

ANNEX 2

TERMS OF REFERENCE OF ETSI ISG SEMANTIC TECHNOLOGIES IN AI-NATIVE NETWORKS (ISG SEM)

Approved by the ETSI Director-General on **1 October 2026**,
following Board#159 consultation on 23-24 September 2026.

SCOPE

ISG SEM will provide an opportunity for ETSI members to coordinate their pre-standards 6G research efforts on semantic technologies in AI-native networks across various European/National funded collaborative projects, extended with relevant global initiatives. The mission of ISG SEM will be to establish the technical foundation for semantic technologies in AI-native networks and pave the way for future standardisation of these technologies.

ISG SEM will prepare structured output on use cases, metrics, architecture and interfaces considerations, data ontologies, AI/ML and computing integration, security aspects, KPIs and evaluation assumptions for semantic technologies in AI-native network, for subsequent evaluation by standards organisations such as future 3GPP releases, future IEEE/Wi-Fi generations, and ITU-R IMT 2030 deliverables.

The scope of **ISG SEM** is summarised below:

- Define a list of key use cases that benefit from semantic technologies in AI-native networks, with a framework and potentially road mapping for their study and evaluation.
- Identify a set of KPIs and an evaluation methodology appropriate for semantic technologies building upon potential synergies with other ETSI Technical Groups, like TC DATA, TC NET, and ISG ISAC.
- Define an architecture framework for semantic technologies in AI-native networks, including interfaces, link-level and system-level mechanisms and protocols, application enablement layer and APIs, and deployment considerations.
- Study semantic information representation, models and processing technologies (semantic encoding/decoding frameworks, semantic knowledge representation, multimodal and multi-task semantics, and AI/ML integration).
- Study technologies for transmission of semantic events (including those based on neuromorphic communications), and their physical-layer implications on the modulation, coding, and waveform design.
- Study how to leverage AI/ML and computing assets in the semantic information processing workflow and establish a framework for their effective integration.
- Study of the end-to-end privacy and security aspects as part of the generation, transmission, detection, computation, and storage of semantic information.
- Foster proof-of-concept and prototyping initiatives (reference implementations, experimental platforms, interoperability demonstrations, and trials).

AREAS OF ACTIVITIES

The activities of **ISG SEM** include the following:

- **ISG SEM** defines relevant use cases for semantic technologies in AI-native networks.
- **ISG SEM** develops a set of KPIs, evaluation methodology and assumptions for characterisation of semantic technologies in AI-native networks, leveraging synergies with other SDOs and ETSI Technical Groups.
- **ISG SEM** defines an architecture framework for semantic technologies in AI-native networks, considering aspects related to network and application service layers, including end-to-end deployment considerations.
- **ISG SEM** proposes semantic information representation, models and processing technologies capable of encoding and decoding information, data and/or environmental aspects into semantically represented symbols robust against both physical and semantic channel errors.

- **ISG SEM** studies technologies for transmission of semantic events, addressing low-layer transmission aspects like AI-aided modulation, channel coding and decoding, novel radio transmission and waveform schemes (including those based on neuromorphic communications).
- **ISG SEM** establishes a framework for effective integration of AI/ML and computing assets into the semantic communications chain, developing enablers for Physical AI, Agentic AI, encoding based on time and event semantics, and compression in AI-Native communication systems.
- **ISG SEM** studies end-to-end mechanisms related to network and application service layers considering security and privacy aspects of semantic technologies, targeting the representation, computation, storage and exposure of semantic data.
- **ISG SEM** studies semantic-aware APIs for enabling efficient data collection and optimization for semantic information transmission and exposure.
- **ISG SEM** studies testing methodologies and fosters proof-of-concepts, experimental platforms, trials, and reference implementations including simulations and measurements.

ORGANISATION

No internal organisation or Working Groups have yet been identified. The ISG will be able to re-consider and evolve its internal structure as required, taking into consideration the workload, priorities, and available resources.

