Design of the ADAPTO management framework for 5G-and-beyond networks

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ABSTRACT

In the context of 5G-and-beyond networks adopting cloud-native Network Functions distributed among Edge and Central Clouds, the ADAPTO project is established. Leveraging recent advancements in Software-Defined Networking (SDN) and Network Function Virtualization (NFV), ADAPTO seeks to craft a framework to orchestrate the utilization of distributed computational and network resources according to the variable workloads and network conditions, combining QoS requirements and energy-saving objectives.

The **goals** of the project are: Virtual Network Functions (VNFs) **autoscaling and placement**, and **seamless offloading** between the Edge and the Central Clouds.
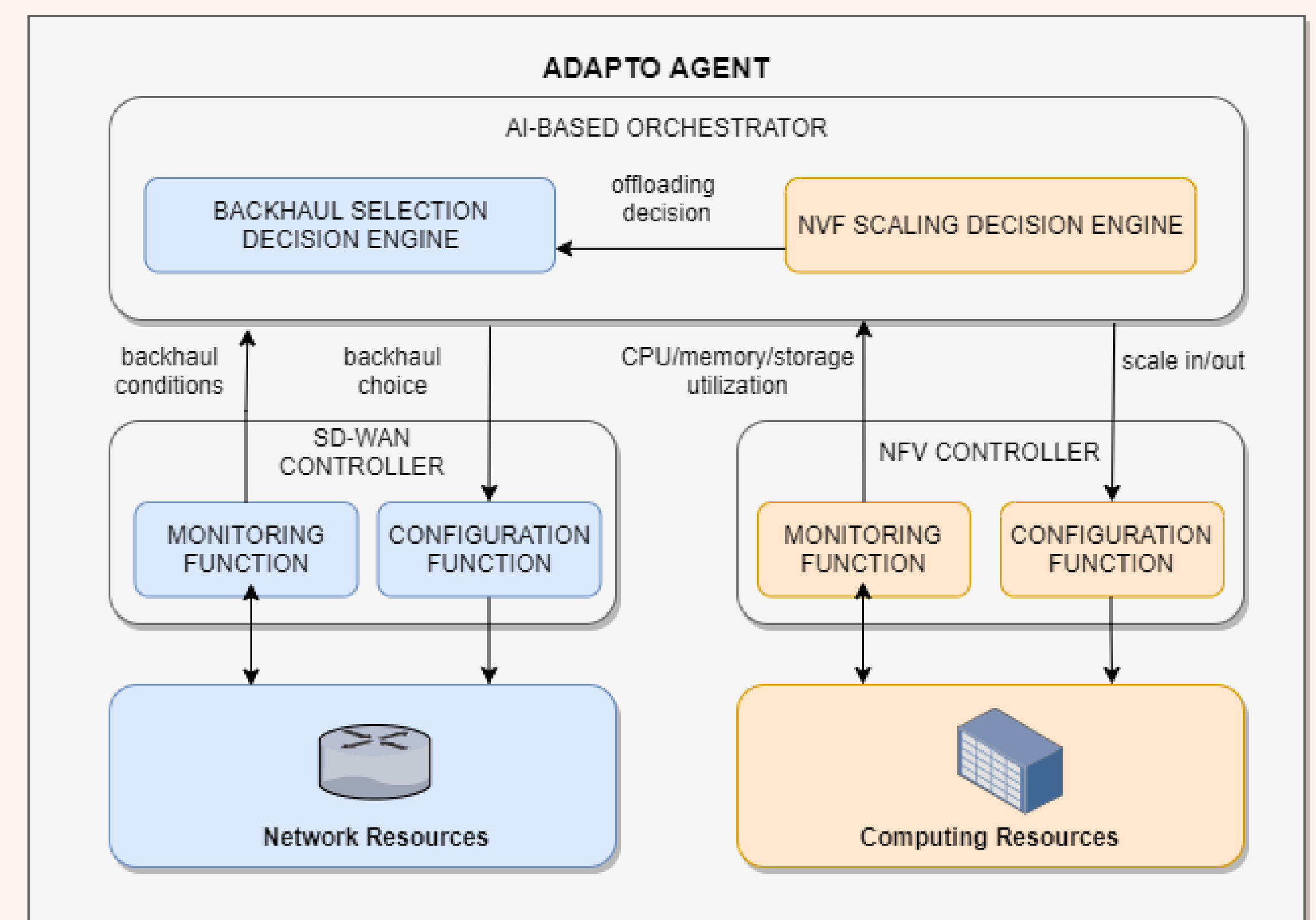
ADAPTO ARCHITECTURE

