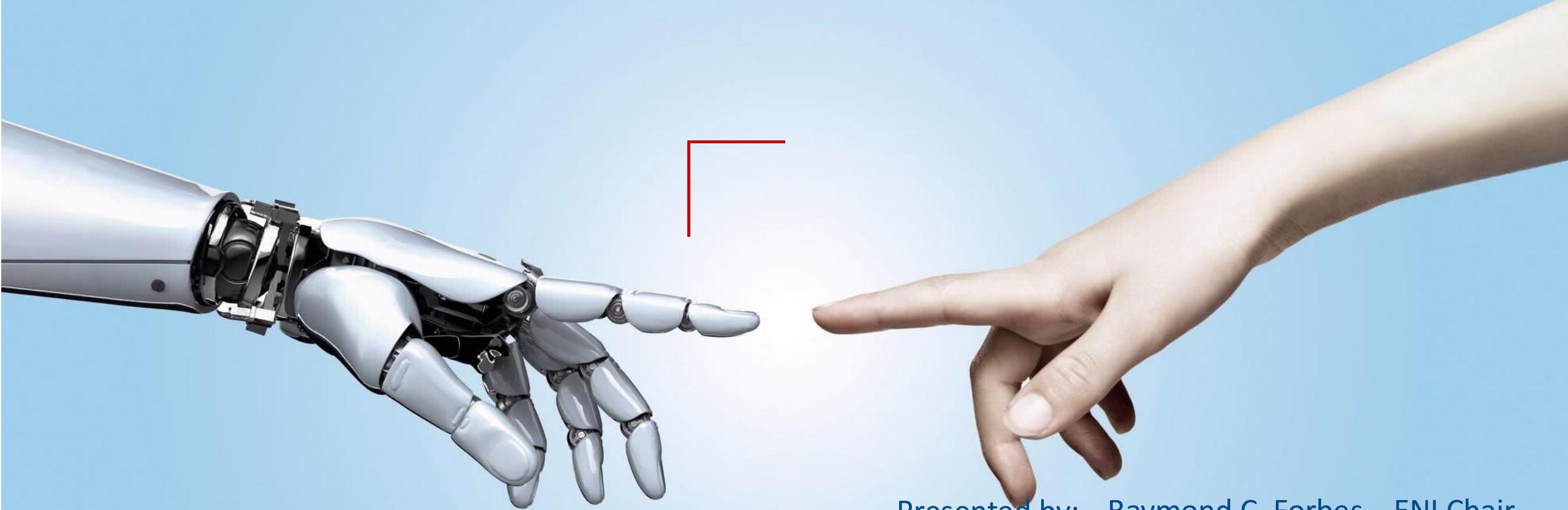


Work in ETSI on AI; focus on AI Agents



Presented by: Raymond C. Forbes – ENI Chair

September 2025



The Standards People

Work in ETSI on AI; focus on AI Agents

The presentation will give an overview of the Work in ISG ENI on AI Agents,
the new work just started,
Proof of Concept project and
specification of AI Agents,
invite co-operation,
and the discussion in ETSI to consolidate the migration to a standardization group.

Dr Ray Forbes

ISG ENI – Group Report 051

Study on AI Agents based Next-generation Network Slicing



ENI GR 051 – Details

ETSI GR ENI 051 V4.1.1 (2025-02)



Experiential Networked Intelligence (ENI);
Study on AI Agents based Next-generation Network Slicing

List of Supporters:

- Deutsche Telekom,
- Telefonica,
- Futurewei,
- CNIT,
- Motorola Mobility
- Huawei Technologies (UK)

Rapporteur: Raymond Colin Forbes

Publication: 10.02.2025

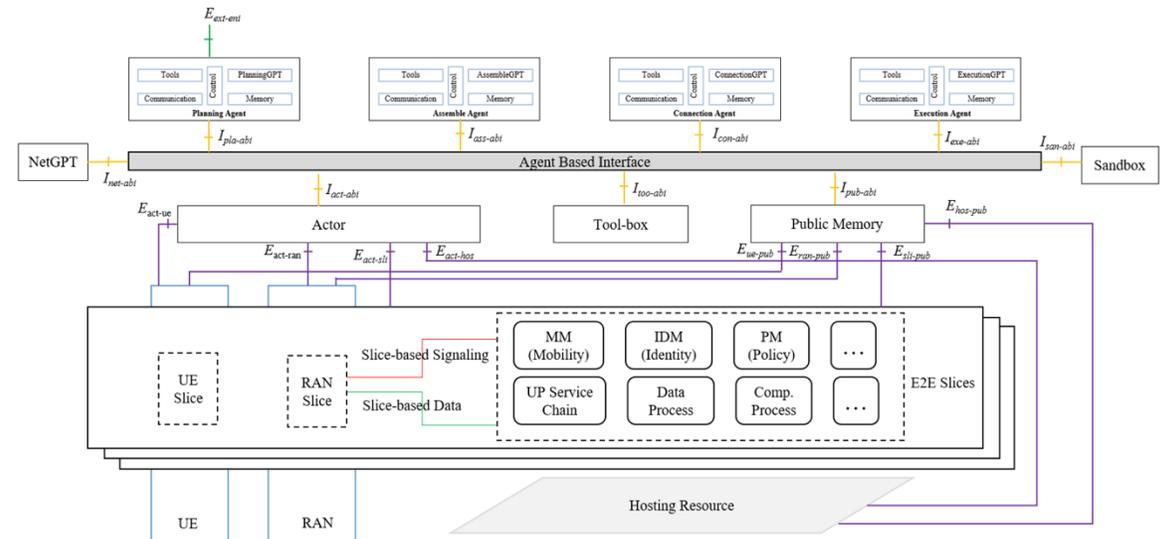
➤ <https://docbox.etsi.org/ISG/ENI/Open/>

ENI GR 051 – Overview

Scope:

- AI-native 6G core network architecture
- Multiple AI agents for intent processing
- Customized network slice generation as a use case for multi-agent collaboration

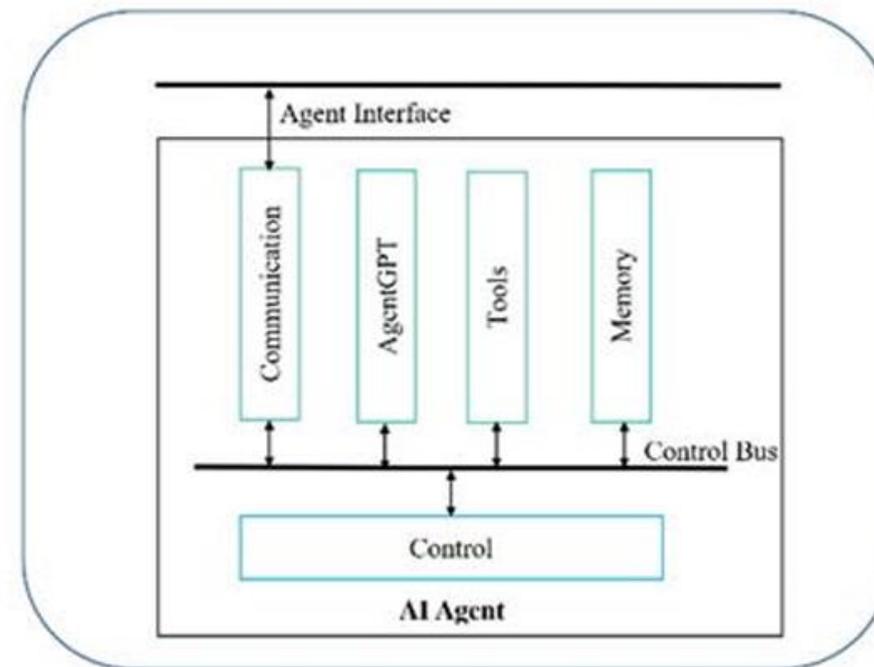
Architecture Overview:



Background: AI Agent architecture in ENI 051

[ETSI GR ENI 051] AI Agent is defined as an autonomous system that can interact with its environment to **collect data**, **learn from the past experiences** and subsequently use these to **improve its decision-making capability** in order to perform specific tasks

- Control: The “brain” of an Agent, responsible for decision-making logic(planning, reasoning, tools selection)
- Tools: The set of external capabilities that an Agent can invoke.
- Memory: Collects and stores short-term context and long-term knowledge.
- Control bus: Mechanism for communication between internal module.

