NEWS

S3NET Requirements and use-case report available soon

The deliverables covering S3NET Application requirements as well as Technical and Operational Requirements and Use Case Report will be soon available on the S3NET website.

These documents provide a quantitative and qualitative analysis of the selected requirements, as well as concrete use-cases that are already being investigated by the S3NET Team. For further information and explanations on the S3NET choices you can download the deliverables on the S3NET Website.

S3NET at the AIDAA XXIV International Conference

S3NET Partner POLIMI presented their work on Fractionated sensors to enhance the Earth Observation service within the S3NET project. The conference took place in Palermo (Italy) on 18-22nd September 2017.

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A WORD FROM THE PROJECT COORDINATOR

Jamin Naghmouchi
Project Coordinator

Welcome to the S3NET Newsletter. This is the first edition which coincides with the end of the first 12 months of the project. Throughout this year the S3NET team, consisting of 8 partners from 4 different countries, has defined the requirements and selected the application areas that best address the challenges faced by our society. This work has been documented in two public deliverables that can be accessed from our website. Furthermore, mission design alternatives and concept compute system specifications as well as benchmark plans have been finalised, thus forming the backbone of S3NET. In the coming year the focus will be on satellite formation flying and fractionated Optical and SAR based EO analysis, as well as the development of the concept compute system and the design, benchmark and construction of the S3NET communication system.

This Newsletter provides some insight into S3NET achievements and activities planned in the coming year. We hope that you will find it useful and we encourage you to get in touch with any questions or comments you may have about what S3NET is doing.

Your comments and suggestions are always welcome – please email them to s3net@eurtd.com or join our LinkedIn network.

Thank you for your interest in the S3NET Project.

Kind regards,
Jamin Naghmouchi

IN THIS ISSUE

ABOUT S3NET

Overview

Earth Observation (EO) from space is evolving and showing a clear trend of moving away from the usual concept of a single satellite with multiple sensors towards fractionated and distributed sensor missions. Meaning multiple satellites, possibly carrying different types of sensors act in a formation or swarm. This approach can present several advantages as better image and service quality and in many cases decrease of deployment costs for satellites, which are potentially smaller and less complex due to simpler mission requirements.

S3NET will contribute to the European Space Industry, by investigating and providing answers to the following questions:

- Which EO mission would benefit most from the fractionated approach?
- How to make a network or a constellation to work as a single instrument?

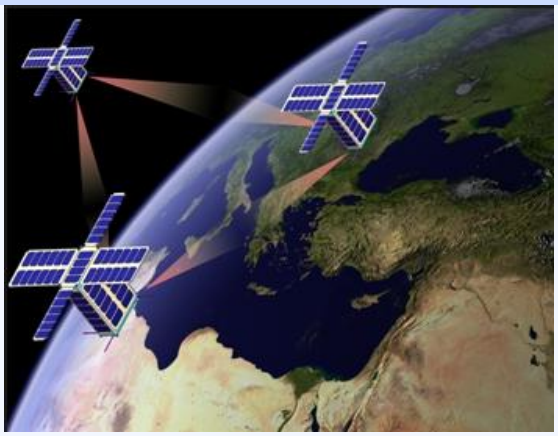
Impact

S3NET will permit a significant enhancement in satellite missions performance by replacing large multi-instrument satellites with a cluster of smaller satellites and constellations thus contributing to mitigate the risk of mission failure. By disaggregating the traditional monoblock satellite S3NET will open the door to scalable missions, incremental deployment, but also cost savings through extended satellite life-time. The Satellite Swarm Sensor Network project is a concept that will restructure the space imaging value chain by making space imaging more affordable thus attracting new actors to the sector and also facilitating the access to space generated data. The access to the latter will be further improved through the reduction of delays of image delivery, resulting from the use of compression algorithms and advanced on-board image processing (superior to compression in terms of data size reduction).

KEY INNOVATIONS AND SELECTED APPROACH

FORMATION FLYING

S3NET will deliver key innovations aiming to revolutionise space mission planning through the enhancement of on-board resources (computing power, communications and fuel) and the implementation of smart algorithms. Spacecraft Formation Flying S3NET aims at disaggregating a satellite to form a plug-and-play network of autonomous or semi-autonomous entities. This implies discovering space orbits providing bounded relative motion under orbital perturbations and delivering flight algorithms for fractionated sensors. For this purpose cluster control and orbit determination algorithms will be benchmarked. An experimental setup to validate selected methods and tools will be built in the Technion's Distributed space Systems Laboratory (DSSL).



