Company Overview

June 11th, 2024

NanoXplore

Agenda

- What is NanoXplore?
- What are our Products?
- What is our Ecosystem?

NanoXplore

Our Company

European Leader in FPGA and SoC FPGA

- French Based Company
  - Paris
  - Montpellier
- 120+ Employees with more than 90% R&D Engineers
- Components Made in EU
- ITAR Free Technology

Advanced products for an advanced market

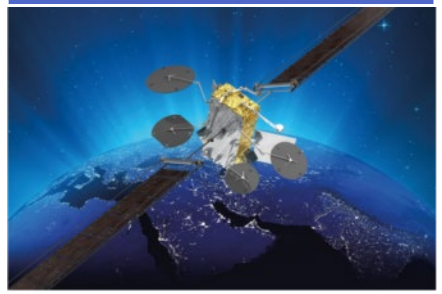
Radiation Hardened	• Amazing radiations results • No need for design mitigations (28 nm)
Local Supply chain	• STMicroelectronics foundry • European Sovereignty • ITAR Free
High Tech	• High Density FPGAs • High Performances • (HSSL)
Security	• Cryptographic Services

Key Markets

Mission

- First mission for the company is to offer SoC FPGA for Hi-Rel markets
- Focusing on key market differentiators like ITAR free, radiation hardening, very high reliability, etc
- Become quickly a clear leader on Space, Defense and Avionic market

Space



Avionic

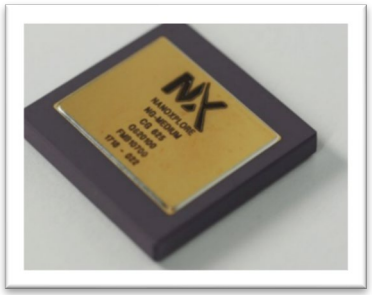
Défense

NanoXplore

Our Products

NX Products – Overview

NG medium



65 nm

Low-End FPGA

- 35kLUTs/32kDFFs
- 3Mb RAM
- 112 DSP
- No HSSL
- No Hard IP Processor

- Companion chip

ESCC9000 qualified

ultra 300

28 nm

Mid-End FPGA

- 290kLUTs/273kDFFs
- 21Mb RAM
- 896 DSP
- 16x HSSL 12G
- ADC/DAC

- Payload
- Platform
- Sensor control
- Power control loop

NG ultra

28 nm

High-End FPGA

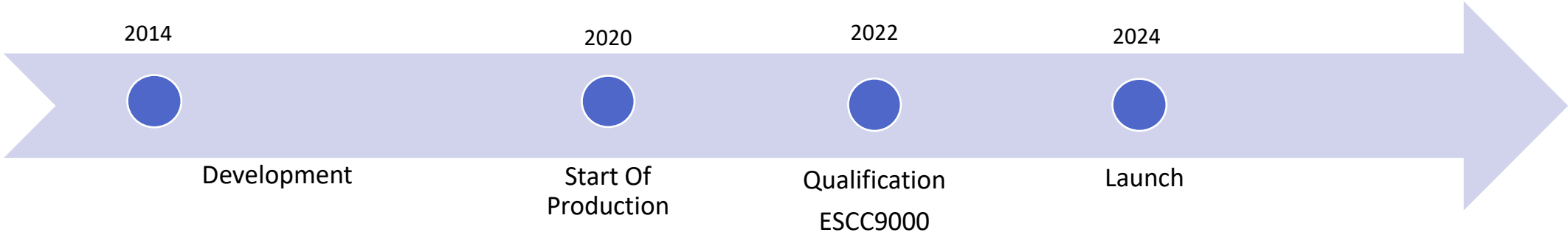
- 537kLUTs/505kDFFs
- 32Mb RAM
- 1344 DSP
- 32x HSSL 12G
- Quad-core ARM-R52 (SoC)