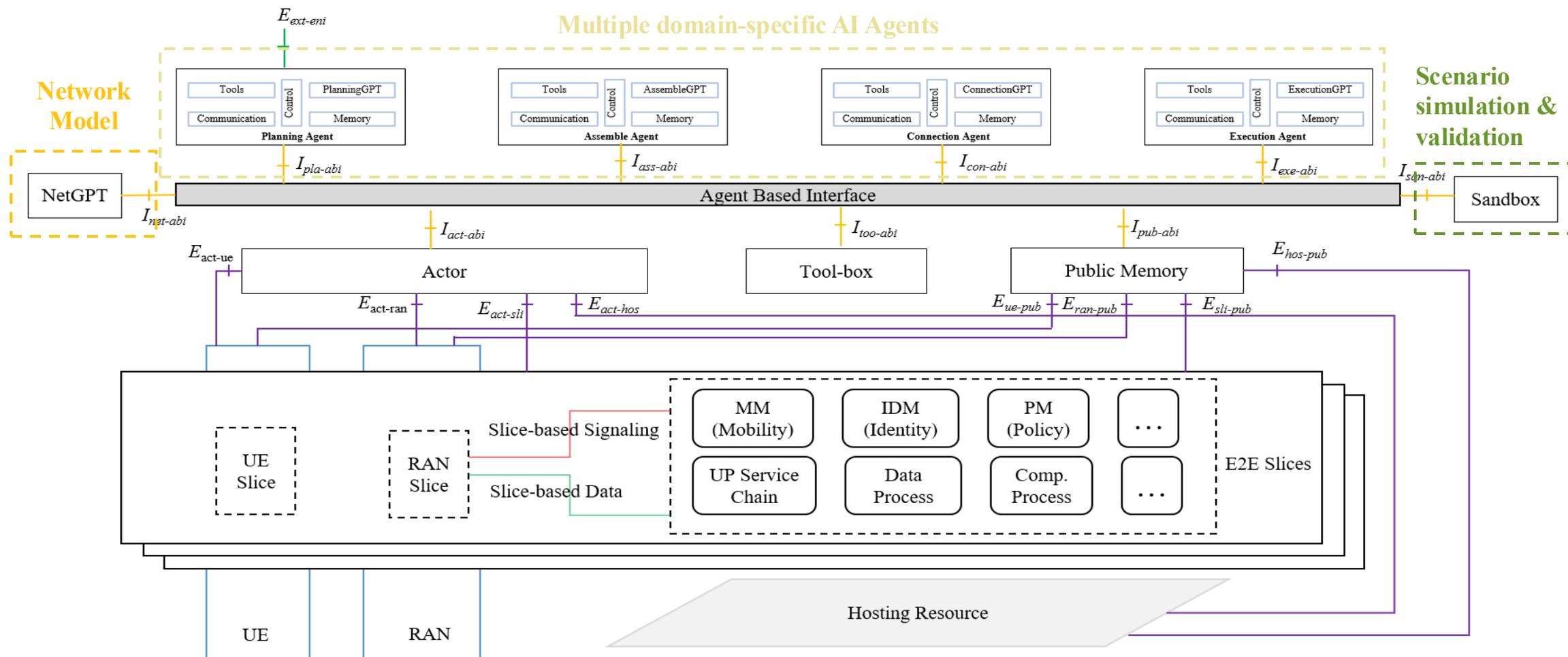


Summary: The AN Agent shows the specific workflow within the Agent. The 051 Agent architecture encapsulates these complex cognitive and perceptual processes within core modules such as control and memory modules. For designing a private network multi-agent system, the AN agent architecture can be employed to define the distinct agents required for the design, with the 051 Agent serving as an implementation blueprint for concrete coding.

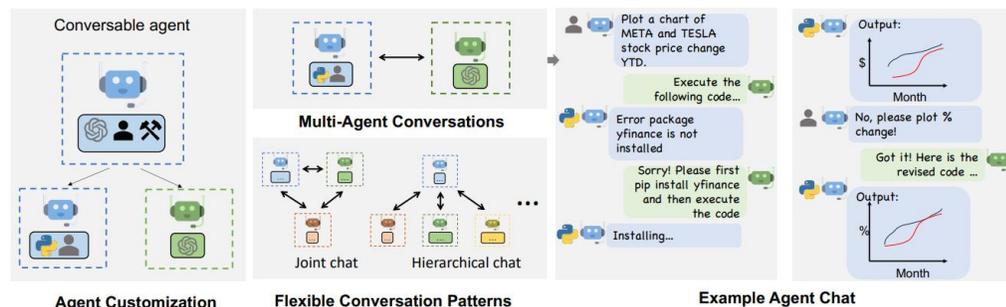


Agent-Based Architecture for Next-Generation Mobile Networks

Key figure of ENI Group Report 051: Study on Agent-Based Next-Generation Network Slicing

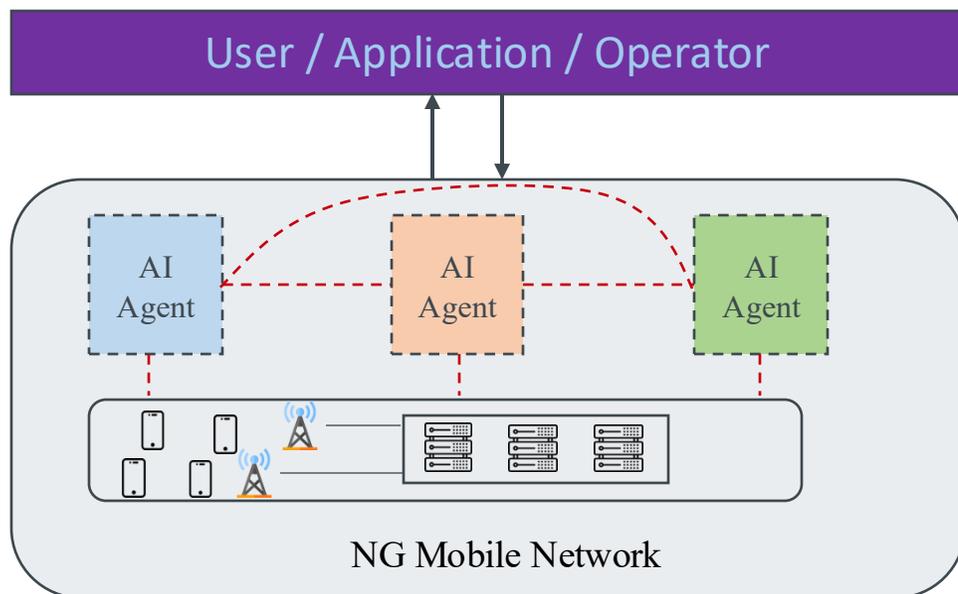


Multi-Agent Systems & Next Generation Mobile Networks



Source: "AutoGen: Enabling Next-Gen LLM Applications via Multi-Agent Conversation", 2023.

- “
- A single LLM can exhibit a broad range of capabilities (especially when configured with the correct prompt and inference settings)
 - **Conversations between differently configured agents** can help combine these broad LLM capabilities in a modular and complementary manner.
 - LLMs have demonstrated ability to solve complex tasks when the **tasks are broken into simpler subtasks**.
 - **Multi-agent conversations** can enable this partitioning and integration in an intuitive manner
- ”



- Employ AI Agents in next generation MN
 - Enriched- and flexible interaction with OTT
 - Customized network configuration and deployment based on the request
 - Services beyond connectivity / solve complex tasks

ENI GR 055 – Details



GROUP REPORT

Experiential Networked Intelligence (ENI);
Use Cases and Requirements for
AI Agents Based Core Network

List of Supporters:

- Deutsche Telekom AG,
- INRIA,
- Ceragon Networks AS,
- IMEC,
- CNIT,
- China Telecommunications,
- Huawei Tech.(UK) Co., Ltd,
- AsiaInfo Technologies Inc,
- Khalifa University

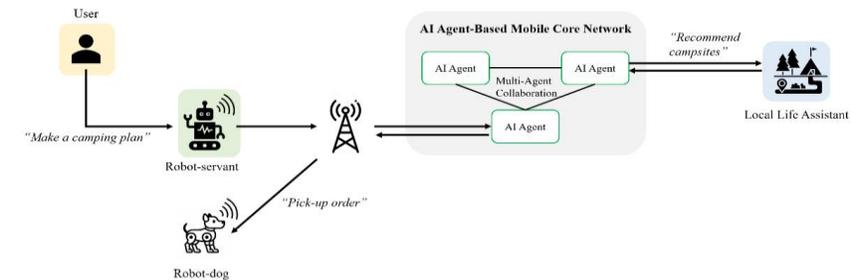
Rapporteur: Raymond Colin Forbes

Publication: expected October 2025

ENI GR 055 – Overview

To Consumer Use Cases

- Use Case on AI Agents to Enable Smart Life
- Use Case on Network-Assisted Collaborative Robots
- Use Case on AI Phone



