Concept Study and Applications of AI-native for Telecommunication Networks

Focus Group on Artificial Intelligence Native for Telecommunication Networks

(ITU-T FG-AINN WG1)

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Scope of WG1 Work

WG1: Terminology and Gap Analysis

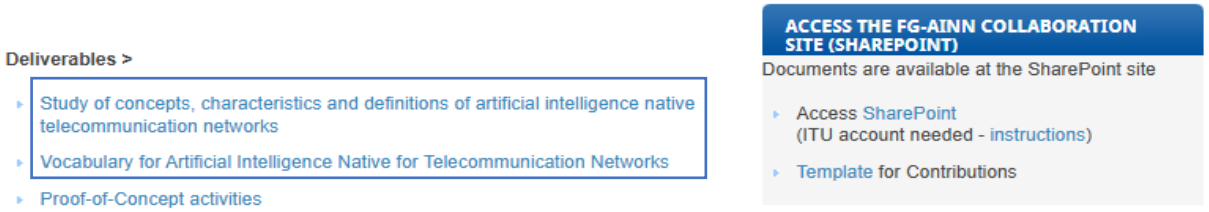
Chairs: Xiaomi An (China) Sujit Kumar (India)

Scope:

To study terminology and gaps for AI Native approach, to develop deliverables related to the gap analysis (focusing on non-radio aspects) with respect to existing technologies and the studies under the standardization organizations, industry bodies, and open-source bodies.

- **Terminology:** To study key concepts, characteristics and terminology for AI Native telecommunication networks.
- **Gap Analysis:** Study existing initiatives related to AI native networks (focusing on non-radio aspects), identify existing standards in other SDOs, and call out the additional work needed to adopt AI native approaches. It should include standards, industry bodies, and research community.

Current status



Work completed

FG-AINN-O-08
(Technical Report)
Study of concepts, characteristics and definitions of artificial intelligence native telecommunication networks
September 2025

FG-AINN-O-031
(Technical Specification)
Vocabulary for Artificial Intelligence Native for Telecommunication Networks
July, 2026

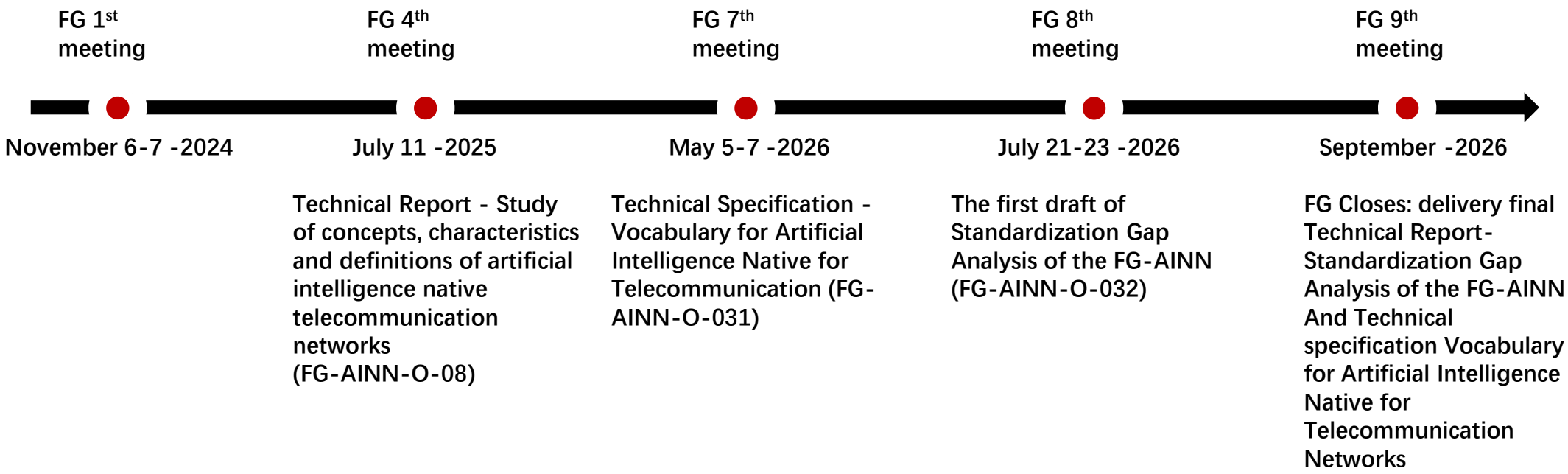
FG-AINN-O-032
(Technical Report)
Standardization Gap Analysis of the FG-AINN, July 2026

Work to be approved

FG-AINN-I-295
(Technical Report)
Standardization Gap Analysis of the FG-AINN:
Finalize of gap analysis report.
Status: 17 gaps reorganized.

FG-AINN-I-296
(Technical Specification)
Vocabulary the FG-AINN:
Status: 13 new terms reduced to 6.

Working Timeline of WG1



Study of concepts, characteristics and definitions of artificial intelligence native telecommunication networks

This technical report summaries the initial findings from the study of core concepts, key characteristics, technical considerations and relevant existing definitions for AI-native and AI-native networks. Based on this study, objects, delimiting characteristics and candidate new definitions for 'AI-native telecommunication networks' and ‘AI-native networks’ are presented.

Benefits of this study

- Consensus building on terms and definitions relation to concept of AI-Native telecommunication networks
  - Coherent understanding and standardization of objects.
  - Clear evaluation of capabilities relating to delimiting characteristics. (e.g. for use case analysis)
  - Baseline for existing standard's gap analysis.
  - Development of interoperable data model and reference architectures.
- To build a common, foundational understanding to guide future work, which could be used in future use case validation and gap analysis of existing standards.

Definition & Delimiting Characteristics

This study is built on well established terminological principles and methods.

