Project GAINS

(Generative AI for Network Sustainability)

Deliverable D2.1

Report on objectives, results, and lessons learned related to Task T2.1 System Design

Giordano, A. – Basile, L. – De Giacomo, A. – Haider, B. – Fruncillo, D. – McGann, O.

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Classification: Internal project use; controlled sharing with partners as needed.

Abstract

This report describes in detail the design of the automation and decision support system of the GAINS project. Objectives, design results, and lessons are presented related to agent-based architecture and the main design artifacts (requirements, data model, interaction contracts, and operational flows) that enable the integration of components and the subsequent validation of the proof-of-concept. The system is designed to provide automated decision support along an end-to-end workflow that includes the ingestion and normalization of heterogeneous data, state and trend analysis, generation of standardized deployment models optimized for environmental sustainability, and production of accompanying technical and procedural documentation.

The architecture adopts a modular design that separates observability, inference, and control functions and organizes them into three main interoperable agents: (i) Network Monitor, for collection and read-only analysis of telemetry, construction of historical baselines, detection of anomalies, and impact estimates; (ii) Knowledge Manager, for ingestion, indexing, and synthesis of technical-operational knowledge and constraints (vendor/role/version), with blueprint production reusable; (iii) Network Orchestrator, for translation of intent into governed candidate configurations, accompanied by a change plan, rollback, and assessment of the expected impact tag.

The Climate component is integrated as a canonical object of the workflow and enables an assessment that can be attributed by device/service/configuration, explicitly distinguishing between direct measurements and model-based/hybrid estimates, with declared assumptions and confidence levels.

The design includes additional governance and security safeguards (audit/traceability, human-in-the-loop, consistency controls, and access policies) necessary to ensure operational consistency and risk reduction, maintaining the modularity of the system and the possibility of independent evolution of the individual agents in the subsequent phases of the design.

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