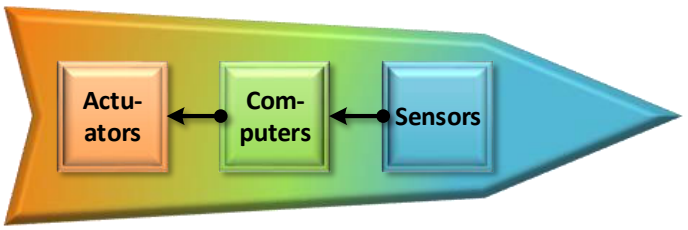
Airborne embedded computing use cases

EXCEED Factsheet

Airborne embedded computing use cases are driven by SWaP (Size, Weight and Power consumption) constraints, whether embedded in space launchers, aircrafts, drones or missiles, and their long-life cycle requires long-term trusted suppliers, in particular for electronics parts.



General avionics chain

Airborne & space launcher embedded equipments: sensors-computers-actuators chains ensuring the flight control mastery, with different kinds of processing that require flexibility, real-time performance and high levels of functional safety in small-form factor with limited power supply.

Gyrostabilized Electro-Optical Sensors

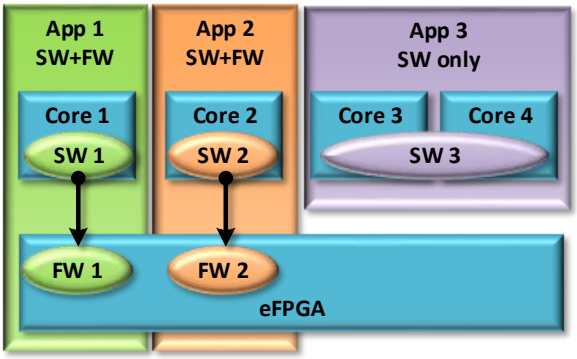
Seekers for trusted pinpoint accuracy need significant embedded processing power to fulfil their mission: from target Detection to Identification and tracking, optronics seekers rely on image enhancements and advanced classification techniques, withstanding in some cases extreme physical environment (temperature, vibration…).

Air-Air Missile: seeker and Highly Integrated control electronics

Missile weapon controllers: highly integrated, power efficient, and versatile computing resources are required to address a large variety of demanding missile guidance algorithms, where performance and safety are equally important.

Research work within EXCEED is on:

- Small-form factor ⇒ size constraints ⇒ integration ⇒ multicore capability
- Flexibility ⇒ multiple different CPU cores & eFPGA mix, multi-memory interfaces, high connectivity, configurability
- Functional safety ⇒ real-time unit, multicore lockstep & eFPGA applications segregation for space & time
- Sovereignty ⇒ European supply chain for trusted and sustainable sourcing



Flexible integration of different kinds of processing

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A trusted European supply chain based on a European cost effective and reliable technology: the 28nm FDSOI

In response to today identified pain points

- Technology dependency
- Commercial dependency
- Aerospace & Defence market being a niche for major vendors

Leading to

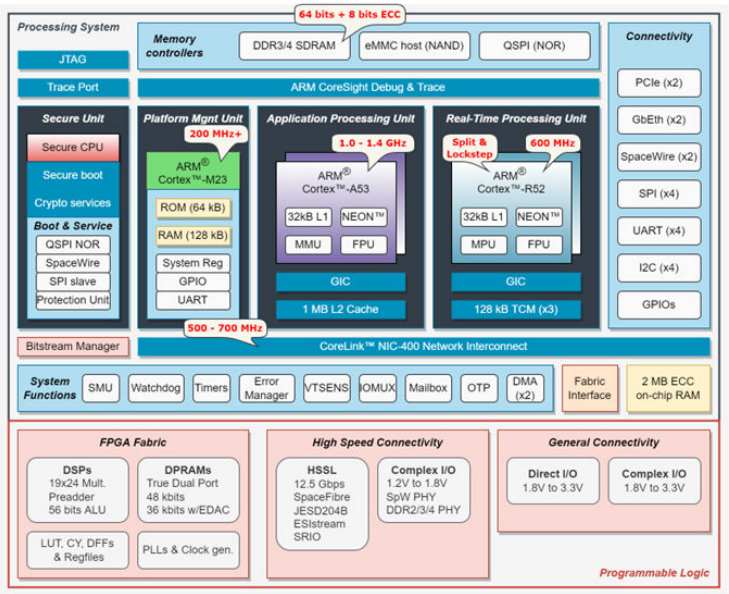
- Access limited to technologies subjected to non-EU governments control
- End user restrictions and Export restrictions
- Technology roadmap driven by other markets and applications

The EXCEED project will lead to

- Aligned semiconductor-OEM industry roadmaps
- Full control of technology and processes for security
- Risk mitigation for marketability and availability
- Backward compatibility with existing design bases

EXCEED trusted/secure SoCs Key Features

- Programmable processing: dual core APU A53 (Linux OS support), Dual core RTP R52
- Configurable processing: field programmable capabilities e.g. LUT, DSP, DPRAM
- Security: secure boot, crypto accelerators, OTP key storage, TRN generator, Lifecycle management. Temperature, voltage, laser and EM sensors will assure the protection against environmental attacks.
- Connectivity: e.g., Legacy/high speed connectivity, programmable Direct/Complex I/O
- Others: red / black separation, Developed with FDSOI 28nm for low power, leading to a family of SoCs to support all Use Cases requested and identified requirements



EXCEED SoC high-level block diagram

EXCEED Duration: Started Nov-2020 End Apr-2025

Technology Readiness Level: TRL 5

It will apply to a wide range of Aerospace & Defence industry applications (use cases)

Tactical Systems and devices use cases

- Military Radios
- Electronics Devices for Dismounted Soldiers
- On-ground signal processor for real- time COMINT
- Unified real-time Homeland Tactical Situation
- EW digital receiver

Security use cases

- Encryption devices
- Secure PNT applications
- Secure communications among distributed sensors

Airborne embedded computing use cases

- Weapon control in missile systems
- Embedded applications of launcher avionics
- Seekers and sighting applications

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