ESA 6G LINO – A Flexible 6G Non-Terrestrial Network Platform for Live Evaluations and Demonstrations

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Project partners: TESAT, VTT, OpenCosmos, University of Surrey, Deutsche Telekom, Airbus Defence and Space

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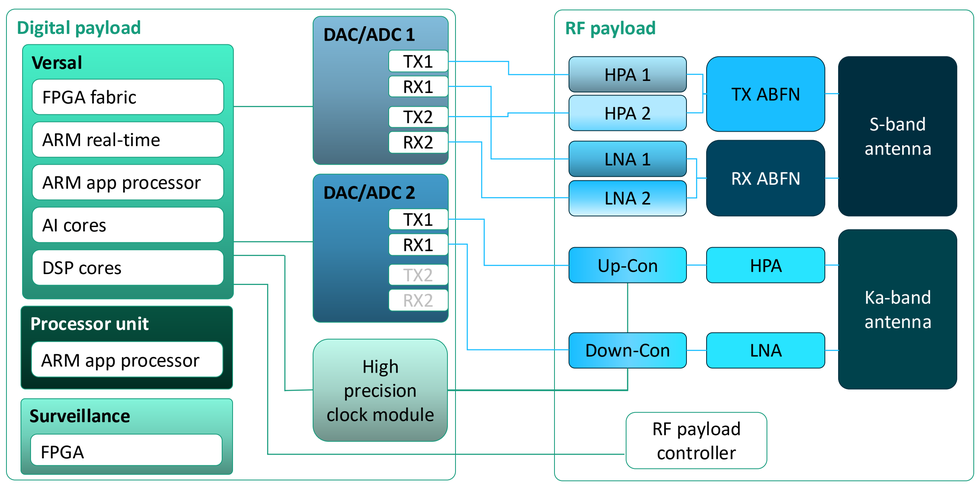
Platform overview

- 16U LEO satellite
- After finishing the launch, in-orbit-verification and demonstration of the use cases below, the satellite will serve as an open development platform for anyone
- Central component: AMD Versal SoC AI Core Series
- Lattice FPGA as system supervisor
- Raspberry Pi Compute Module 5 (CM5) as computational unit
- Analog Devices AD9361 transceiver as SDR interface
- Architecture provides full reconfigurability of Versal and Raspberry Pi CM5 after launch



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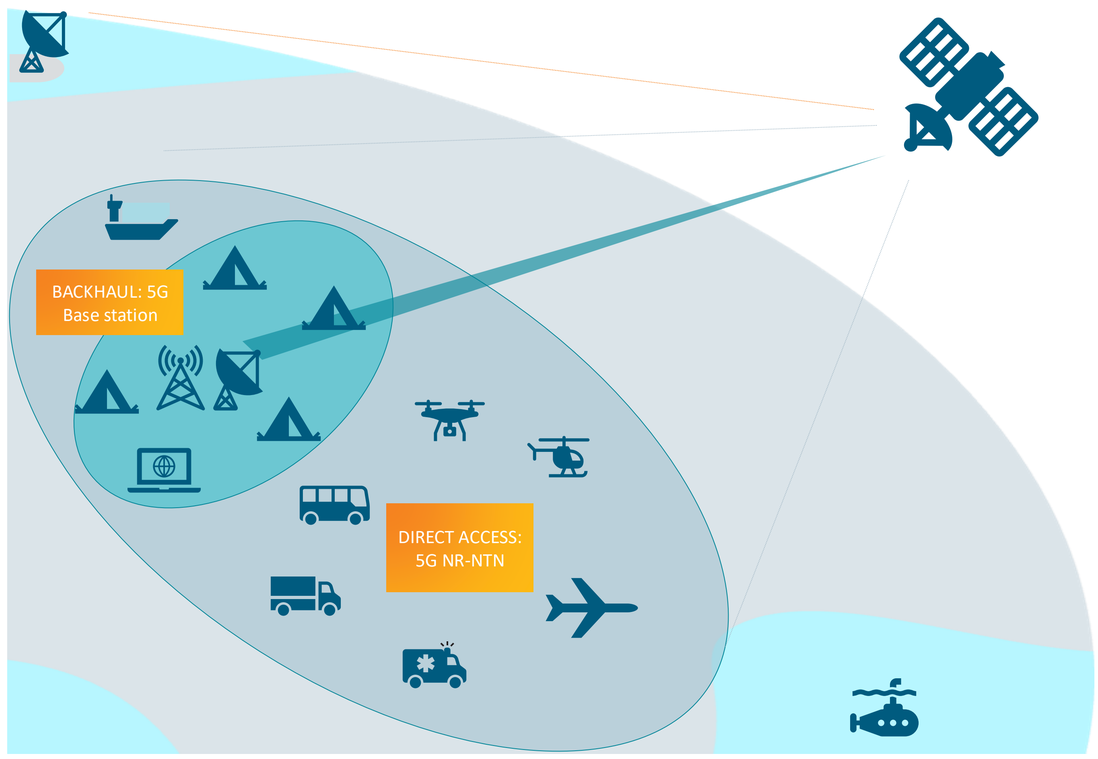
Use cases of the project