Methodology:

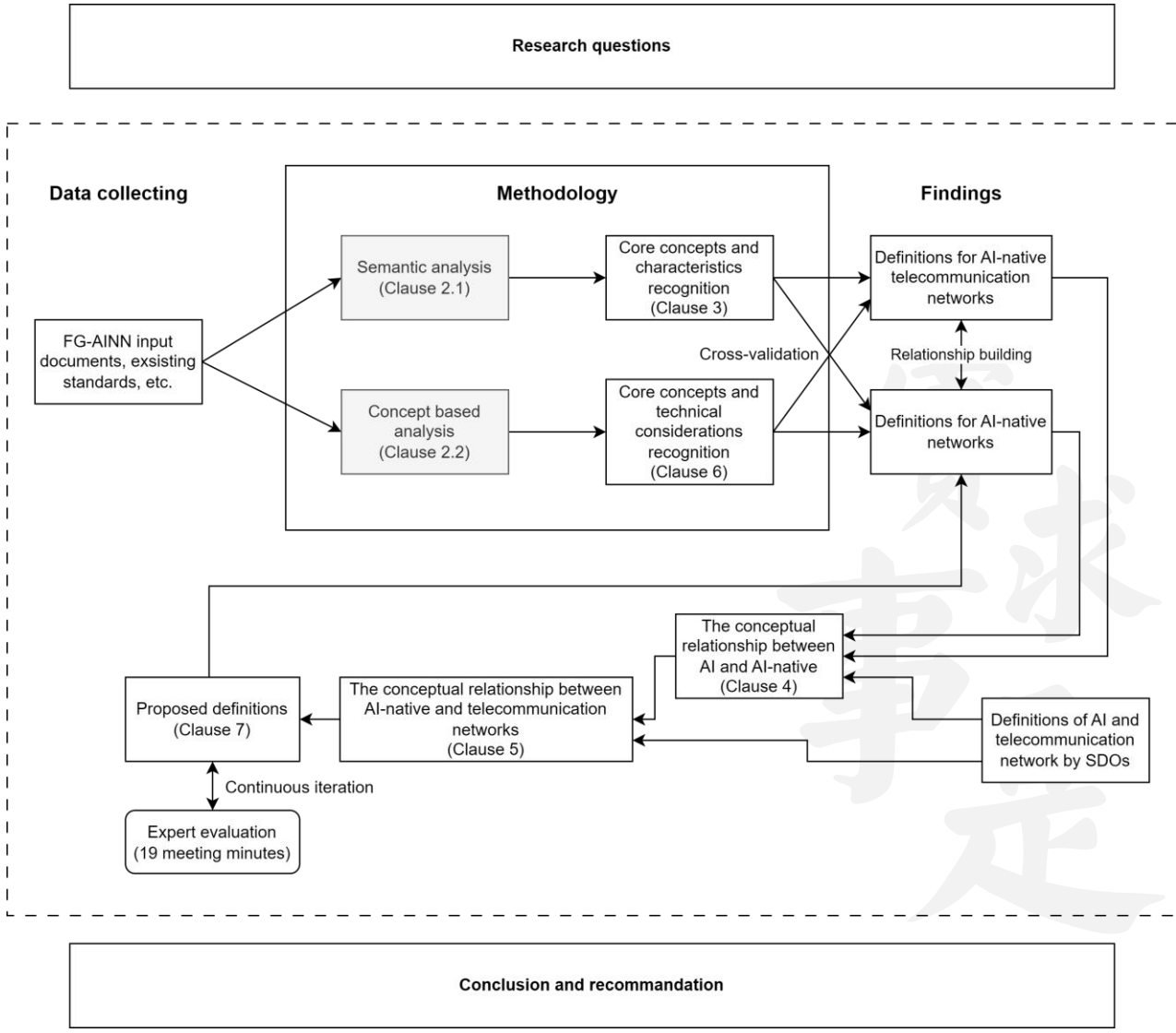
- Semantic analysis (ISO 704:2022, ISO 1087:2019): identify objects, characteristics, and concepts from existed definitions and explanations. & Concept-Based Analysis (CBA)

Data source:

- FG-AINN and WG1 input documents
- Consensus-building based on 19th ITU-T FG-AINN WG1 expert meetings.

Result:

- 3 delimiting characteristics and 2 proposed definitions of AINN.



Source: Research flow (FG-AINN-O-08)

