This work item will be updated with the general terminology required as the ENI specifications are developed. In Release 3 the Work Items will add:

- Definition of terms for External Reference Points,
- Definition of terms for APIs for each External Reference Point,
- Definition of terms for Interfaces for each API,
- Definition of terms for formal semantics,

➤ Definition of terms for cognition processes.

4. ENI 005 (WI RGS/ENI-005v311) System Architecture (Release 3): Rapporteur John Strassner (FutureWei)

The purpose of this specification in this release of the System Architecture is focused on defining APIs, interfaces, and protocols used by the ENI System Architecture based on information and data models specified in GS ENI 019. This will be supported by integrating the results of GS ENI 019, which will define the ENI information model. It will also specify the ENI cognition model, as well as enhance the description and specification of several Functional Blocks, including the use of control loops and policy management. This latter will be supported by integrating the results of GS ENI 019 and GS ENI 030. Finally, it will enhance the description and specification of architectural principles for interacting with other groups within and outside ETSI.

List of associated capabilities, e.g.:

- define and specify APIs, Interfaces, and protocols used by ENI based on information and data models,
- specify the ENI cognition model in detail
- enhance the description and specification of the ingestion, normalisation, and output generation of data, information, and policies (imperative, declarative, and intent) in detail
- enhance the description and specification of the control loops used in ENI
- enhance the description and specification of policy management used in ENI
- enhance the description and specification of architectural principles for interacting with other groups within and outside ETSI.

5. ENI 009 (WI RGR/ENI-009v121) Data processing mechanisms: Rapporteur Hongdan Ren (China Telecom)

In Release 3, the revision of GR ENI 009 will focus on adding data format, data conversion, data format/interface consistency, data security and other aspects to the ENI data mechanisms.

List of associated capabilities, e.g.:

- Data Format
- Data Security
- Data Translation

6. ENI 010 (WI RGR/ENI-0010v121) Measurement of Evaluation Categories for AI application to Networks: Rapporteur Yu Zeng (China Telecom)

The goal of the Work Item Revision of GR ENI 010 is to be published in Release 3, adding measurement criteria to the basic evaluation in Release 2.

List of associated capabilities, e.g.:

- Measurement criteria
- Evolution of Categorization for AI

7. ENI 012 (WI DGR/ENI-0022) Reactive In-situ flow information Telemetry: Rapporteur Yali Wang (Huawei)

The purpose of the report ENI 012 in Release 3 is to publish a description of the flow-oriented on-path telemetry techniques which provides relevant measurement or event reports to the AI-enabled network entities. IFIT methodologies leverage the ENI architecture and provide performance management. IFIT-based reactive telemetry is one kind of telemetry processing in the Data Ingestion Functional Block specified in ETSI GS ENI 005. The telemetry information can be used by ENI to understand the network performance and maintain Service Level Agreements (SLAs). The synergy with IETF standardization progress is expected in order to be aligned with the tools for intelligent network monitoring.

List of associated capabilities, e.g.:

- Integration with the Architecture specified in ETSI GS ENI 005
- Closed-Loop Performance-Management capability
- Intelligent flow and packet selection capabilities
- Smart data export capabilities
- Dynamic/On-demand network probing and measurement technique selection capabilities
- Flexible and adaptable network performance measurements

8. ENI 013 (WI DGR/ENI-0023) ENI Intent Policy Model: Rapporteur Jiachen Zheng (China Mobile)

The purpose of ENI 013 in Release 3 is a gap analysis report on intent information model and provide a list of recommendations on general guidelines.

List of associated capabilities of ENI013 as follows:

- Recognize the gaps between ENI and other SDOs
- Provide the guideline for ETSI ISG ENI.