Edge and Central datacenters interconnected by multiple backhaul infrastructures.
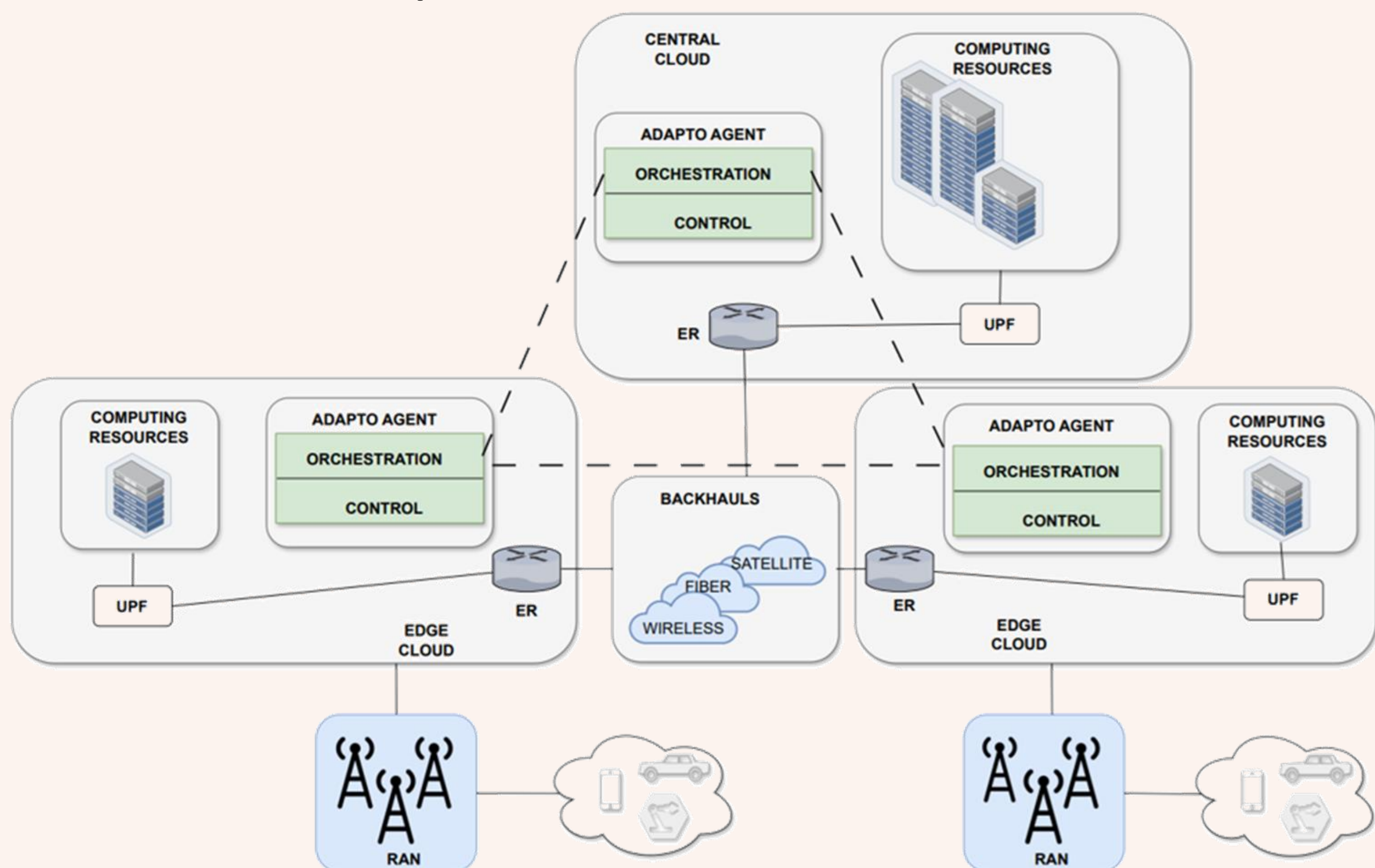

ADAPTO AGENT

Component for the dynamic management of computational and communication resources.