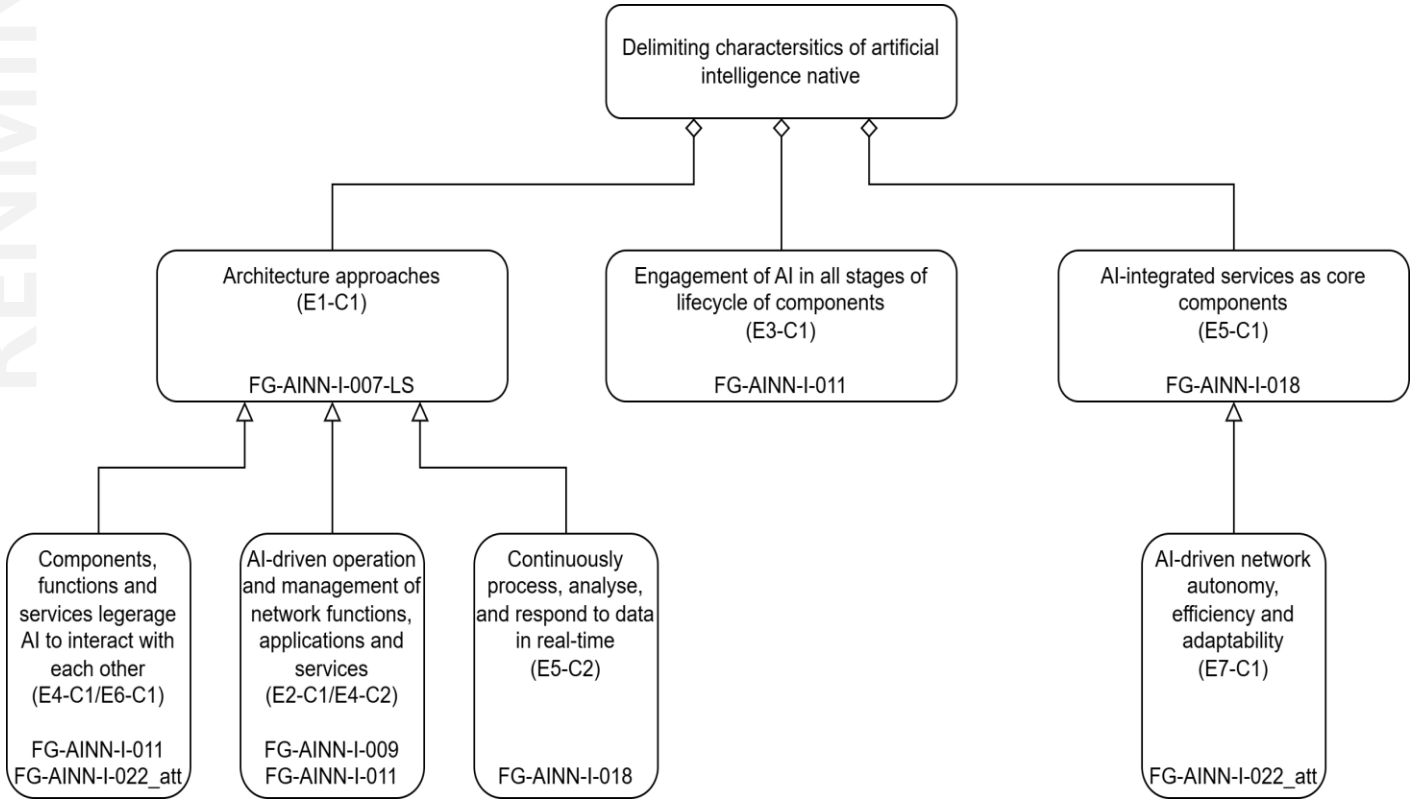
Identifying and coding objects and characteristics of AI-native

Semantic analysis from 7 core explanations of "AI-Native" from existing input documents from FG-AINN.

Code	Explanation of AI Native	Type of Object	Characteristics
E1	approaches where AI is deeply integrated into the core architecture of telecommunication networks [b-FG-AINN-I-007-LS]	architecture approaches	Network architecture is enhanced to deeply integrate AI (E1-C1)
E2	systems, products or services where AI is crucial for their operation [b-FG-AINN-I-009]	applications or services	AI is crucial for the operation and management of network functions, applications and services. (E2-C1)
E3	a system, function, or architecture that integrates AI as a core component in all stages—design, deployment, operation, and maintenance—ensuring that AI is a fundamental part of the system's functionality [b-FG-AINN-I-011]	core components of network	AI is integrated as a core component in all stages-design, deployment, operation and maintenance of network components (functions and applications and services)"(E3-C1) AI is a fundamental part of the network's functionality(E3-C2),
E4	an environment where all components interact using AI, creating a comprehensive, interconnected network of AI-driven components [b-FG-AINN-I-011]	environment where all components interacting using AI	all components interact using AI (E4-C1) Components in the environment themselves are AI-driven" (E4-C2)
E5	systems where AI is a foundational element, enabling the network to continuously process, analyse, and respond to data in real-time [b-FG-AINN-I-018]	Network system	AI is a foundational element (E5-C1) enabling the real time responses in network by continuously processing, analysing data (E5-C2)
E6	an approach where all components can leverage AI within themselves and interactively with each other [b-FG-AINN-I-022_att]	architecture approach	network components, functions and services leverage AI to interact with each other(E6-C1)
E7	an approach that integrates AI technologies at a fundamental level within network architecture to enhance network autonomy, efficiency, and adaptability [b-FG-AINN-I-022_att]	architecture approach	AI integration is for the purpose of enhancing autonomy, efficiency and adaptability etc(E7-C1)

Source: FG-AINN-O-08

Identifying delimiting characteristics and propose definition



Source: Delimiting characteristics of 'artificial intelligence native' (FG-AINN-O-08)

- **AI-native telecommunication network is: "Telecommunication networks integrating AI as a core component, enabling novel value-added services, and enhancing the performance of the network and its services.**

NOTE1: Integrating AI refers to use AI technologies as enablers through the entire lifecycle of telecommunication network's design, deployment, operation, and maintenance.

NOTE2: Enhance performance refers to higher level of autonomy, efficiency, adaptability resource utilization.

