People desire to be connected, no matter where they are. Recently, providing Internet access to on-board passengers has received a lot of attention from both industry and academia. However, in order to guarantee an acceptable Quality of Service (QoS) for the services with low incurred cost, the path to route the services, as well as the datacenter to deploy the services should be carefully determined. This problem is challenging, because there are different types of Air-To-Ground (A2G) connections, i.e., satellites and Direct Air-To-Ground (DA2G) links. These A2G connection types differ in terms of cost, bandwidth, and latency. Furthermore, due to the moving nature of a flight, it is important to consider adapting the service location gradually. In this work, we formulate two Mixed Integer Linear Programs (MILPs) for the problem of Joint Service Placement and Routing (JSPR): i) Static (S-JSPR), and ii) Mobility-Aware (MA-JSPR) in Space-Air-Ground Integrated Networks (SAGIN), where the objective is to minimize the total
cost. We compare S-JSPR and MA-JSPR using comprehensive evaluations in a realistic European-based SAGIN. The obtained results show that the MA-JSPR model, by considering the future flight positions and using a service migration control, reduces the long-term total cost notably. Also, we show S-JSPR benefits from a low time-complexity and it achieves lower end-to-end delays comparing to MA-JSPR model.

Stichworte: placement, location-routing, migration, space-air-ground, mobility-aware, multi-period optimization

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