

Terms of Reference (ToR) for ETSI ISG Experiential Networked Intelligence (ISG ENI)

Approved by the Director-General on **6 September 2022** following Board#139 consultation.

Scope

ENI focuses on improving the operator experience by the use of closed control loop mechanisms for different network operations. These mechanisms are based on context-aware, metadata-driven policies, and augmented by Artificial Intelligence (AI) learning and reasoning, to more quickly recognize and incorporate new and changed knowledge. This enables actionable decisions to facilitate prompt adaptation to various business and operational needs.

The main objectives of ISG ENI are listed as:

- To develop standards for a Cognitive Network Management system, incorporating one or more closed control loops. The closed loop control approach is based on extensions to the “observe-orient-decide-act” model (e.g., the incorporation of situation awareness, learning, and reasoning capabilities).
- To enable adapting the usage of available network resources and services of the envisaged Cognitive Network Management system, according to the real-time evolution of user needs, environmental conditions and business goals. The decisions taken are based on facts and inferences that use detailed state and telemetry information about network resources and services, along with the preferences of users and operators.
- To quantify the Operator Experience by introducing metrics and an associated evaluation procedure; closed control loops will enable the ENI System to optimize and adjust network resources and services using cognitive methods to maximize the Operator Experience.
- To specify different types of policies that will be used to drive adaptive behavioural changes by using various cognitive methods, including AI mechanisms.
- To create specifications of a modular and extensible ENI system, including AI mechanisms, which can be implemented in a phased approach to accelerate ICT’s adoption for existing and emerging systems/networks and technologies.
- To provide the ability of the ENI system to morph and adapt to the evolution of relevant AI mechanisms.
- To further elaborate standards that will address:
 - (1) the demonstration of Use Cases by using the System Architecture, and
 - (2) the requirements of the Operator Experience in and across multiple types of network infrastructures, including 5G networks, and
 - (3) the model-driven architecture, described by functional blocks and appropriate Reference Points and Interfaces, that supports adaptive and evidence-driven service operation through Cognitive Network Control and Management to provide the required Operator Experience.
- To provide a telemetry processing framework that uses context and situation awareness to learn and reason about which data should be collected using what types of processing mechanisms to support information collection and measurement about network performance, network resources and services.
- To support network security and privacy requirements, following what has already been done in PoC activities, in collaboration and strict alignment with other ETSI security groups including ISG SAI and TC CYBER.
 - Domain-specific Security is to be implemented in the domains that ENI is assisting.
- To launch additional Proof of Concept (PoC) activities, where PoC proposals shall address at least one goal relevant to ENI, related to an ENI Use Case, a set of ENI Requirements, and the demonstration of aspects of the ENI System Architecture, as specified in the ENI PoC Framework.

- To provide external Reference Points, along with APIs and DSLs, to be used for ENI to interact in an operator controlled manner with existing and emerging ICT systems. This promotes interoperability between ENI and Assisted Systems as well as migration towards AI-assisted ICT services.
- To evolve toward Plugtests and Hackathon events to test interoperability.

Areas of activity

The activities of ISG ENI are spread amongst the following areas:

- Revision/maintenance of already published documents,
- Specify additional use cases and requirements to reduce the integration complexity of incorporating recommendations and commands via an API broker for the operators' business and for some vertical industries,
- Architecture specification:
 - continue to develop a generic technology-independent system architecture of a network supervisory assistant system (specified in an earlier release)
 - updated versions of the Use Cases and Requirements specifications will be used to enhance the above system architecture, and
 - the system architecture will be based on extensions to the 'observe-orient-decide-act' control loop model with external and internal reference points and APIs, and
 - the system architecture will incorporate detailed situation awareness, learning, and reasoning capabilities, and
 - define an information model for the main objects in the System Architecture (in the next release), and
 - define one or more data models, based on the information model, for populating APIs (in the next release), and
 - continue enhancement of the System Architecture to include interfaces and protocols, detailed functional flow diagrams, sequence and interaction diagrams, state machine diagrams, Reference Points, and APIs (in the next release), and
 - specification of the difference in semantics for ENI policies (in the next release), and
 - enhanced procedures for processing Policies (specified in the next release), including:
 - Conflict detection and resolution between different Policies, and
 - Coordination between ENI Functional Blocks for supporting Policies applied to different parts of the infrastructure, and
 - knowledge management for Policies (specified in the next release), including:
 - How to implement, manage, and distribute different types of knowledge, and
 - Procedures for lifecycle management of knowledge, including import, update, delete, and query, and
 - interworking outlining the use of external reference points and APIs (activity envisaged for this and a future release),
- AI with relation to the ENI Architecture:
 - continue development of AI functional blocks that augment and enhance other functional blocks in the system architecture, and
 - evaluation and measurement of the effectiveness of different categories of AI (in this and the future release),
- Data mechanisms:
 - describe high-level description of data mechanisms including data acquisition and processing (in this and the future release), and
 - study reactive In-situ flow information Telemetry (in this and the future release),
- PoC framework
 - increase of the number of PoCs, and
 - recommend new PoCs to follow the ENI architecture, support the external Reference Points, and provide essential feedback to the design of the external Reference Points, and
 - Enhanced adherence to Use cases and external reference points, demonstrating interworking, and

- preparation to evolve to ENI Plugtests and Hackathons (activities envisaged for the next release),
- Cooperation with internal entities
 - coordinated activities with security groups (including ETSI TC CYBER and ISG SAI), to ensure that all communications between ENI and Assisted Systems to operate securely (activity envisaged for this and the next release),

Outreach and engagement (collaboration with other stakeholders)

On the understanding that ISG ENI is a unique global venue that builds relationships between standards and R&D communities it is considered essential that the ISG engages as much as possible with representatives from the following classes of organisation:

- ETSI Member R&D and professional employees not devoted to standards development,
 - Liaising our specification with H2020 projects and other research entities with promotion and realization of workshops and other demos:
 - Demonstration of one or two use cases related with System Architecture in an earlier release, others in this and the next release.
- Non-member academic institutions and activities,
- Other standards body research arms and activities,
 - Liaising our specifications on AI or policy with the Linux Foundation and other Open Source Communities (OSCs) (activity envisaged for the next Release).
- Dissemination of the ENI concept foundations through several media/tutorial events.

Annex (informative): collaboration with other bodies

ISG ENI will set-up the appropriate communication channels to the following groups both within and outside of ETSI.

ETSI groups

- PP 3GPP
- TC INT/AFI
- TC CYBER
- ISG NFV
- ISG ZSM
- ISG MEC
- ISG SAI
- ISG ETI
- ISG F5G
- ISG IPE
- OSG OSM

External groups

- ISO/IEC
- ITU-T
- BBF
- ONF/ONS
- IETF
- MEF
- TMForum
- CCSA
- OASIS
- CEC projects H2020/5GPPP
 - Horizon Europe
- Linux Foundation Networking
 - ONAP
 - Acumos
 - PNDA

If required, the ISG ENI may decide to establish additional liaison relationships.