

Call for pitches – Guidelines for R&T topics

Topic of interest: Dynamic Optimization of Satellite Operations

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Short description of research topic:

Dynamic multi beam satellite coverage allocation and optimization mission ground segment

Detailed areas of research proposed:

Dynamic multi-beam satellite coverage allocation and optimization of mission ground segment.

Software-defined flexible payloads open up for a wide range of opportunities to dynamically adapt the payload configuration and resource optimization.

The dynamic resource management functions implemented in future Satellite Earth Hub Stations shall be capable of accounting for a number of events affecting the communication services and their quality of service and adapting on the fly the resources in a view to optimize the mission performance.

The following events should be considered:

- Rain fade affecting either the user link or the feeder link
- Evolution of traffic requirements due to the creation, deletion or modification of traffic requests
- Communication services tailored to mobile user terminals with partial knowledge about their future positions

The resource management function can modify the multi-beam layout (i.e. the set of beams and the beam shape), the assignment of terminals to beams, bandwidth/power allocations and the on-board routing/connectivity to reactively or pro-actively manage these events and optimize the aggregated capacity and the service quality provided to each customer.

Target results foreseen (e.g. maturity level to reach, deliverables to produce, estimated timing, etc.):

The proposed R&D project, for which Airbus would be very interested to collaborate with research partners, should address the following topics:

- Building representative mission scenario and datasets
- Exploring and benchmarking different algorithms for both traffic prediction and payload configuration optimization.
- Several research fields are relevant for that:
 - Operation Research: exact algorithms (mathematical programming, constraint programming), approximate algorithms (metaheuristics, local search...)
 - Automated Planning and Scheduling: classical, probabilistic and conditional planning

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- Artificial Intelligence, including Machine Learning and in particular Reinforcement Learning
- Assessing the performance of the algorithm in terms of run-time complexity and optimality

Other relevant aspects to consider (e.g. previous experience required working in Defence and Space sector, access to specific facilities or laboratories, etc.)

A clear expertise in the technological area and possibilities to bring to the consortia material, laboratories, test-facilities and workforce would be of high interest.