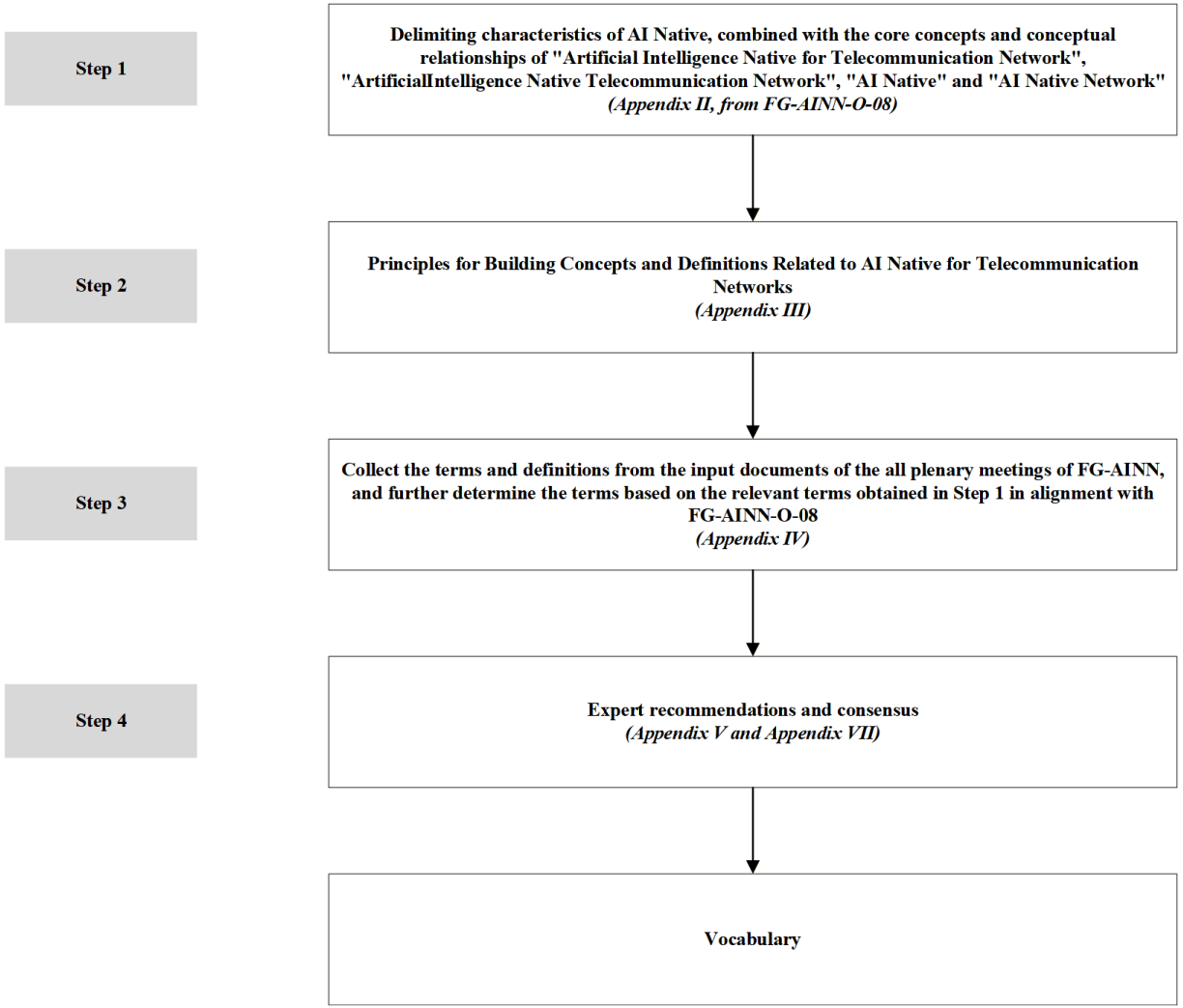
NOTE3: AI-native telecommunication network environment refers to all components and entities external to the network interacting with the AI-native telecommunication network including humans , devices and applications.

NOTE4: AI-native telecommunication network value-added services refer to added-value services integrating AI and leveraging telecommunication network communication and computing capabilities. This extends the definition of value-added services based on [3GPPTR 21.905]."

Vocabulary for Artificial Intelligence Native Telecommunication Networks

This Vocabulary as a technical specification provides a set of common terminology, definitions and concepts related to AI Native in association with FG-AINN-O-08 (Study of concepts, characteristics and definitions of artificial intelligence native telecommunication networks). The vocabulary is finalized under the guidance of the "Principles for Building Concepts and Definitions Related to Native Artificial Intelligence in Telecommunication Networks," incorporating terms used in different deliverables of FG-AINN and expert opinions through consensus building

Work methods & progress



Source: Research flow (FG-AINN-O-031)

This document identifies terms related to AINN and constructs a conceptual terminology relations.

Methodology:

- ISO 1087:2019; with support from FG-AINN-O-08

Achievement:

- 6 customized terminologies.
- 13 selected terminologies.

Concept relationship diagram

Revisions to the concept relationship diagram

NOTE 1: The terms in the white boxes indicate the core concepts of AI-native telecommunication network.
NOTE 2: The bold terms in the grey boxes indicate the delimiting characteristics of AI-native.
NOTE 3: The terms in the grey boxes indicate derived characteristics of AI-native telecommunication network.
NOTE 4: See Appendix II for details of illustration of three types of concept relation in UML graph.