To Business Use Cases

- Use Case on AI Agent-based Customized Network for Smart City Traffic Monitoring
- Use Case on AI Agents-Based Customized Network for Smart Construction Sites
- Use Case on AI Agent Ensuring Game Acceleration Experience

Telecom Operator Use Cases

- Use case on AI Agent-Based Autonomous Network Management
- Use Case on AI Agent-Based Disaster Handling Network Management
- Use Case on AI Agent-Based Time-Sensitive Network Management

Use Cases and Requirements for AI Agents Based Core Network (ENI GR 055)

Scope:

- potential use cases and new service requirements relevant to agent-based mobile core network
- Three use case categories: i) to consumer, ii) to business, iii) telecom operator

Use Cases for Agent-Based CN

To Consumer Use Cases

- AI Agents to Enable Smart Life
- Network-Assisted Collaborative Robots
- AI Phone

UCs provided by: Huawei

To Business Use Cases

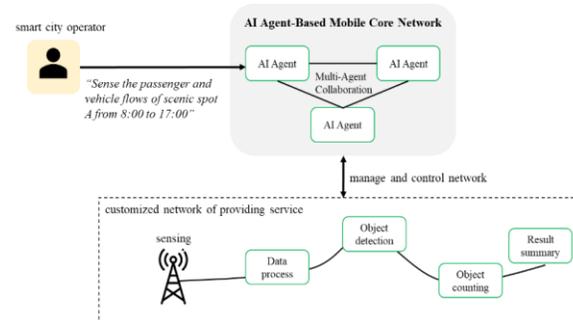
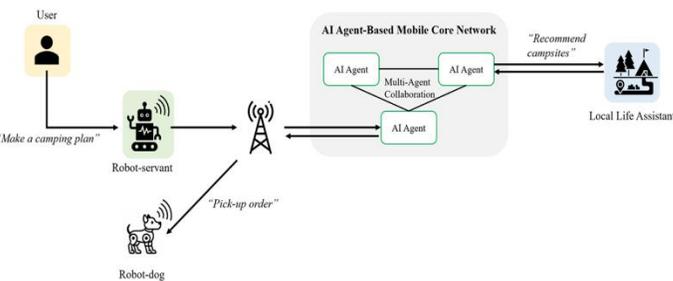
- AI Agent-based Customized Network for Smart City Traffic Monitoring
- AI Agent-based Customized Network for Smart Construction Sites
- AI Agent Ensuring Game Acceleration Experience
- AI Agent-Assisted Collaborative Energy Distribution in Power Enterprises

UCs provided by: Huawei, Fraunhofer IOSB-INA, AsiaInfo Tech.

Telecom Operator Use Cases

- Agent-Based Autonomous Network Management
- Agent-Based Disaster Handling Network Management
- Agent-Based Time-Sensitive Network Management
- Agent-Driven Core Network Signaling Optimization
- Agent-Based Core Networks to Enhance User Experience

UCs provided by:
Huawei, Ceragon Networks, AsiaInfo Tech.



ENI GR 056 – Details



GROUP REPORT

Experiential Networked Intelligence (ENI);
Use Cases and Requirements for
AI Agents Based Core Network

List of Supporters:

- Intracom Telecom
- Deutsche Telekom AG
- INRIA
- Ceragon Networks AS
- Huawei Tech. GmbH
- CNIT
- Khalifa University
- IMEC
- Futurewei
- AsiaInfo Technologies Inc.

Rapporteur: Onur Ayan

Publication: expected October 2025

ENI GR 056 – Overview

Overview of Open-Source Multi-Agent Frameworks:

- Frameworks: AutoGen, CrewAI, LangGraph, Agent Development Kit
- Topologies: Hierarchical, Network, Supervisor, Custom
- Comm. Patterns: Sequential Chat, Nested Chat, Group Chat

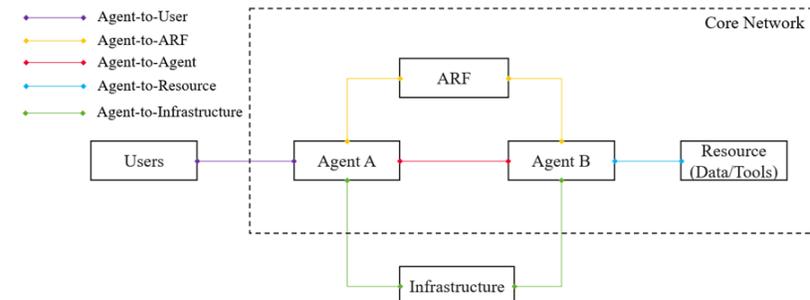
Overview of Multi-Agent Communication Protocols

- Model Context Protocol (MCP)
- Agent Communication Protocol
- A2A
- Agent Network Protocol
- Agent Connect Protocol (Agntcy)

Inter-Agent Communication:

Interface and Method Requirements

- Agent-to-User Interface
- Agent-to-Agent Repository
- Agent-to-Agent Interface
- Agent-to-Resource Interface
- Agent-to-Infrastructure Interface

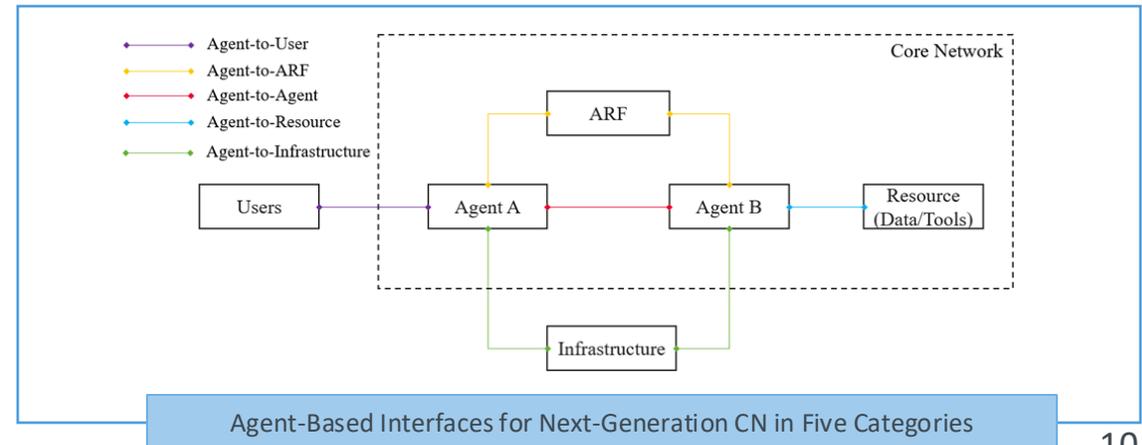
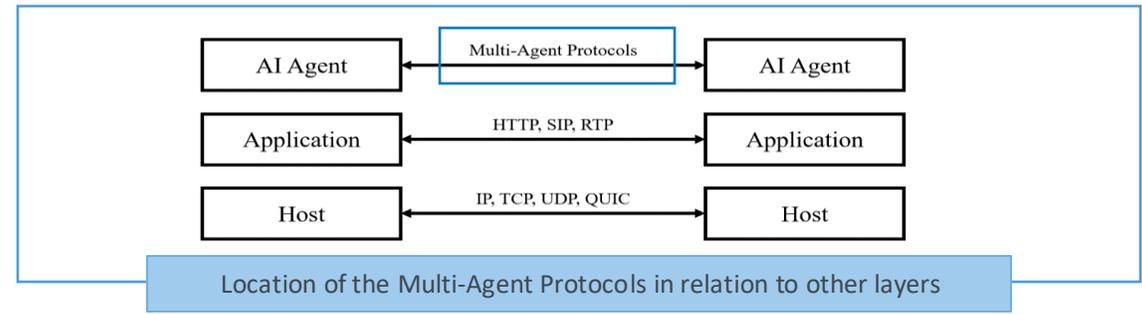
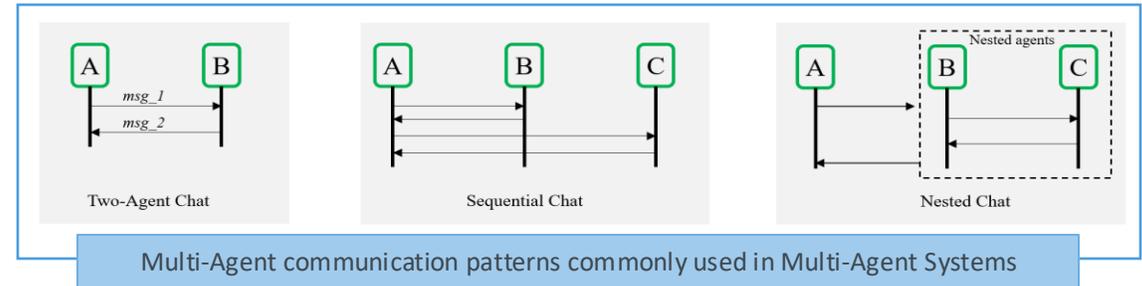