SPECIFIC RULES, COMPLEMENTING THE ETSI TECHNICAL WORKING PROCEDURES, APPLYING TO THE ISG:

Term of Office of the ISG Chair (as specified in ETSI TWP Clause 3.3.1)	
The ISG Chair shall be appointed by the ISG for a term of office of	2 years

Term of Office of ISG Vice-Chairs (as specified in ETSI TWP Clause 3.3.2)	
The ISG Vice-Chair(s) shall be appointed by the ISG for a term of office of	2 years

Term of office of ISG Working Group Chairs (see ETSI TWP Clause 3.3.2)	
The ISG Working-Group Chair(s) shall be appointed by the ISG for a term of office of	2 years

Duration of the ISG Kick-off Period	
The ISG Kick-off Period shall start with the ISG Kick-off Meeting and shall end	end of Kick-off Meeting

ISG Members eligibility to vote after the ISG Kick-off Period (see ETSI TWP Clause 3.7.2)	
Option 3	ISG Members are eligible to vote (voting Members) if they have attended at least two (2) of the previous three (3) ISG Plenary Meetings, the ISG Kick-off Meeting being counted as a Plenary Meeting.

ISG Members voting weight (see ETSI TWP Clause 3.7.3)	
Option 2	The ISG Members eligible to vote and not part of an Academic, Corporate or Public Group are granted a voting weight equal to one (1). Each organisation is entitled to cast a single vote. If several delegates from the same organisation cast a vote, only the last vote cast is retained. The ISG Members eligible to vote and part of an Academic, Corporate or Public Group are granted a voting weight equal to one (1). Each Academic, Corporate or Public Group is entitled to cast a single vote exercised by one (1) of its member organisations. If several delegates from the same Group cast a vote, only the last vote cast is retained.

ISG Members voting results interpretation (see ETSI TWP Clause 3.7.4)	
Option 1	A proposal shall be deemed to be approved if seventy one percent (71 %) of the votes cast are in favour. Abstentions or failure to submit a vote shall not be included in determining the number of votes cast. If a proposal fails to achieve seventy one percent (71 %), the result shall be re-calculated using only the votes of the ISG voting Members with the ETSI Full member status. If the re-calculated result achieves seventy one percent (71 %), the proposal shall be deemed to be approved;

COLLABORATION WITH OTHER BODIES

The ISG may set up appropriate communication channels with the following groups:

ETSI GROUPS	
EPP 3GPP	ETSI Partnership Project – 3 rd Generation Partnership Project
ISG ENI	Industry Specification Group - Experiential Networked Intelligence
ISG ISAC	Industry Specification Group - Integrated Sensing and Communications
ISG MEC	Industry Specification Group - Multi-access Edge Computing
ISG ZSM	Industry Specification Group - Zero-touch network and Service Management
SDG OpenCAPIF (OCF)	Software Development Group - OpenCAPIF (Open Common API Framework)
TC DATA	Technical Committee - Data Solutions
TC ERM	Technical Committee - Electromagnetic Compatibility and Radio Matters
TC NET	Technical Committee - Federated Network, Edge, Cloud, and AI Technologies
TC QT	Technical Committee - Quantum Technologies
TC SAI	Technical Committee - Securing Artificial Intelligence

and others as identified during the progression of the work.

EXTERNAL GROUPS	
5GAA	5G Automotive Association
5G-ACIA	5G Alliance for Connected Industries and Automation
AI-RAN Alliance	Artificial Intelligence Radio Access Network Alliance
IETF	Internet Engineering Task Force
IRTF	Internet Research Task Force
ITU-R	International Telecommunication Union - Radiocommunication Sector
ITU-T	International Telecommunication Union - Telecommunication Standardization Sector
O-RAN Alliance	Open Radio Access Network Alliance
Relevant ACM Initiatives	Association for Computing Machinery
Relevant IEEE Initiatives	Institute of Electrical and Electronics Engineers
WRC	World Radiocommunication Conference

and others as identified during the progression of the work.