



STAR-Dundee

20 Years of Spacecraft Networking Innovation

Testing SpaceFibre in Orbit: The OPS-SAT and NORBY Technology Demonstrators

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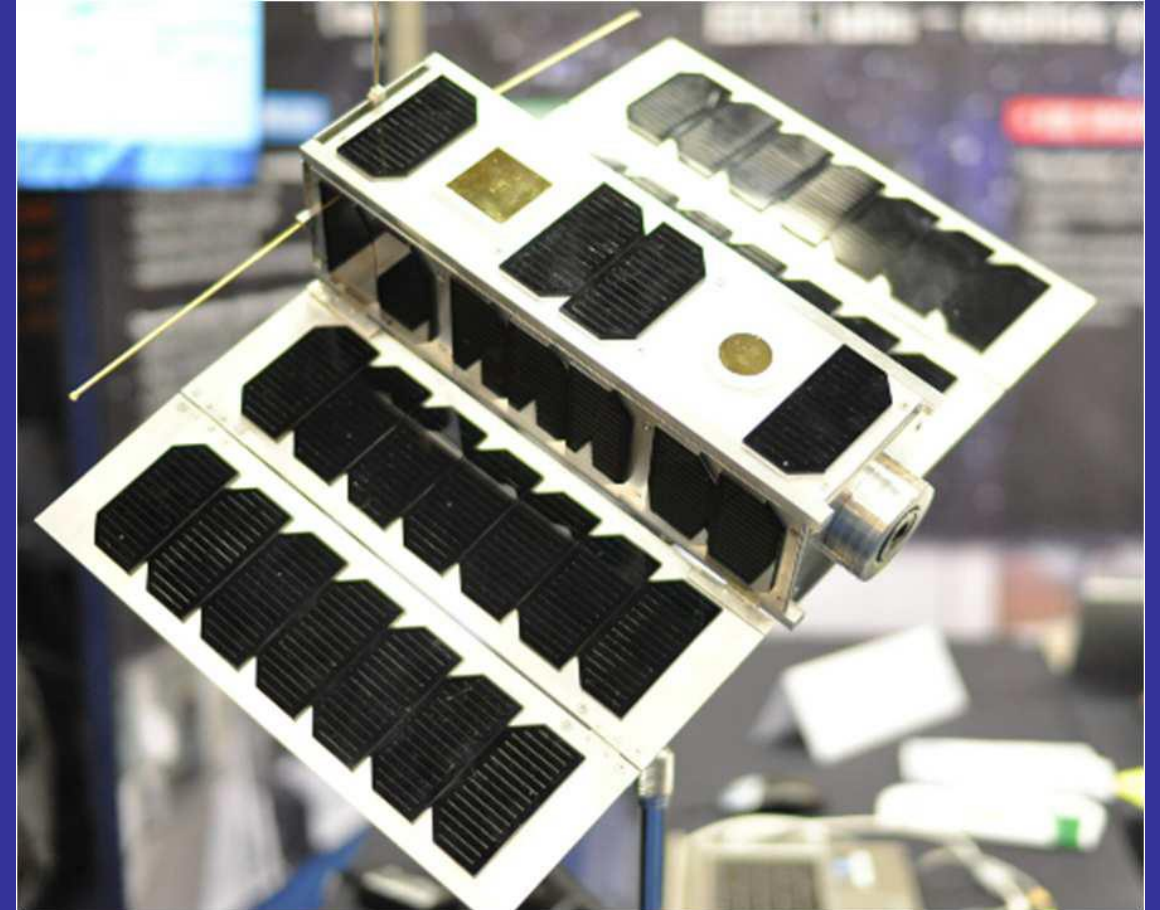
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SpaceFibre

- SpaceFibre (ECSS-E-ST-50-11C) is a technology specifically designed for use on-board spacecraft that provides point-to-point and networked interconnections at Gigabit rates.
- SpFi is being adopted worldwide by the aerospace industry and as part of this adoption, new experiments are developed to demonstrate its capabilities and performance in real space environments.
- The purpose of the experiments is to increase TRL and showcase integration of SpaceFibre in real missions.