Study on Multi-Agent Frameworks for Next-Generation Core Networks (ENI GR 056)

Scope:

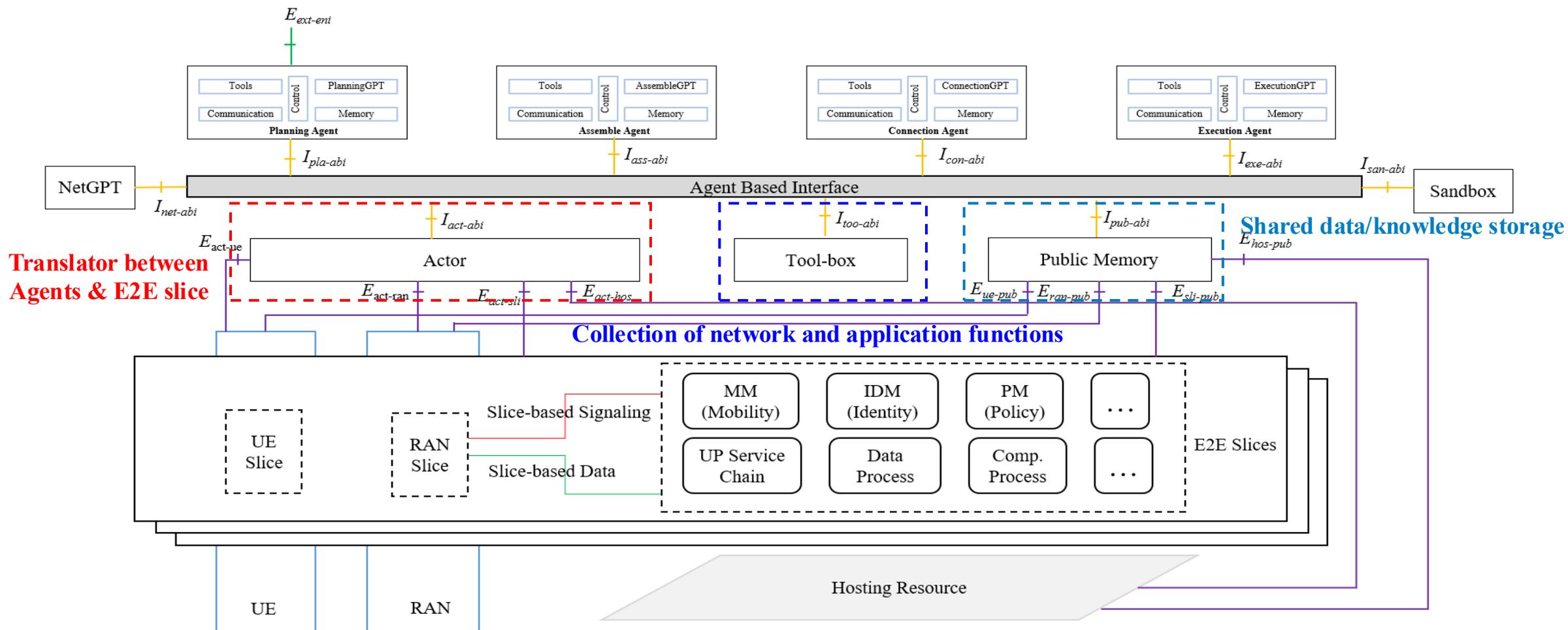
- Open-Source Multi-Agent Frameworks
 - AutoGen
 - LangGraph
 - Agent Development Kit
 - CrewAI
- Open-Source Multi-Agent Communication Protocols
 - A2A
 - MCP
 - Agntcy and Agent Connect Protocol
- Agent-Based Interface and Design Principles
 - 5 types of interfaces for an agent-based core network:
 - Agent-to-User
 - Agent-to-Repository (ARF)
 - Agent-to-Agent
 - Agent-to-Resource
 - Agent-to-Infrastructure
- Multi-Agent Collaboration Mechanisms
 - Closed-Loop Optimization
 - Network Feedback Reinforcement Learning
 - Multi-Agent Self Reflection
 - Multi-Agent Conflict Resolution

Goal: Gap Identification and potential recommendation for 3GPP based on the acquired knowledge on multi-agent system design and deployment guidelines



Agent-Based Architecture for Next-Generation Mobile Networks

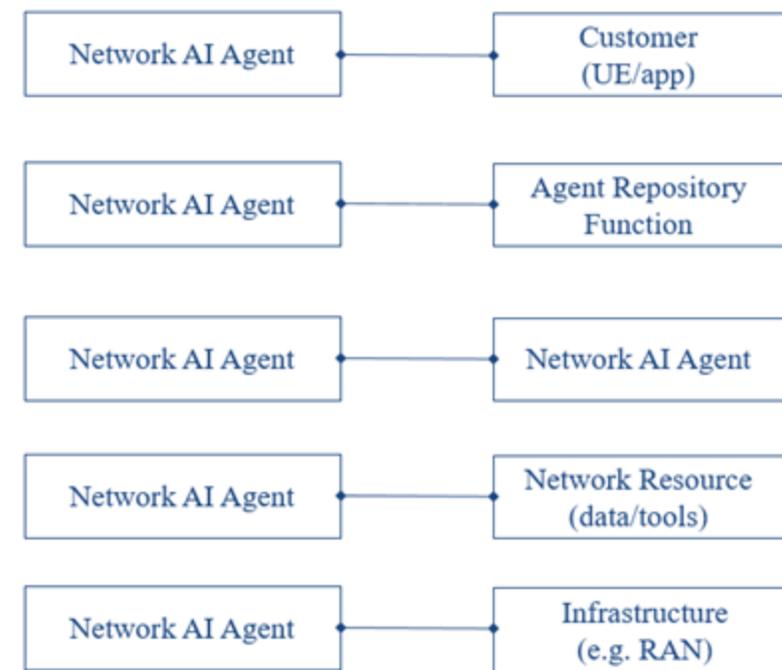
Key figure of ENI Group Report 051: Study on Agent-Based Next-Generation Network Slicing



ISG ENI – Recently Started Work Items (1/3)

ETSI ENI GS 059:

- Title: AI Agent Interface and Protocol Specification for Next-Generation Mobile Communication System
- Rapporteur: Onur Ayan
- Status: Approved in ENI #35 (8-11 Sep. 2025)
- Scope:
 - Gap analysis between supported features of existing protocols (e.g., A2A, MCP),
 - Requirements definition for agent interface and protocol design
 - Interface and protocol design for supporting communication between an AI agent and other entities (e.g., AI agents, tools, data sources, UEs, 3rd party APPs) in a mobile network.
 - Identification of different interface types in agent-based mobile network architecture and key methods and data objects therein.