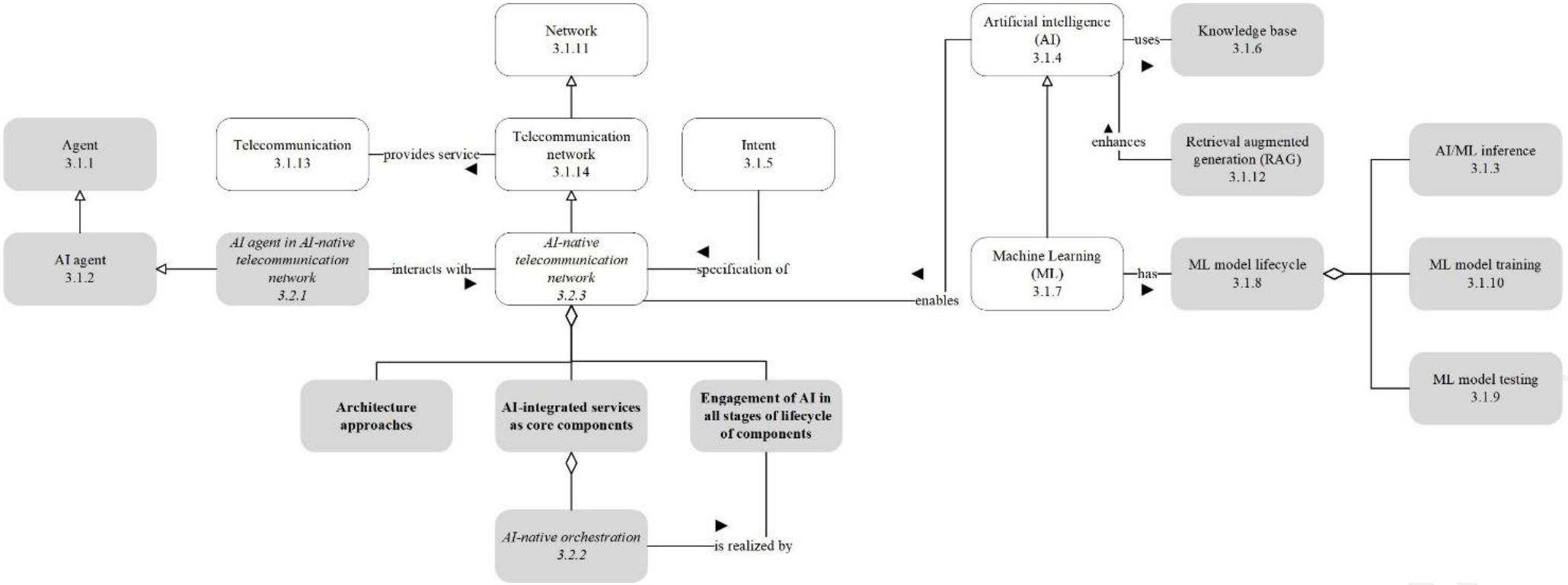


Figure 1: Concept system for AI-native telecommunication network

Standardization Gap Analysis of the FG-AINN

This Gap Analysis as a technical report identifies standardization gaps for AI-native networks in telecommunication networks, building on FG-AINN-O-08 (Study of concepts, characteristics and definitions of artificial intelligence native telecommunication networks) in terms of relevance to delimiting characteristics of AI-native networks

Purpose and Scope of the Gap Analysis

Why this analysis and what qualifies as a standardization gap

Purpose

This technical report identifies standardization gaps for AI-native telecommunication networks, reviews existing and ongoing recommendations from relevant SDOs, and provides inputs for future standardization work within ITU-T SG13 and beyond.

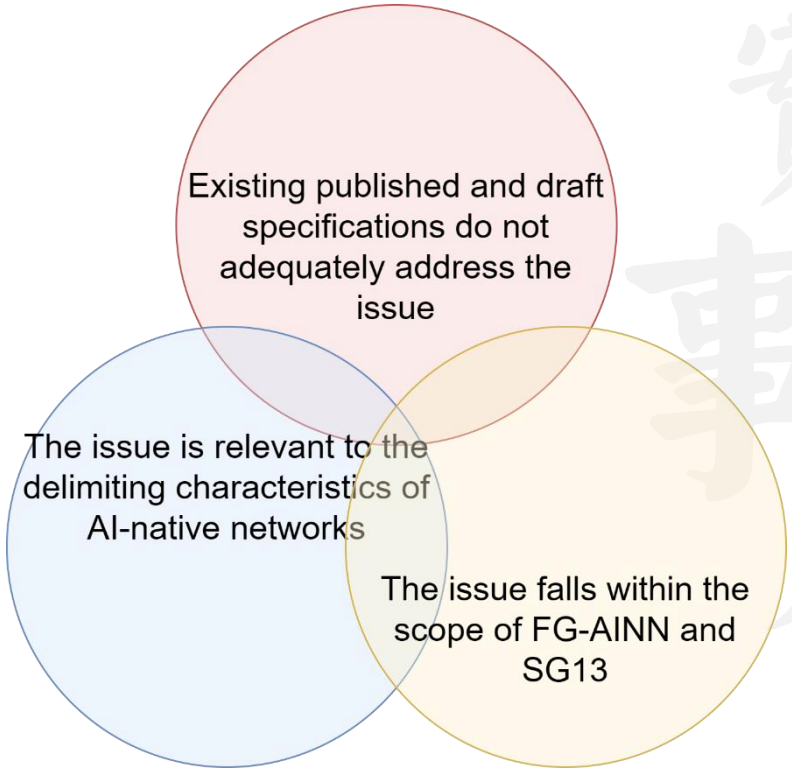
Scope

The analysis covers published and ongoing recommendations from nine SDO bodies: ITU-T SG13, SG21, SG2, SG17, SG20, IETF/IRTF, ETSI ISGs, ONAP and 3GPP. The scope is defined in alignment with FG-AINN-O-08, with special considerations about relevance to delimiting characteristics of AI-native networks.

(AI-native telecommunication network is: Telecommunication networks integrating AI as a core component, enabling novel value-added services, and enhancing the performance of the network and its services.[b-FG-AINN-O-08-R1])

Gap qualification criteria

A candidate standardization gap is identified where all three conditions are met:



What this analysis has used and produced

Multiple evidence sources have been consolidated into a current portfolio of 27 candidate standardization gaps. These gaps span architecture, data, application–network interaction, model management, trust, compliance, resilience and AI-specific service assurance.

Resources Dimension	Number	Detail
SDO bodies reviewed	9	ITU-T SG13, SG21, SG2, SG17, SG20, IETF/IRTF, ETSI ISGs, ONAP, 3GPP
AI-native delimiting characteristics used	3	Derived from definitions in FG-AINN-O-08 (D1-C1 through D2-C2)
Domains/topics categories	10	Terminology, use cases, requirements, capabilities, architecture, protocols/APIs, governance, semantics/data, security/privacy, societal/ethics
Representative use cases analysed	17	Introduced from WG2 deliverable FG-AINN-O-025
Numbered gap sources consolidated	19	GS1–GS9 from standards analysis; GS10–GS19 from use case and architecture analysis
Identified standardization gaps	27 (current draft)	Grouped into 12 thematic clusters in the document

Structure of this technical report

Main body

Clause	Title	Function
1	Scope	Defines the objectives and boundaries of the gap analysis
2	References	Normative references
3	Definitions	Terms defined elsewhere and in this document
4	Abbreviations and acronyms	—
5	Conventions	—
6	Gap analysis framework and methodology	Describes the four-step process framework, semantic analysis methods for delimiting characteristics and domains/topics, and use case analysis methods
7	Overview of SDO standards and related work	Top-down analysis: maps existing standards to delimiting characteristics (7.1) and domains/topics (7.2); consolidates gap sources GS1–GS9 (7.3)
8	Gap sources derived from use case requirements and technical challenges	Bottom-up analysis: extracts uncovered requirements and technical challenges from 17 use cases and architecture inputs; consolidates gap sources GS10–GS19
9	Standardization gaps for AI-native networks	Core output: gap description template (9.1), overview of all identified gaps and their relationships with AINN characteristics (9.2.1), and detailed descriptions of each gap (9.2.2, Tables 9-3 through 9-29)

