

Master thesis 30 or 60 credit (ECTS) on “Resource efficient end-to-end service provisioning in 5G and beyond”

5G and beyond networks are expected to support a plethora of services with different requirements over a single physical infrastructure. Service requirements are usually expressed in terms of end-to-end (e2e) KPIs such as delay, throughput, availability. Upon the request of a service, logical e2e networks can be created by properly combining different resources in the network (e.g., radio backhaul and fiber links, cloud resources, etc.) to ensure e2e service requirements. The power consumption and type of energy powering the network devices can also be considered when resources are combined,

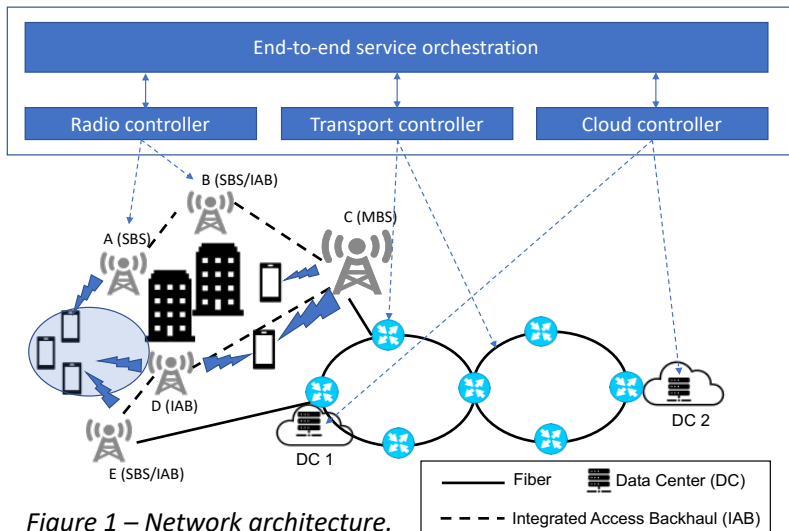


Figure 1 – Network architecture.

making the network more energy efficient and green [1][2].

An example of a 5G network is depicted in Figure 1. The network is composed of three different domains, i.e., radio, transport, and cloud. The radio domain is in charge of handling user radio access, deciding the resources to be scheduled to users and Integrated Access Backhaul (IAB) links [3][4]. The transport domain consists of connectivity resources (i.e., in the form of optical/electrical transmission and switching devices) carrying the traffic between base stations and the clouds. The cloud domain comprises all the compute resources (i.e., the servers where the service is executed). The resources in each domain

are handled by the corresponding controller. An overarching orchestrator receives service provisioning requests, and it is in charge of ensuring that e2e requirements are satisfied during service operation [5]. To do so, the orchestrator periodically collects information from each domain controller in an abstracted form that allows to create a generic picture of the network without knowing what is the specific resource that needs to be allocated. The orchestrator can leverage information from the different domains to create or modify e2e logical networks satisfying specific service requirements. Preliminary studies already indicate the advantages of a joint selection of radio and transport resources [5][6]. This thesis aims at investigating more in deep these aspects, also considering evolving network conditions (e.g., when resources become overloaded or unavailable). Furthermore, energy consumption and footprint of the network will also be taken into account in an e2e perspective.

The outline of this MSc thesis is as follows (will be adapted depending on number of credits and students)

- Literature review on joint orchestration of resources, IAB, and energy efficiency in mobile/fixed networks.
- Assessment:
 - Development of an event-driven simulator able to deal with service requests and network changes.
 - Design and implementation of a resource efficient e2e service provisioning strategy.
 - Comparison with a benchmark solution (e.g., with resources that are not jointly optimized).

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References

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