- Payload
- Platform

NG-MEDIUM

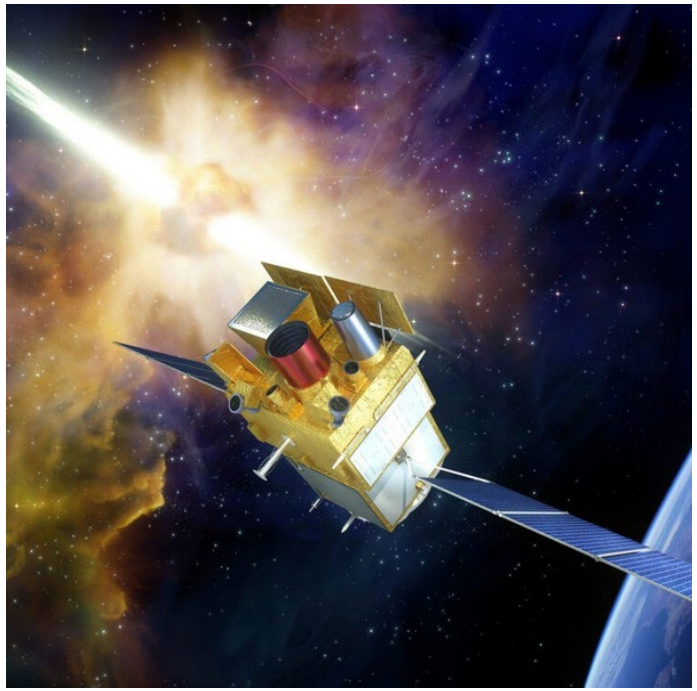
Overview

Flight Heritage – DORN (Change'6)



Flight Heritage – to come

SVOM – June 22, 2024



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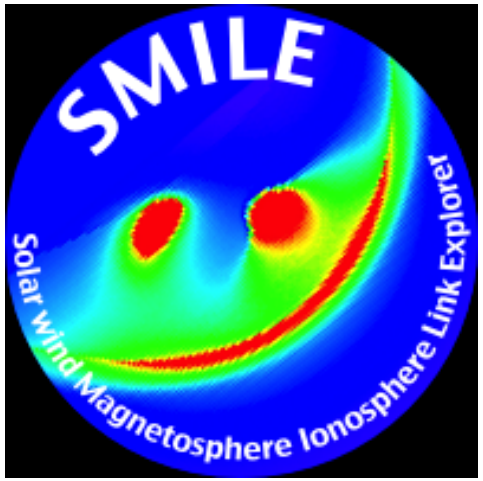


GALILEO CMCU – 2025

NG-MEDIUM


esa

European Space Agency
Agence spatiale européenne

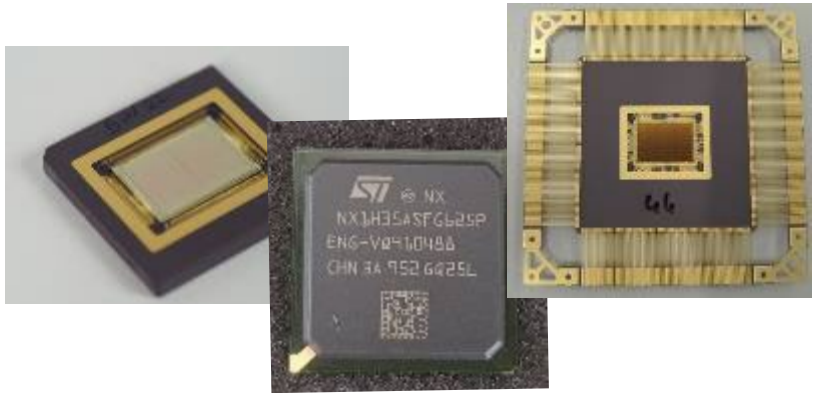
Certificate of Qualification No. 382

This is to certify that NanoXplore, Sèvres , France has been qualified by ESA for the supply of Integrated Circuits, Silicon, Monolithic, 35KLUT Radiation-Hardened FPGA (NG-Medium) , for use in ESA space programmes, according to ESCC Generic Specification 9000 and associated Detail Specification 9304/010 as recommended by the Space Components Steering Board.

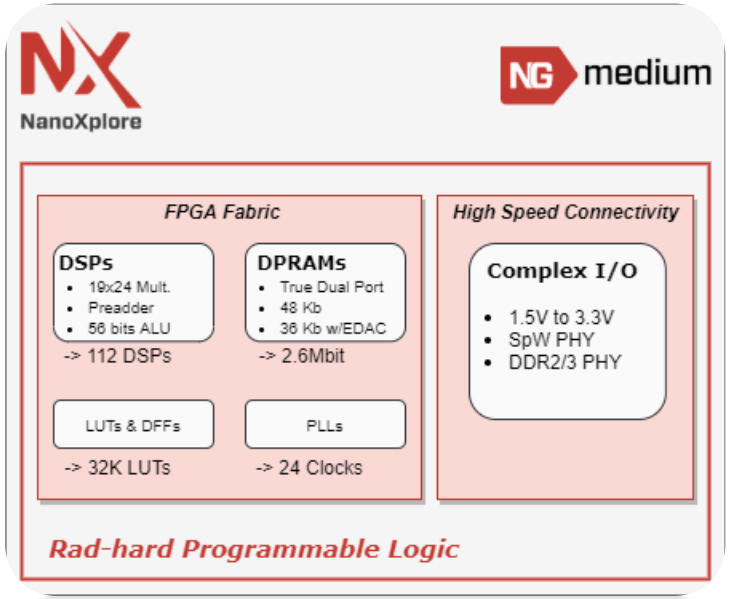
This certificate is valid until August 2024.