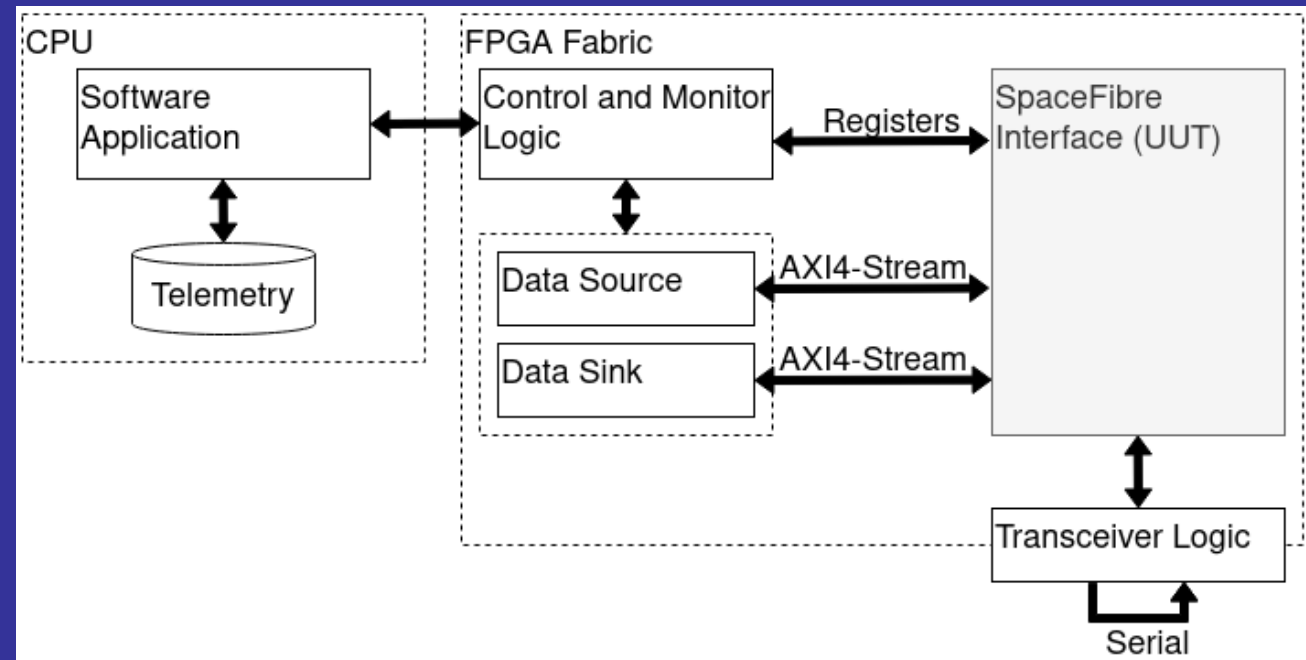
OPS-SAT Mission

- OPS-SAT is a 3U CubeSat
- First nanosatellite to be directly owned and operated by ESA
 - Technology demonstrator platform
- Launched on December 18, 2019
- Intel/Altera Cyclone V FPGA