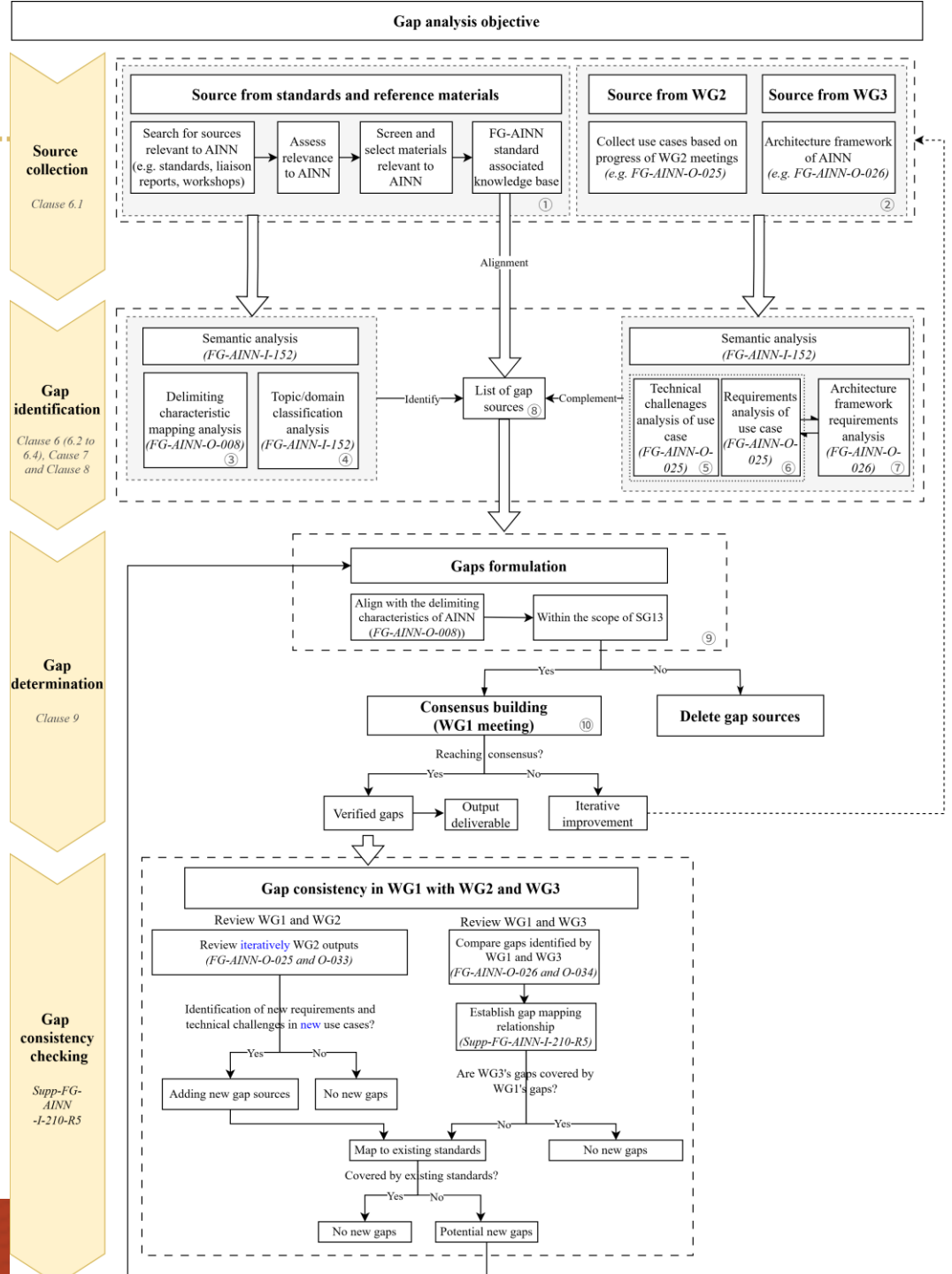
Annexes (supporting evidence)

Annex	Title	Function
A	Criteria for identifying relevant SDOs	SDO selection criteria
B	Process for identifying relevant SDOs	SDO identification process and results
C	Criteria for selecting relevant standards	Document screening criteria
D	Coding scheme of labels from AI-native definitions	Delimiting characteristic coding rules (D1-C1 through D2-C2)
E	Detailed analysis of standards relevant to FG-AINN	Full inventory of reviewed standards from each SDO with mapping evidence
F	Use case analysis process and results	References to detailed use case analysis in Supp-FG-AINN-I-210-R4

Methodology and traceability

How the Gaps Were Identified

- Clause 7 analyses existing standards from two complementary perspectives: coverage of AI-native delimiting characteristics, and distribution across domains/topics. Areas with limited coverage are summarized as gap sources GS1–GS9.
- Clause 8 extracts requirements and technical challenges from 17 use cases and architecture inputs. Uncovered requirements and challenges are consolidated as gap sources GS10–GS19.
- Gap sources are not themselves final gaps. In Clause 9, they are compared with existing specifications, filtered for AI-native characteristic relevance and SG13 scope, formulated into candidate gaps, and submitted for expert consensus.
- The domain/topic analysis (Clause 7.2) was used to examine the standardization landscape and contributed to the identification of gap sources. The final gap formulation aligns with delimiting characteristics, reflecting that AI-native-specific needs , particularly those from use case and architecture analysis , provide the most distinctive inputs for gap identification.