+ Main application: 5G NR gNodeB in space

- gNodeB deployment with optional 5G Low PHY acceleration in the Versal FPGA and interfacing to OpenAirInterface (OAI) running on Raspberry Pi Compute Module 5
- Digital transparent mode also available in order to forward 5G NR signal to base station on ground

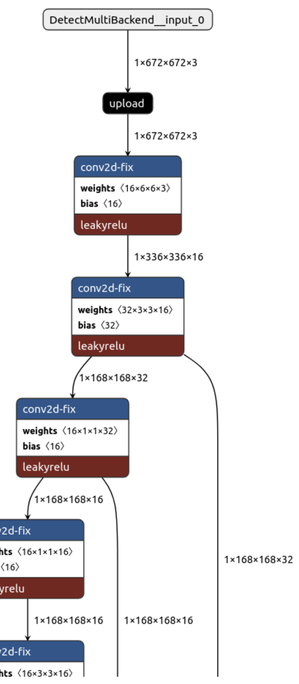


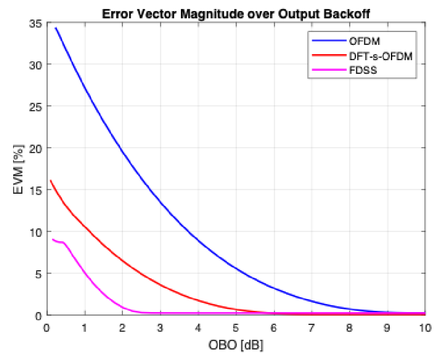
+ Demonstration of TN to NTN handover scenario

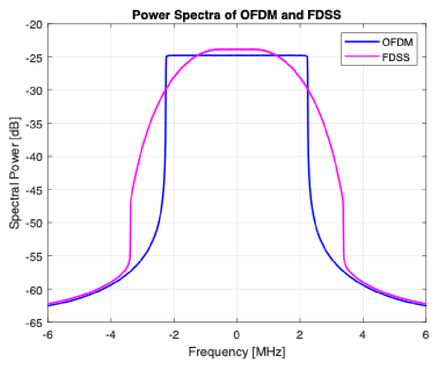
- Filling the gap in coverage by an NTN connection via satellite for a moving user leaving a terrestrial 5G cell towards remote area
- Providing seamless connectivity by performing conditional handover procedure from terrestrial to non-terrestrial network

+ AI-based spectrum monitoring and allocation

- Mobile communications allow huge number of simultaneous accesses to the channel which can lead to user interference
- Training and deployment of AI-based spectrum allocation algorithm
- Capturing of the spectrum in the relevant bandwidth and feeding into the neural network located within the AI engine inside of the Versal platform
- Predict available frequency slots in the spectrum which can then be used for an unobstructed communication







+ Evaluation of 6G waveform candidates

- 5G NR employs an OFDM waveform which poses challenges in satellite transmission
- OFDM waveforms impair the available output power of the power amplifier due to a high peak-to-average power ratio (PAPR)
- This results in a lower SNR at the receiver and thus affects the throughput of the link
- OFDM waveform enhancements like frequency domain spectral shaping (FDSS) can reduce this high PAPR and therefore improve the efficiency which is a crucial point for satellite missions

+ Your future custom space experiment?

- Due to the full reconfigurability of the AMD Versal and the Raspberry Pi CM5 also after launch, almost arbitrary use cases can be invented, implemented and tested on this platform

Interested in deploying your experiment in space?
→ Contact us!

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[1] © Tesat-Spacecom

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