*Artist view of SAMSON (**S**pace **A**utonomous **M**ission for **S**warming and Ge**o**location with **N**anosatellites)*

OPTICAL INSTRUMENTS

Artist view of optical missions: on-board elaboration enables reduction of downlinked data volume and allows faster and prompter delivery of product to final user.

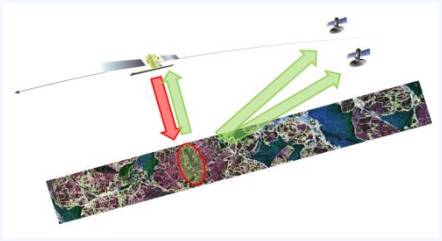
S3NET will enable multi-sensor fractionated acquisition in constellation or cluster formations. This requires that on-board sensors of different satellites travelling in the same orbit (constellation) or work together in a group (cluster).

The following pre-processing steps will be investigated within S3NET: cloud detection, band-to band registration and data compression, both lossy and lossless (CCSDS-123 standard).

SYNTHETIC APERTURE RADAR

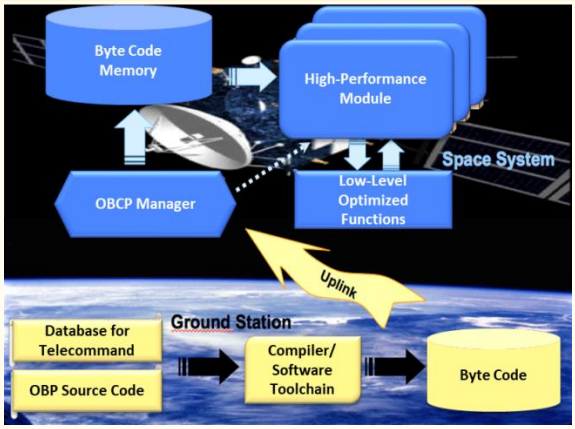
S3NET will enable SAR to transmit/ broadcast the final data product directly to the end user, by reducing the data amount to be transferred. This requires increased onboard computer power making it possible to shift SAR image formation from the ground segment to on-board computers.

At this stage 2 use-cases have been selected for further evaluation: resampling and decimation for staggered SAR and generation of focused high resolution (bi-static/generic) SAR images



SESAME's configuration, with the two SESAME spacecraft flying in close formation relative to each other, and in a loose formation with respect to a Sentinel-1 satellite.

ON-BOARD PROCESSING



S3NET compute system concept

Replace the single high-performance DSP by a scalable software managed high-performance, low-power hardware system that can be employed in space.

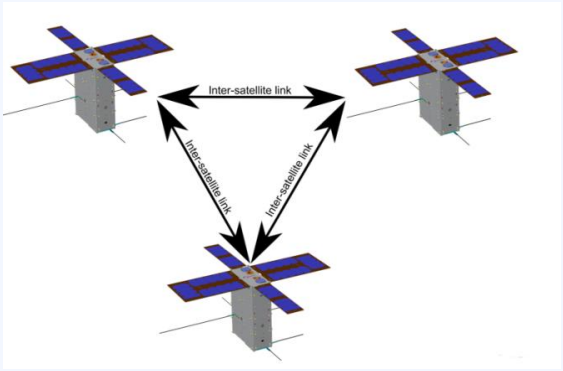
The S3NET compute system concept will include at least 2 high-performance compute units steered by a system controller. The system targets to scale up to 10x the performance achievable with a single high-performance DSP.

It will enable benchmarking of algorithms kernels, reaching performance evaluation for the workloads, indicating the expected on-board computer performance of S3NET use cases.

SATELLITE COMMUNICATION

The innovation in terms of satellite communication will consist in the establishing of properties of the transmission protocol based on various properties of the swarm constellation (ex. number of satellites, topology with a master satellite, static or dynamic constellations) and specific application domain.

S3NET will enhance the communication middleware protocols and space protocols to provide the communication needs for dispersed sensors, swarm satellite systems and distributed systems.



Inter Satellite Links (ISL)

LEARN MORE

To learn more or enter to a discussion with the S3NET team members contact us via the S3NET website or join our LinkedIn network.

Disclaimer

'This Newsletter reflects only the author's views and the Union is not responsible for any use that may be made of the information contained therein.'