Methodology and Traceability

AI-Native Delimiting Characteristics

[D1-C1] integrating AI

[D1-C1-1] as a core component

[D1-C1-2] through the entire lifecycle of telecommunication network's design, deployment, operation, and maintenance

[D1-C2] enabling novel value-added services

[D1-C3] enhancing the performance of the network and its services

[D1-C3-1] higher level of autonomy

[D1-C3-2] higher level of efficiency

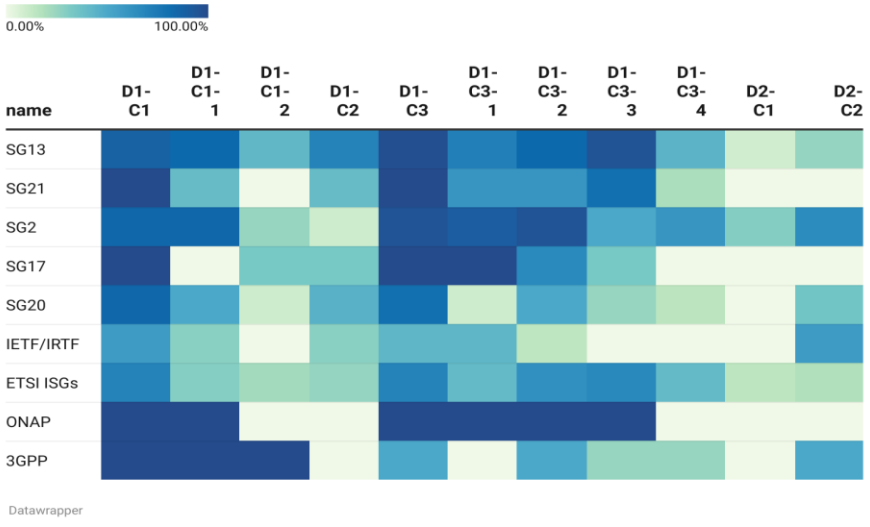
[D1-C3-3] higher level of adaptability

[D1-C3-4] higher level of resource utilization

[D2-C1] all steps are managed by AI, using AI

[D2-C2] make AI integration easier in the network

Standard coverage heat map (delimiting characteristics)



Analysis methods related to domains/topics

[D/T-1] Terminology/vocabulary and definitions/ concepts and characteristics of AI-native networks

[D/T-2] Use cases/applications

[D/T-3] Requirements

[D/T-4] Capabilities/functions

[D/T-5] Architecture

[D/T-6] Protocols and APIs

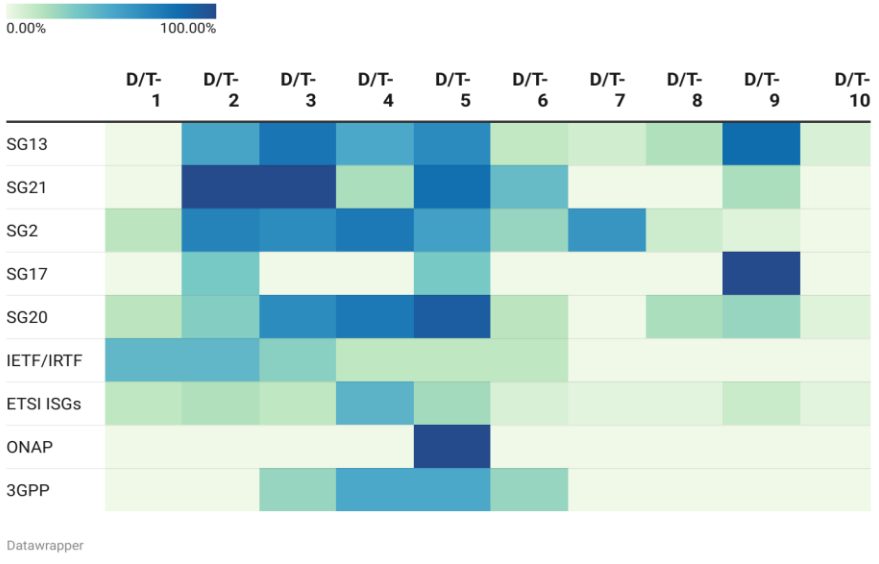
[D/T-7] Governance and management

[D/T-8] Semantic interoperability, digital twin, metaverse, data model, data infrastructure