9. ENI 015 (WI DGR/ENI-0025) Processing and Management of Intent Policy the goals of the WI in Release 3 are: Rapporteur Ziting Zhang (China Telecom)

The purpose of the report ENI 015 in Release 3 is to describe the following topics: (1) Enhanced procedures for processing Intent Policy, e.g.: Detail the Procedures of intent policy processing; Conflict detection and resolution between different Intent Policies; (2) Knowledge management for Intent Policy, including: How to use a Knowledge Graph to manage Intent policies; How to use a Knowledge Graph for managing Intent policy knowledge; Procedures for lifecycle management of intent knowledge, e.g. import, update, delete, and query of the intent knowledge; (3) Typical use cases and requirements which can reduce the management complexity for Intent Users, e.g.: Use cases for Business Users/Operational Users/Technical Users that are all users of Intent. In Release 3, Draft GR ENI 015 will focus on the enhanced procedures for intent policy processing, as well as the management of intent policy and intent policy knowledge by using knowledge graph. Typical use cases will also be provided in Release 3 to demonstrate the reduction of management complexity for intent users.

List of associated capabilities, e.g.:

- Integration with the Architecture specified in ETSI GS ENI 005 and ETSI GR ENI 008
- Enhanced intent policy and intent policy knowledge processing capabilities
- Conflict detection capabilities
- Conflict resolution capabilities
- Intent policy and intent policy knowledge lifecycle management capabilities
- Intent policy management capabilities by using Knowledge graph
- Intent policy knowledge management capabilities by using knowledge graph

10. ENI 019 (WI DGS/ENI-0029) Representing, inferring in interfaces and Proving Knowledge in ENI: Rapporteur John Strassner (FutureWei)

The purpose of this specification ENI 019 in release 3 is to specify and define the ENI information Model, and also to provide two or more exemplary data models derived from the ENI Information Model. It will explain how ontologies can be used by ENI for semantic reasoning by defining richer and more detailed semantics for model elements of the ENI Information Model. Semantic reasoning includes representing more detailed meaning of an entity and its relationship to other entities in order to better make decisions involving that entity.

Information models and data models used as examples in GRs are informative. It is what is specified in GS ENI 019 that takes precedence.

List of associated capabilities, e.g.:

- Information models and associated capabilities
- Data models and associated capabilities
- API specifications

11. ENI 030 (WI DGS/ENI-0030) Transformer Architecture Rapporteur John Strassner (FutureWei)

The purpose of this specification ENI 030 in release 3 is to enhance the information described in GR ENI 018 and specify how a transformer architecture can be used to translate input policies to ENI Policies for use in cognitive networking and decision making in modern system design. A transformer is a deep learning model that uses self-attention to weight and understand the meaning of an input. This will be used to translate different types of input policies into a form that other ENI Functional Blocks can understand.

More specifically, this is done by using the Attention mechanism to search for a set of positions in the input text where the most relevant information is concentrated. The model then predicts next word based on context vectors associated with these source positions and all the previous generated target words.

List of associated capabilities, e.g.:

- the information (from the intermediate state) spread throughout the sequence of encoder hidden states,

- attention mechanism overcomes the information bottleneck of the intermediate state by allowing the decoder model to access all of the hidden states, rather than a single vector (i.e., the intermediate state) build out of the encoder's last hidden state, while predicting each output,
- may be selectively retrieved by the decoder according to where in the input it is processing.

12. DGR/ENI-0031v311 Construction and application of fault maintenance network knowledge graphs Rapporteur Bingming Huang (China Unicom)

The purpose of this report ENI 031 in release 3 is to describe use cases and a construction method of fault maintenance knowledge graphs. This report also defines the data requirements, a schema design and the knowledge application interface fault maintenance knowledge graphs. This report will encompass research and investigation activities that will address wireless networks at the first stage. Subsequent efforts may extend the work into access networks.

List of associated capabilities, e.g.:

- the main target related to the construction of fault maintenance network knowledge graphs,
- obtaining of computer-readable and writable network fault maintenance domain knowledge, and
- fault management using Knowledge graphs,
- enabling of the learning and reasoning of relevant algorithm models of fault self-repair are also envisaged.