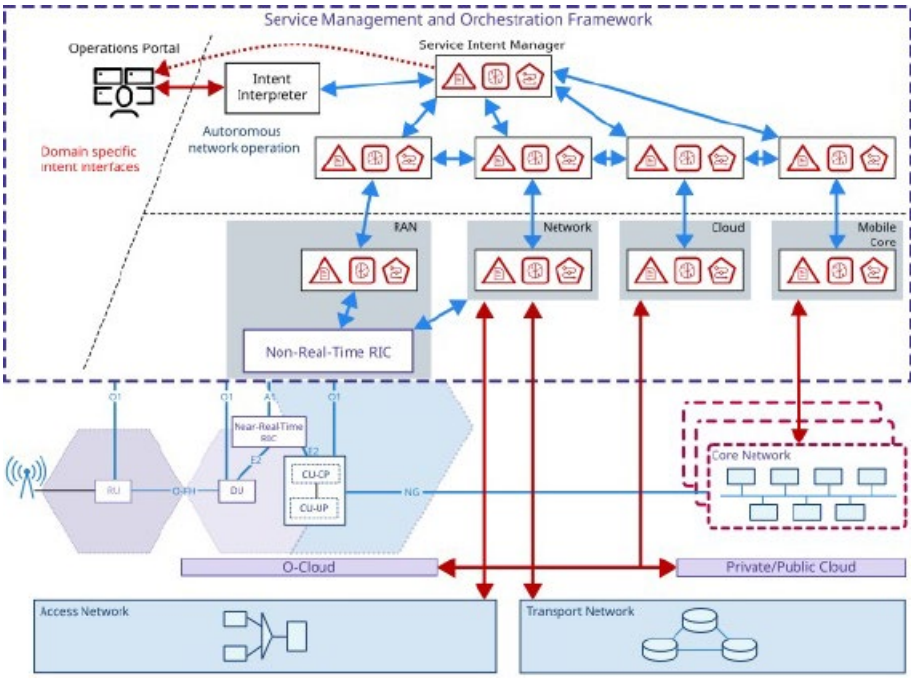
6G-RIC
Research and
Innovation Cluster

GEFÖRDERT VOM
Bundesministerium
für Bildung
und Forschung

Intent-based Networking for Self-Optimizing 6G Networks

VARUN GOWTHAM / FLORIAN SCHREINER / IULISLOI ZACARIAS / ANDRÉ DRUMMOND

Can AI-based autonomous management systems augment traditional management systems and simplify network management of disaggregated and ultra-dense 6G networks? How does such an AI-based management system look like? What methods must be incorporated to build a collaborative management system?



A disaggregated mobile network is deployed in a heterogeneous and distributed infrastructure managed by the intent-based system. An operator sets the network goals through an Operations Portal using a GUI or a high-level specification language without stating how this goal should be achieved. The Service Intent Manager takes the high-level goals and breaks them into lower-level specifications, which are sent to Intent Management Functions responsible for different domains of the network and able to figure out policies that can be applied in the network to achieve the network operators' goals.

KEY FINDINGS

Through a prototype based on the Intent-based Networking (IBN) framework proposed by the IG1253 set of technical guidelines from the TM Forum, we demonstrate the successful role of AI in bringing autonomy into the Network Management System (NMS). Our implementation, which builds on the existing concept of employing AI for network management, shows that AI models can capture knowledge, evolve, and learn based on the arising requirements of the network. Multiple models can be used to achieve a holistic system goal collaboratively. Our software prototype successfully captured users' intents, which were decomposed and set to different IA models capable of generating domain-specific language to manage and control the underlying network elements. Additionally, employing Graph neural networks (GNN) allows us to deal with network heterogeneity and to deal with diverse ways of expressing knowledge (e.g., the user intent represented as a graph using the RDF notation, the telemetry data collected from the network elements, and the topology of the network). Through the collaboration of multiple Intent Management Functions arranged hierarchically, the Demonstator was able to simplify and elevate the abstraction level of the management interface and perform complex decision-making

V. Gowtham, F. Schreiner, M. -I. Corici, T. Magedanz, I. Zacarias, A. Drummond, A. Jukan, "Intent-based Networking for QoS-aware Cloud and Transport Network Management based on Graph Neural Networks," 2023 IEEE Future Networks World Forum.

M. -I. Corici, V. Gowtham, T. Magedanz, A. Prakash and F. Schreiner, "NEMI: A 6G-ready, AI-enabled Autonomic Network Management System for Open Campus Networks," 2022 IEEE Globecom Workshop on Network Management for 6G Communication Systems.