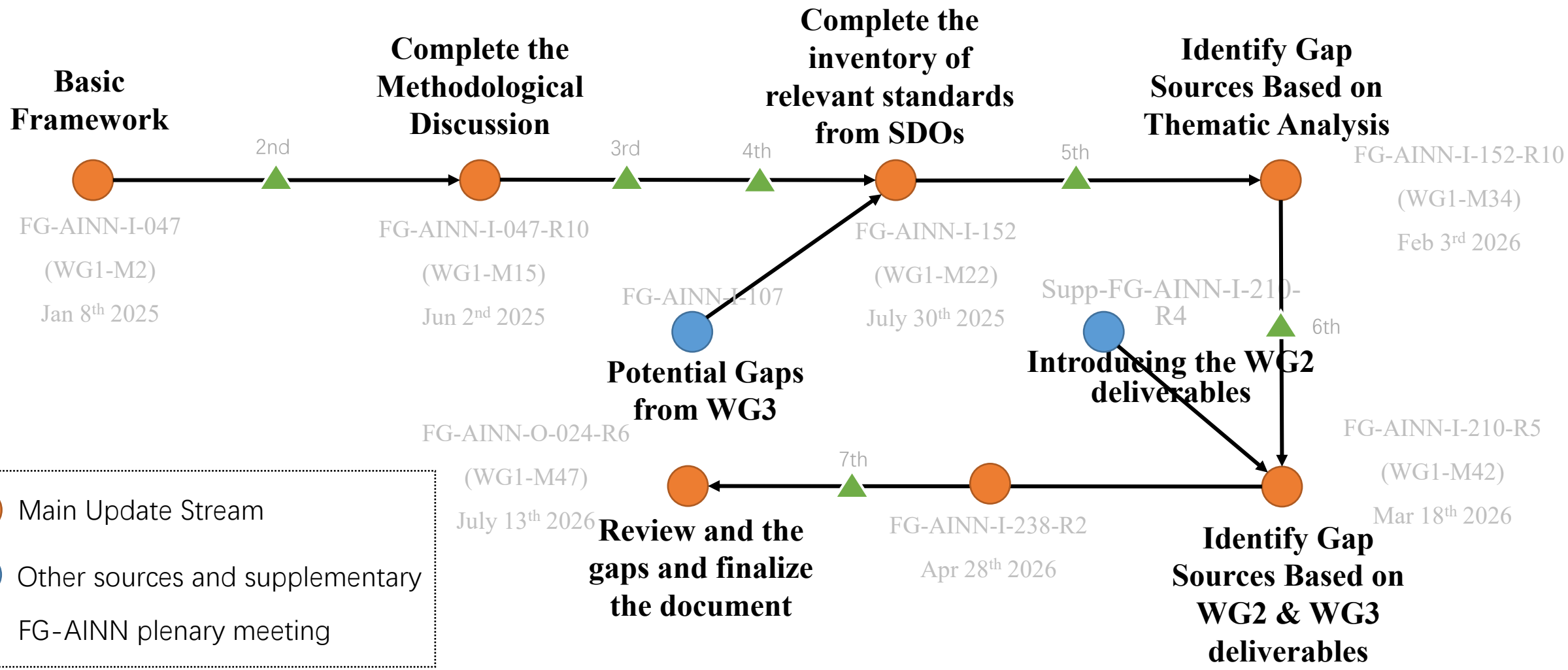
[D/T-9] Security, privacy

[D/T-10] Societal impact assessment and ethics

Standard coverage heat map (domain/topics)

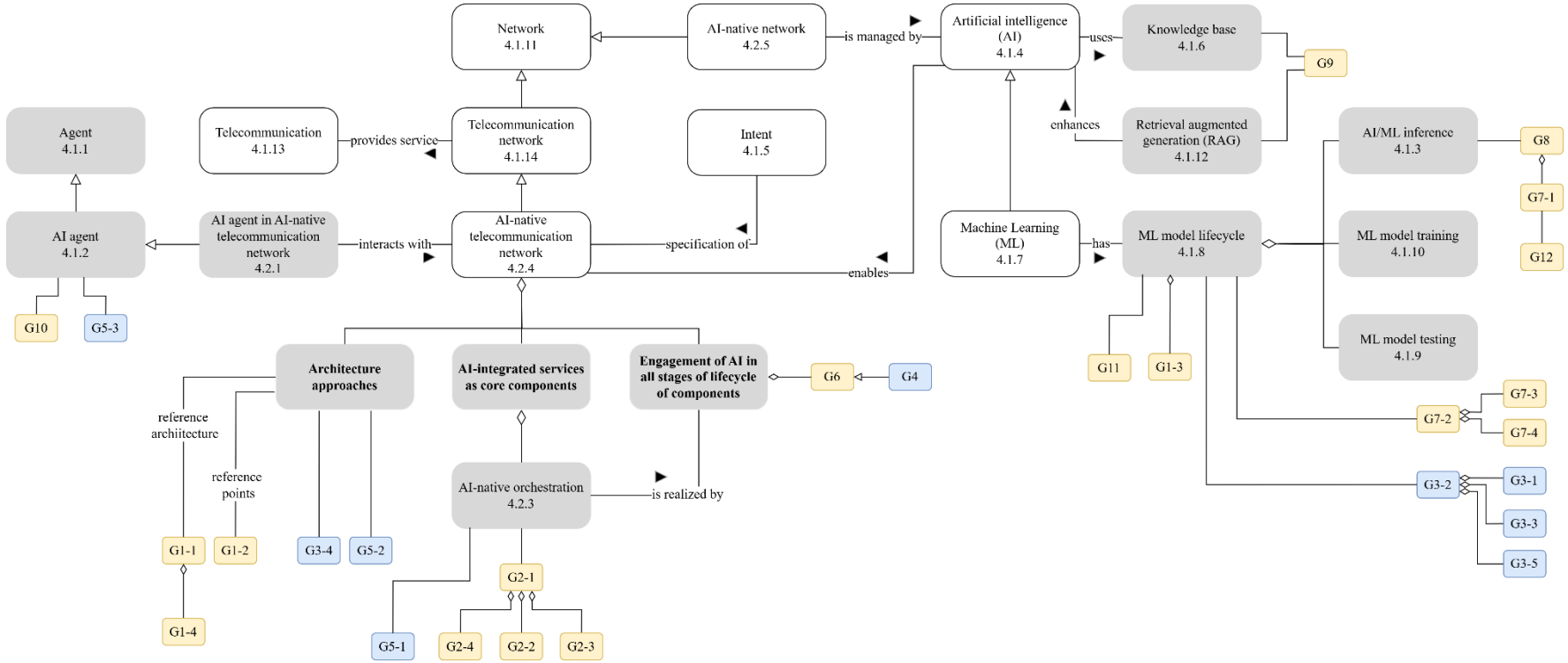


Structure of this technical report



What This Analysis Has Used and Produced

Standardization gaps associated with the delimiting characteristics and concept system of AI-native telecommunication networks in Figure 1 of the Vocabulary document [b-FG-AINN-I-295]



Title of gaps (excerpt)

Gap number	Title of gaps
G1-1	Absence of a unified reference architecture for AI-native telecommunication networks in alignment of delimiting characteristics of AI-native
G1-2	Absence of standardized reference points between AI-native functional entities and network functions
G1-3	Insufficient native architecture support for the lifecycle management of AI model for “Network for AI”
G1-4	Absence of standardized mechanisms for co-existence between AI-native and traditional network functions
G2-1	Absence of standardized identification and semantic conventions for AI-related data types
G2-2	Absence of standardized data exchange interfaces for AI-related data across network domains
G2-3	Absence of standardized governance mechanisms for cross-domain AI data sharing
G2-4	Absence of mechanisms for cross-domain AI-related data reuse

Thank you for your attention !
Welcome for question

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