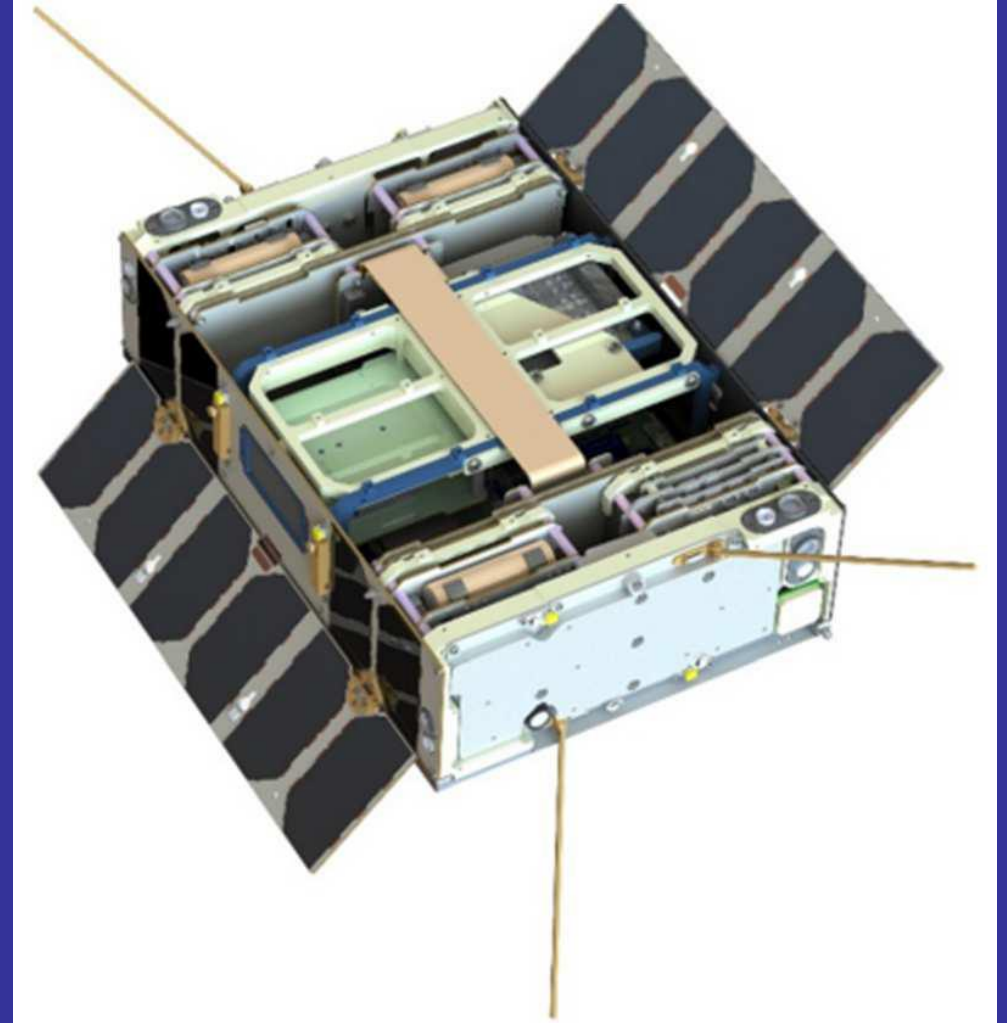
OPS-SAT Experiment

- Link running at 2.5 Gb/s
- All Virtual Channels sending at maximum allowed data rate
- The loopback is done at the physical medium attachment (PMA)
- Software running on the CPU to control and monitor the experiment and store results for the telemetry
- Total experiment runtime of 90 minutes



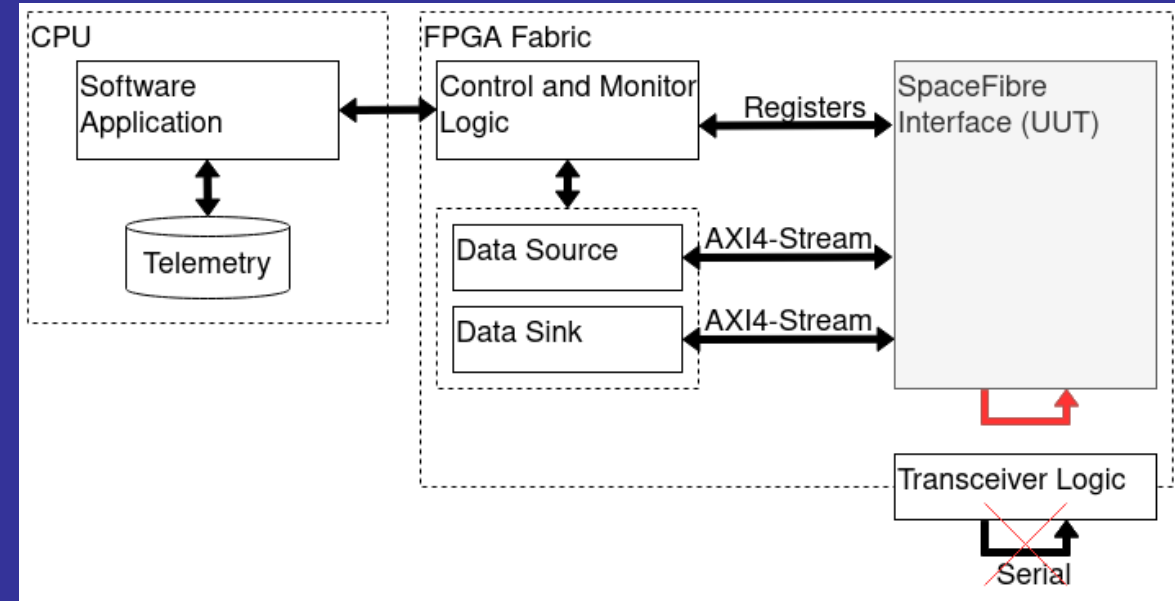
NORBY Mission

- NORBY is a 6U CubeSat nanosatellite
 - Flight test of the platform and evaluation of technical solutions under real conditions
- By Novosibirsk State University & launched on September 28, 2020
 - Collaboration with Thales Alenia Spain
- Commercial FPGA representative of space applications



NORBY Experiment

- Link running at 2.5 Gb/s
- All Virtual Channels sending at maximum allowed data rate
- Software running on the CPU (LEON3) to control and monitor the experiment and store results for the telemetry
- Total experiment runtime of 24 minutes
- Due to design limitations, the loopback was done inside the SpFi interface using its inbuilt loopback feature. This is a parallel loopback and not a serial loopback



Conclusion

- OPS-SAT and NORBY are the first publicly known missions to have tested SpaceFibre in orbit have been described
 - Both missions implemented the STAR-Dundee SpaceFibre Interface IP
- Both experiments reported successful results
 - SpaceFibre demonstrated in orbit
- These experiments show the integration flow of SpaceFibre in real spacecrafts
- The STAR-Dundee SpaceFibre IP family has been, and is currently being, implemented in FPGA and ASIC designs for several missions and products in Europe and the USA

A high-angle, wide shot of the Earth from space. The sun is rising over the horizon on the left side, creating a bright, glowing effect that illuminates the atmosphere and the top of the planet. The Earth's surface is visible, showing the blue oceans and the brown and green landmasses. The overall color palette is dominated by deep blues and purples, with the bright white and yellow of the sun providing a strong contrast.

THANK YOU!