RESEARCH DIRECTIONS

- **Runtime call graph extraction**: network-based monitoring to infer interdependencies between μVNFs.
- **Model-based resource management**: dynamic service placement for vertical scaling [1].
- **Data-driven resource management**: Edge-Cloud offloading mechanism considering resource overload [2].
- **Combination of Model-based and Data-driven approaches**: combination of the two approaches when Service Level Objectives are not satisfied.

PRELIMINARY RESULTS
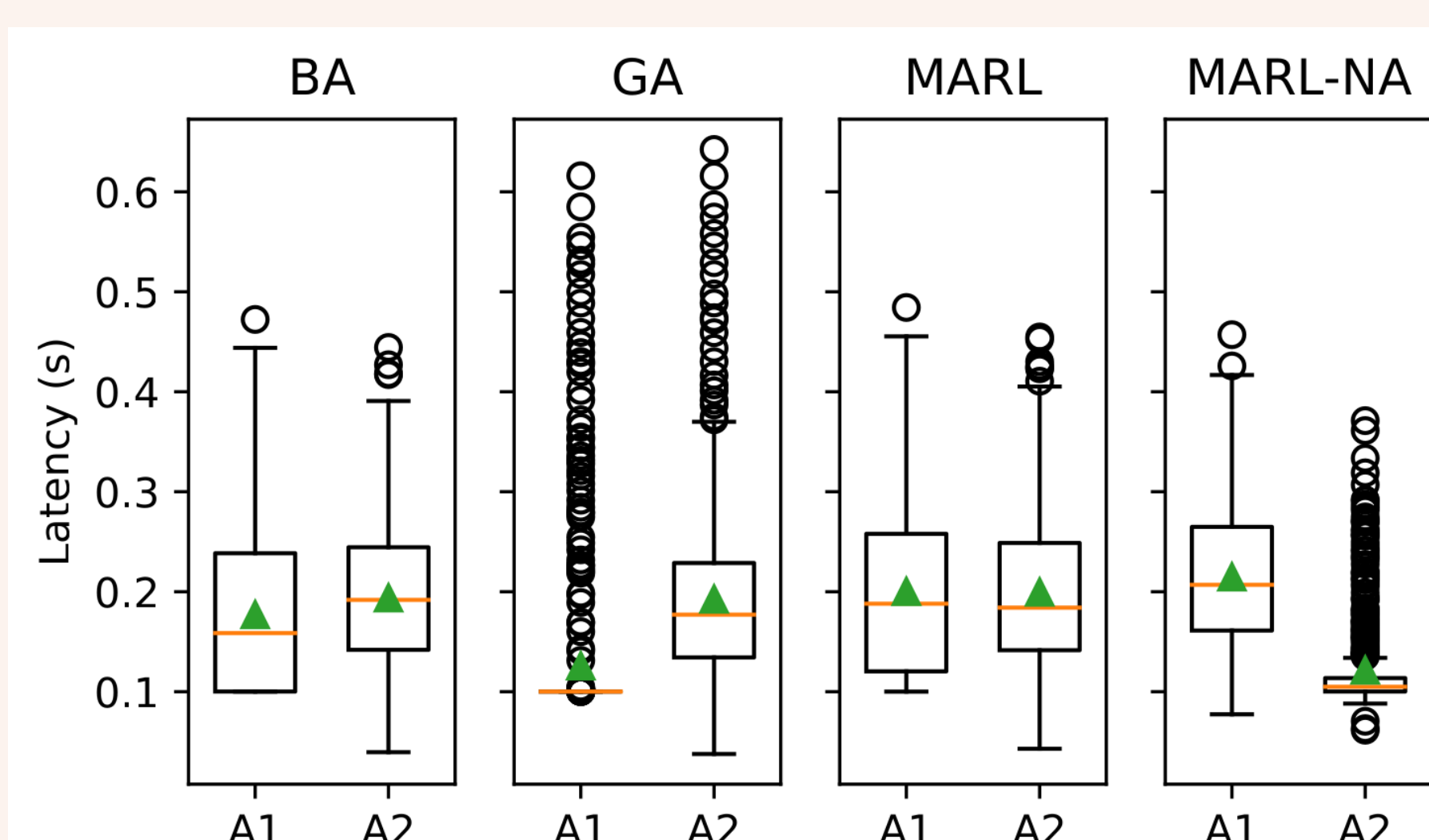