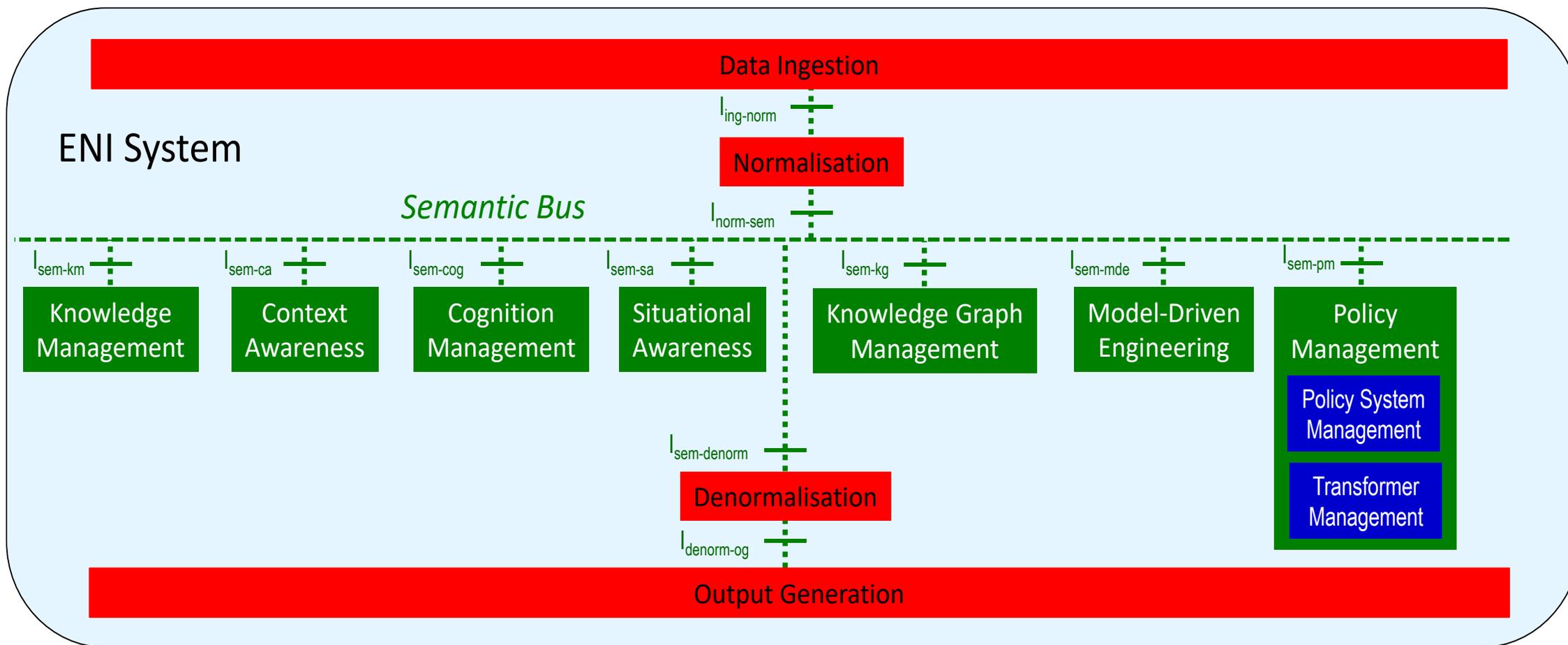


ISG ENI – Recently Started Work Items (2/3)

ETSI ENI GR 060:

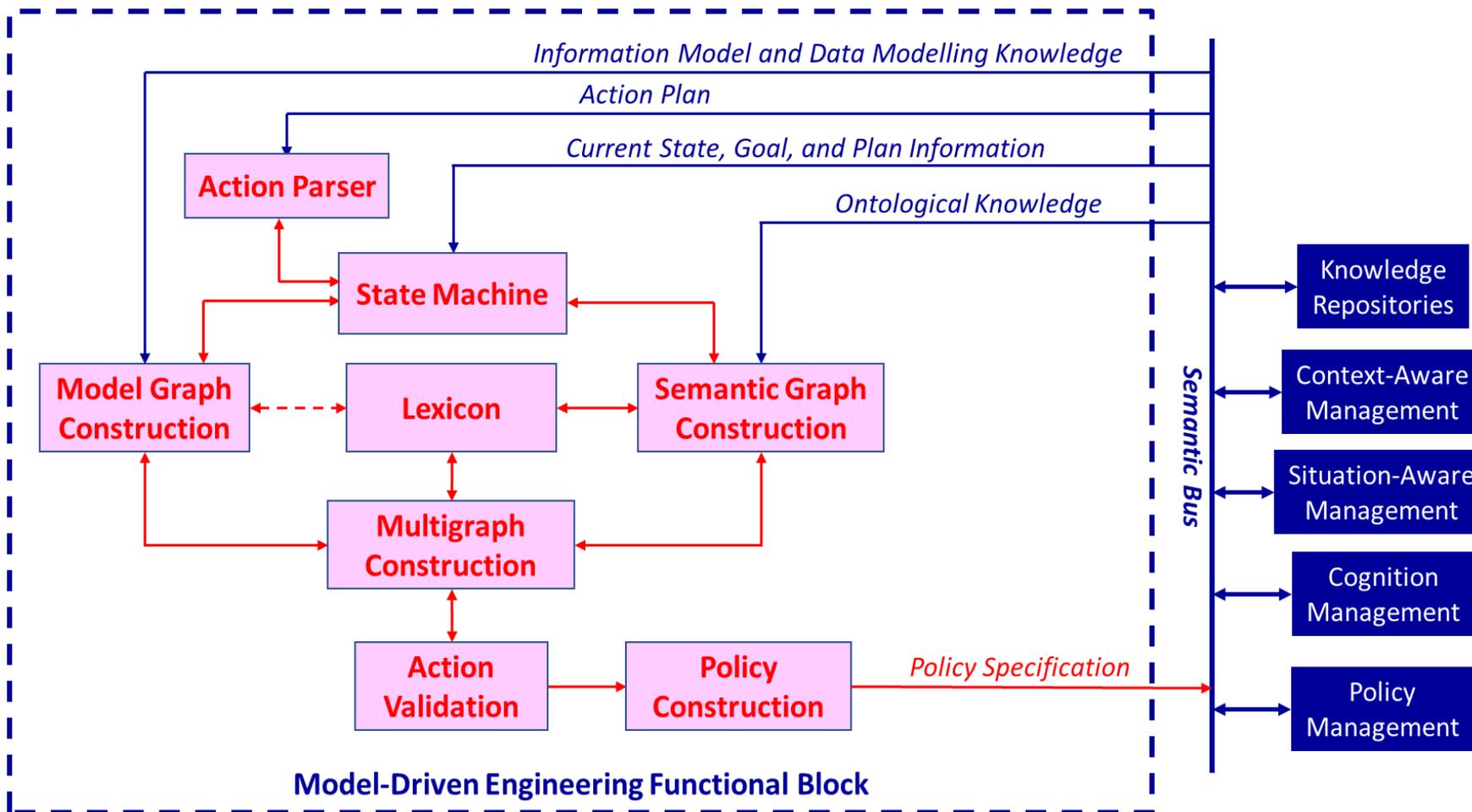
- Title: Study on Model Training for Network AI Agents
- Rapporteur: Daniel Gordon
- Status: Approved in ENI #35 (8-11 Sep. 2025)
- Scope:
 - Model training methods of network AI agents in telecommunications
 - Analysis of challenges and requirements specific for the selected model training methods
 - Test and validation experiments to verify and compare different model training methods suitable for network AI agents.

ENI Internal Reference Points



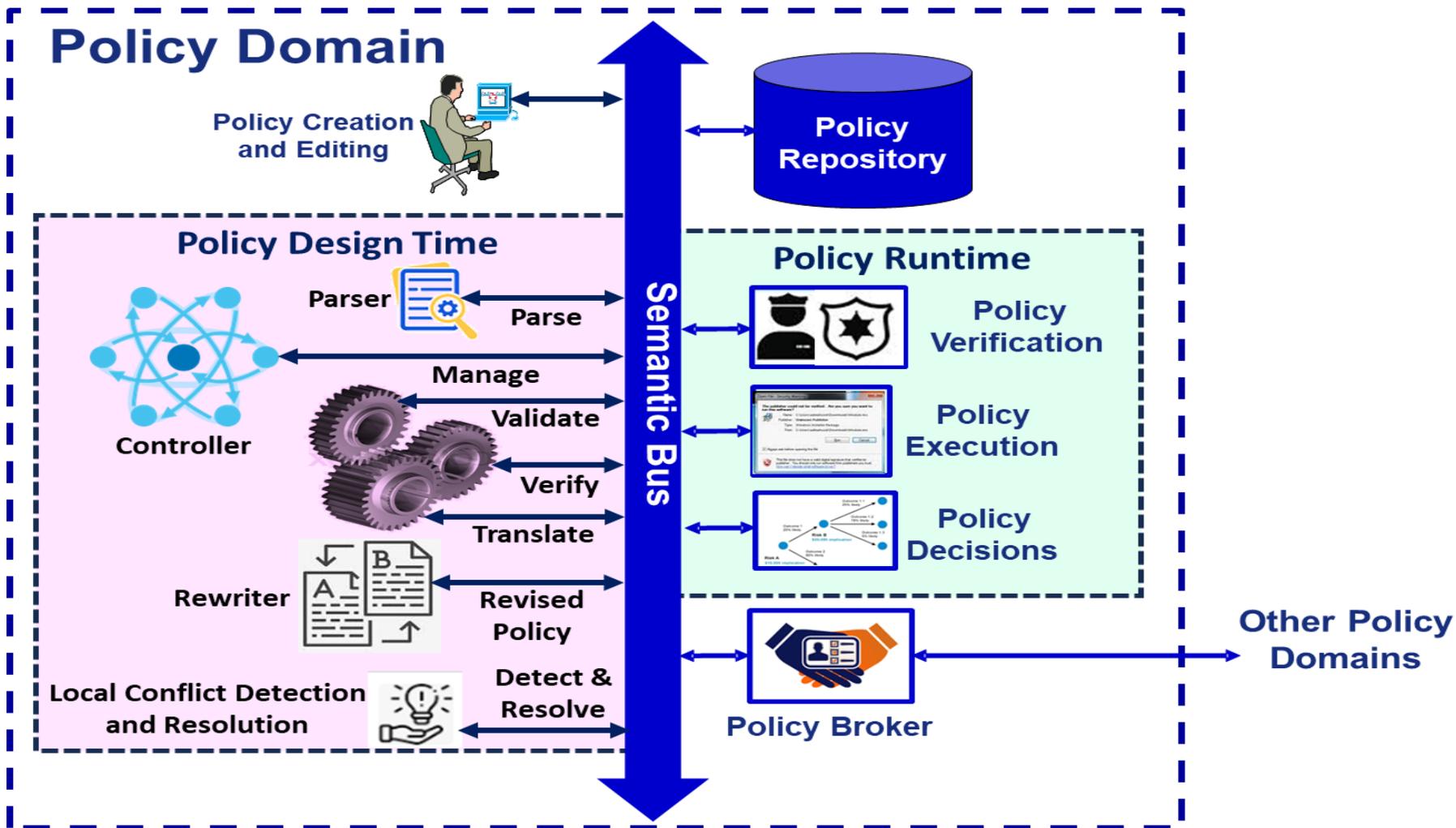
Source: ETSI GS ENI 005 v4.1.1; ENI System Architecture stable

Overview of Model Driven Engineering



Source: ETSI GS ENI 005 v3.1.1; ENI System Architecture published

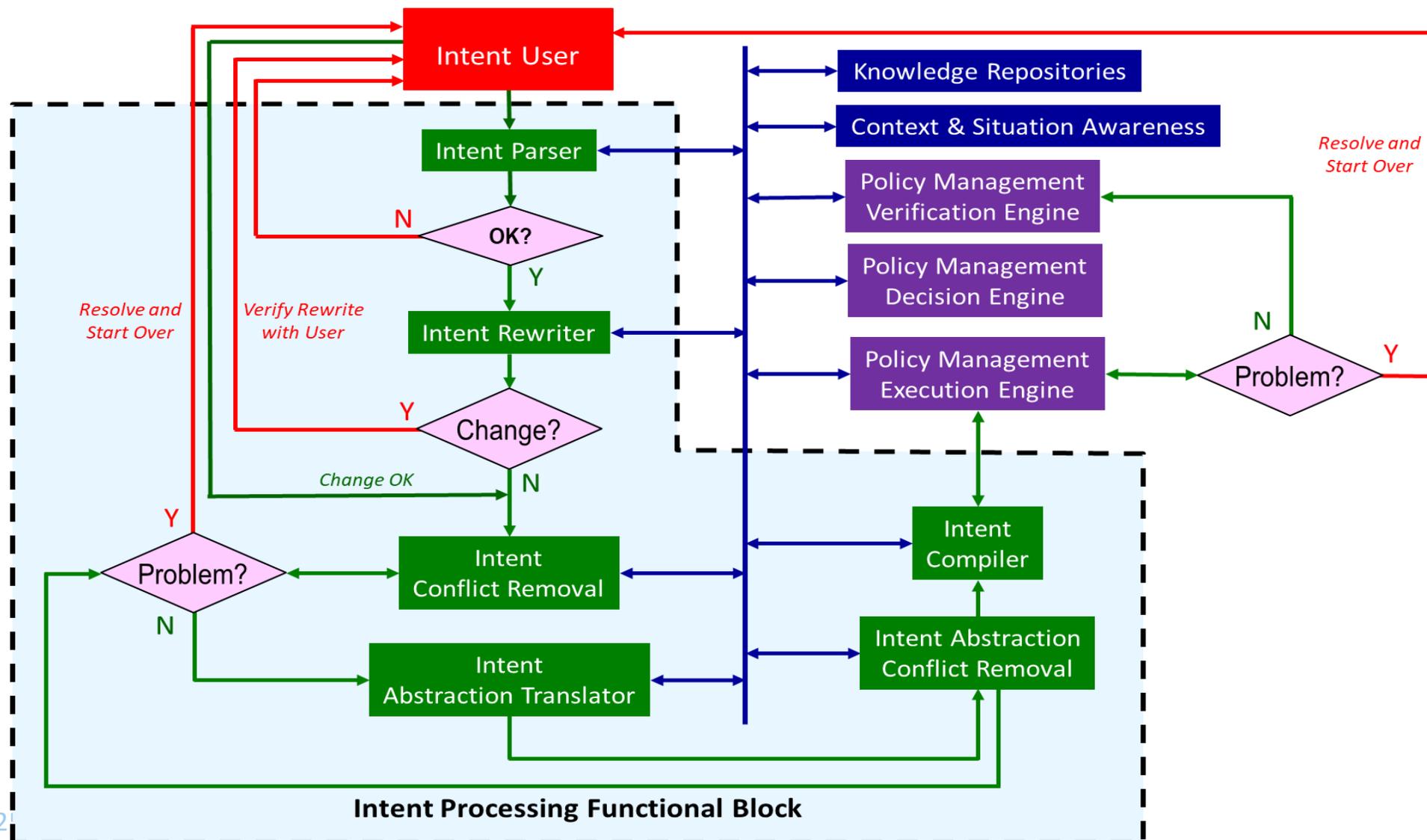
High Level Policy Architecture



Source: ETSI GS ENI 005 v4.1.1; ENI System Architecture revision in drafting

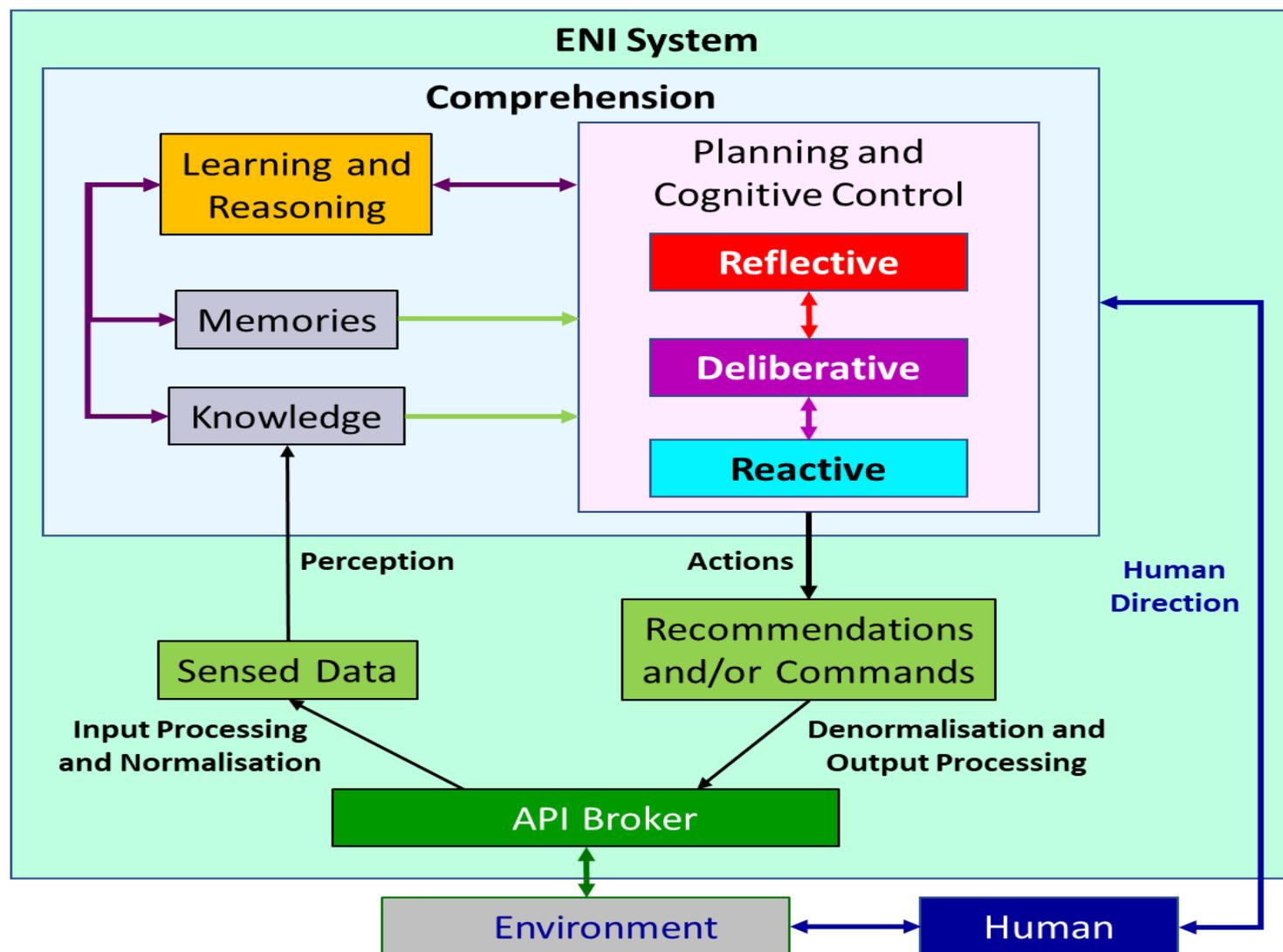
ENI Intent Policy Control

Source: ETSI GS ENI 005 v3.1.1; ENI System Architecture published

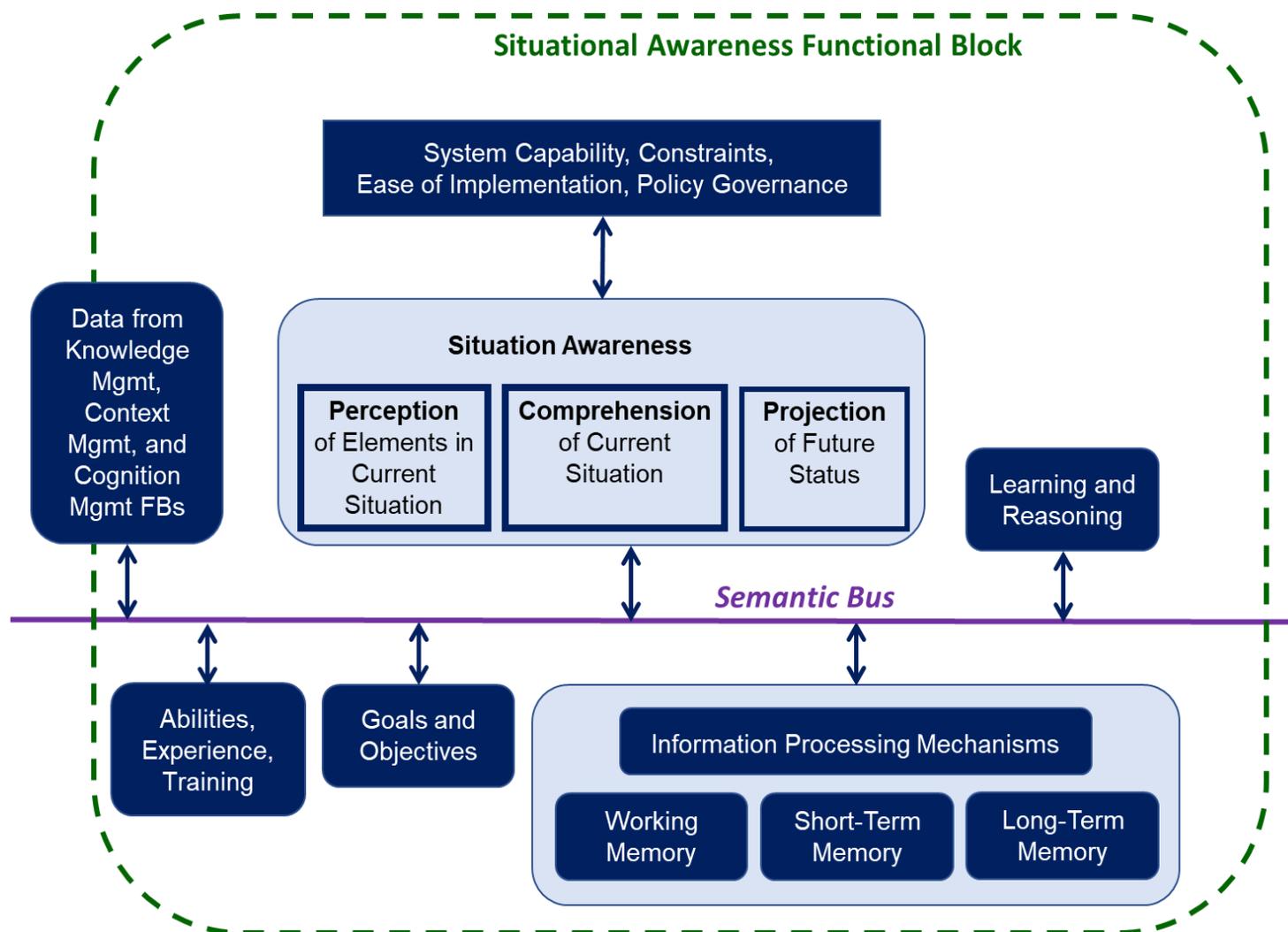


Cognition in ENI

Source: ETSI GS ENI 005 v3.1.1; ENI System Architecture published



Cognitive Processing in ENI



PoC Team and ENI Work-Flow proposal



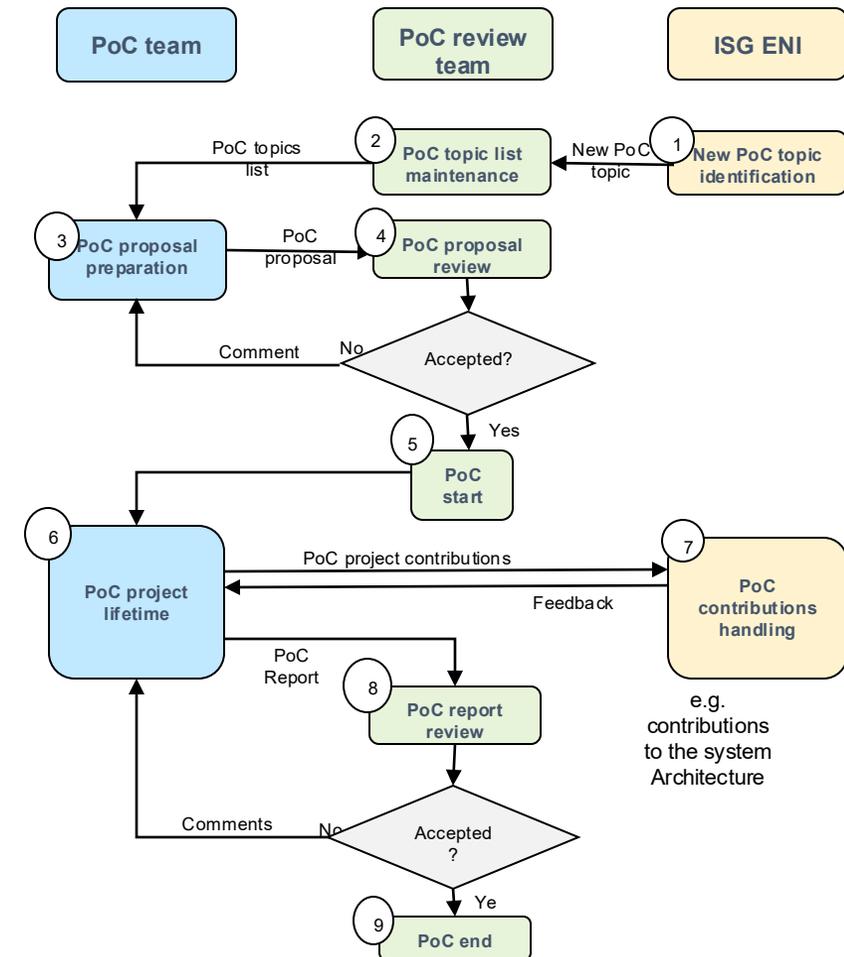
Using the process defined in ETSI

Procedures:

- ✔ ISG ENI approved & published a PoC framework (2nd version)
- ✔ PoC review group to receive and review PoC proposals with formal delegation from ISG
- ✔ Publish the PoC proposals (on ETSI Portal wiki) according to the PoC framework
- ✔ PoC teams (the proposers – which may include non-members) shall present an initial proposal and a final report, according to the templates given by ISG for review
- ✔ PoC Team(s) are independent of the ISG, must choose a PoC Team Leader and draft the proposal according to the process and templates defined by the ISG



ENI PoC review team:



Source: ETSI GS ENI 006 v2.1.1; ENI PoC framework published

ENI PoC List (Release 1 & 2)