Latency obtained using data-driven approach [3].
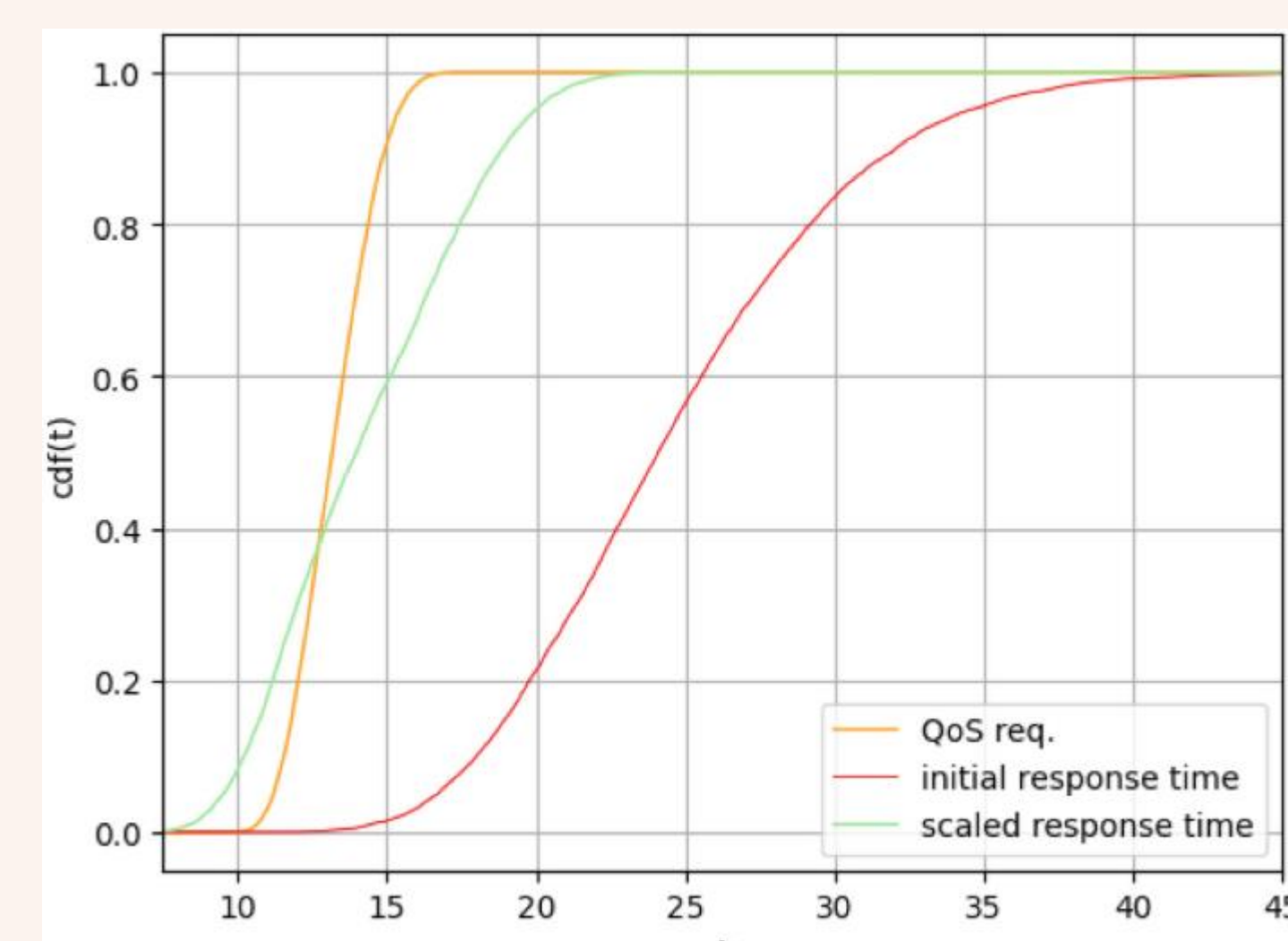
Application of the model-based approach on multiple MEC nodes [1].

REFERENCES

[1] Picano, Benedetta, et al. "Elastic Autoscaling for Distributed Workflows in MEC Networks." International Conference on Advanced Information Networking and Applications (AINA). 2024.

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[3] Botta, Alessio, et al. "Adaptive overlay selection at the SD-WAN edges: A reinforcement learning approach with networked agents." Computer Networks 243 (2024)