Title	PoC Team Members	Main Contact	Start Time	Current Status (Dec.-2020)
PoC#1: Intelligent Network Slice Lifecycle Management	China Telecommunications China telecommunications, Huawei, Intel, CATT, DAHO Networks, China Electric Power Research Institute	Haining Wang	Jun-2018	Completed
PoC#2: Elastic Network Slice Management	Universidad Carlos III de Madrid Telecom Italia S.p.A., CEA-Leti, Samsung R&D Institute UK, Huawei	Marco Gramaglia	Nov-2018	Completed
PoC#3: SHIELD, security through NFV	Telefonica Space Hellas, ORION, Demokritos (NCSR)	Diego R. Lopez Antonio Pastor	Jan-2019	Completed
PoC#4: Predictive Fault management of E2E Network Slices	Portugal Telecom/Altice Labs SliceNet Consortium	António Gamelas Rui Calé	Mar-2019	Completed
PoC#5: AI Enabled Network Traffic Classification	China Mobile Huawei, Intel, Tsinghua University	Weiyuan Li	Jun- 2019	Completed
PoC#6: Intelligent caching based on prediction of content popularity	China Unicom Beijing University of Posts and Telecommunications, Samsung, Cambricon, Huawei	Bingming Huang	Sep-2019	Completed
PoC#7: Intelligent time synchronization of network	China Unicom Beijing University of Posts and Telecommunications, Samsung, Cambricon, Huawei	Bingming Huang	Sep-2019	Completed
PoC#8: Intent-based user experience optimization	China Telecommunications/Huawei Technologies China Telecommunications, Huawei Technologies, AsialInfo, Beijing University of Posts and Telecommunications	Dong Li	Jan-2020	Completed

ENI PoC List (Release 3)

Title	PoC Team Members	Main Contact	Start Time	Current Status (Sept. 2022)
PoC#9: Autonomous Network Slice Management for 5G Vertical Services	Nextworks TIM, Nextworks, Samsung, WINGS, UC3M	Gino Carrozzo / Marco Gramaglia	Jan-2020	Completed
PoC#10: Intelligent Telecom Network Energy Optimization	China Mobile China Mobile Research Institute, Intel, Quanta Cloud Technology, Hong Kong ASTRI	Liexiang Yue	Jan-2020	Completed
PoC#11: Intelligent Energy Management of DC	China Telecommunications: China Telecommunications, Intel, AsialInfo, Samsung, Huawei	Yu Zeng	April-2020	Completed
PoC#12: Intelligent Transmission Network Optimization	China Mobile China Mobile Research Institute, China Mobile Group Zhejiang Co., Ltd., Huawei, Intel	Chen Shaofan	Sept.-2020	Completed
PoC#13: Intelligent Coverage Optimization of 5G Massive MIMO BS	China Telecommunications China Telecommunications, Intel, Inspur	Xueqi Yuan	October-2020	Completed
PoC#14: Intent-based Cloud Management	NTT Labs NTT labs, Intracom Telecom, NTT-AT, Intel	Chao Wu	June-2021	Completed
PoC#15: PINet—Polymorphic Intelligent Network	China Telecommunications China Telecommunications, China Mobile Research Institute, AsialInfo Technologies Inc., Maipu Communication Technology Co., Ltd.	Ziting Zhang	Nov.-2021	Completed
PoC#16: AI based family broadband network user experience optimization	China Mobile China Mobile Research Institute, AsialInfo Inc., Intel	Bian Sen	October-2022	Completed

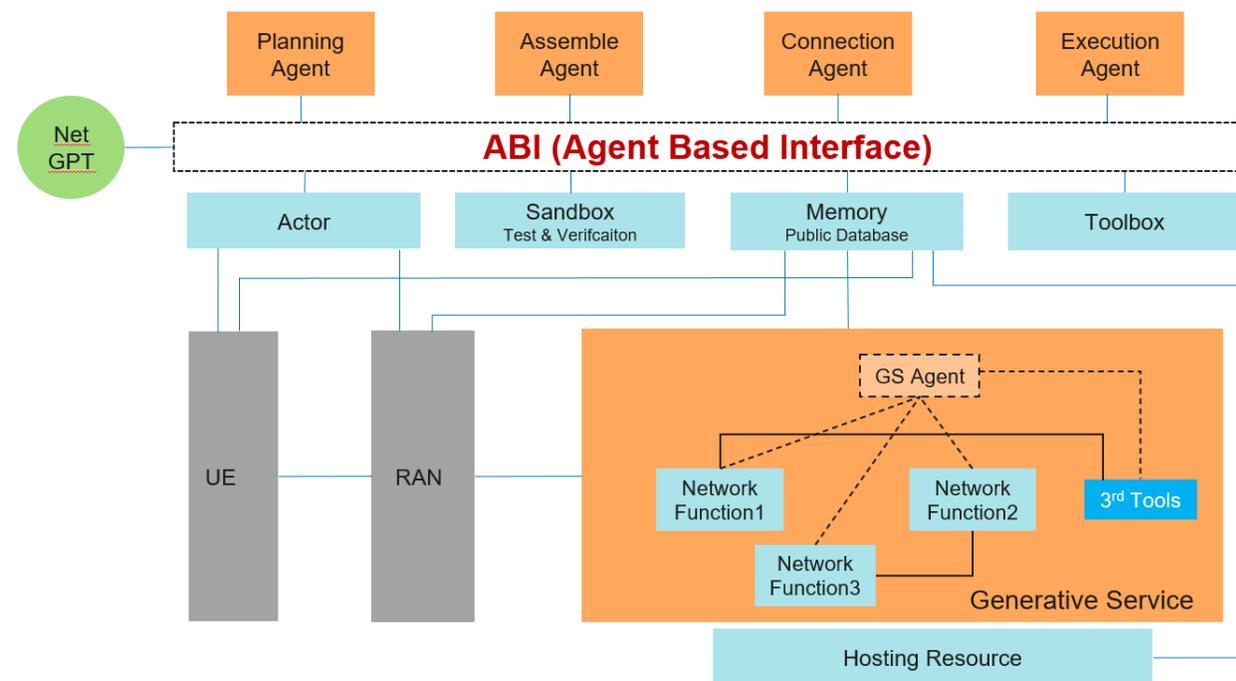
ENI PoC List (Release 4)

Title	PoC Team Members	Main Contact	Start Time	Current Status (September 2025)
PoC#17: Intelligent Satellite-Terrestrial Integration Network Architecture	China Telecommunications China Telecommunications, Tsinghua University, AsiaInfo Technologies Inc., Huawei (UK) Technologies Ltd., CNIT, CNR IST.	Yu Zeng	July-2023	Completed
PoC#18: Intent-driven Operating for User-Centric Cloud-Network Convergence Services	China Telecommunications China Telecommunications, AsiaInfo Technologies Inc., Huawei (UK) Technologies Ltd., BUPT, Xidan University.	Li Zhen	July-2023	Completed
PoC#19: Space-Ground Cooperative Network Slicing	China Telecommunications China Telecommunications, National Digital Switching System Engineering and Technology Research Center, CAICT, AsiaInfo Technologies Inc., Huawei (UK) Technologies Ltd..	Yu Zeng	July-2023	Completed
PoC#20: IP Network Congestion Prediction and Prevention	China Unicom China Unicom, China Telecommunications, BUPT, Purple Mountain Laboratories, Intel Corporation (UK) Ltd	Bingming Huang	April- 2024	Completed
PoC#21: Validation of LLM for Network OAM Application on Generic Computing Platform	China Telecommunications China Telecommunications, Intel UK Ltd, Huawei (UK) Technologies Ltd., China Unicom	Yu Zeng	April-2024	Completed
PoC#22: NTN, 5G SRv6 integration for TSN (Time Sensitive Network) by Artificial Intelligence	CNR ISTI CNR ISTI, CNIT, China Telecommunications Huawei (UK) Technologies Ltd.	Pietro Cassarà	April-2024	Ongoing
PoC 24: AI Core-Next Generation Network Architecture	Huawei GmbH Huawei GmbH, Deutsch Telekom, UPV, China Telecommunications, Futurewei	Onur Ayan	Sept- 2025	Plenary agreed

ISG ENI – Recently Started Work Items (3/3)

ETSI ENI PoC:

- Title: AI Core-Next Generation Network Architecture
- Main Contact: Onur Ayan
- PoC Team:
 - Huawei Tech. GmbH
 - Deutsche Telekom AG
 - Universitat Politècnica de València
 - Two more members are under consideration
- PoC Use Cases:
 - Network-Assisted Robot
 - AI-Phone



Together, we make it happen!

Thank you.