Head of the Product Assurance and Safety Department

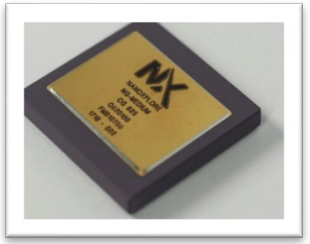
Date
31 August 2022



- First Commercial Product
- 65nm technology
- Supply chain running for both space and general applications
- SpW & DDR2 PHY hard-coded



NG-MEDIUM Family

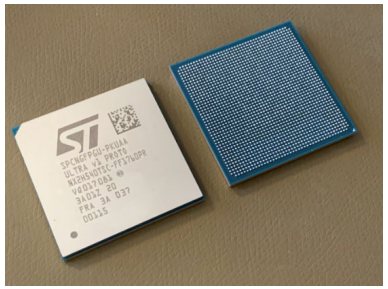


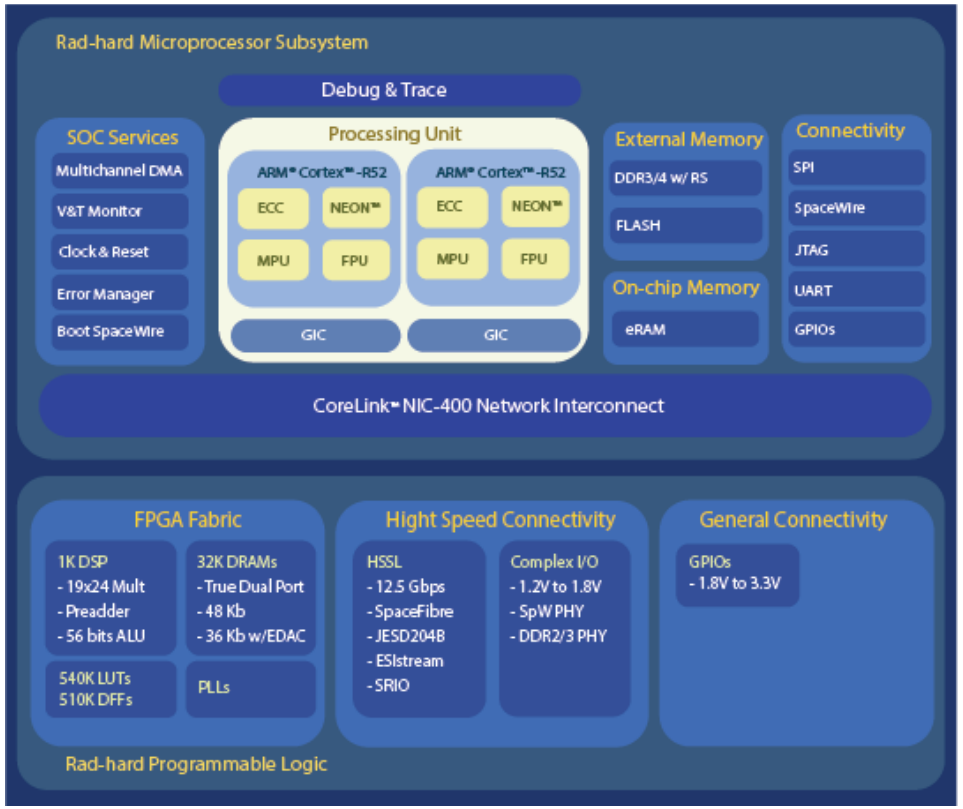
Small FPGA made for Space	Commercial grade SoC FPGA
NG medium RH	NG medium JEDEC
ESCC9000	JEDEC
Ceramic QFP-352 & LGA-625	Leadfree Plastic BGA 625
High Level Immunity	High Level Immunity
Space : Class 1 & Class 2	Space Constellations Avionics Military & Defense

NG-ULTRA

Overview

NG-ULTRA

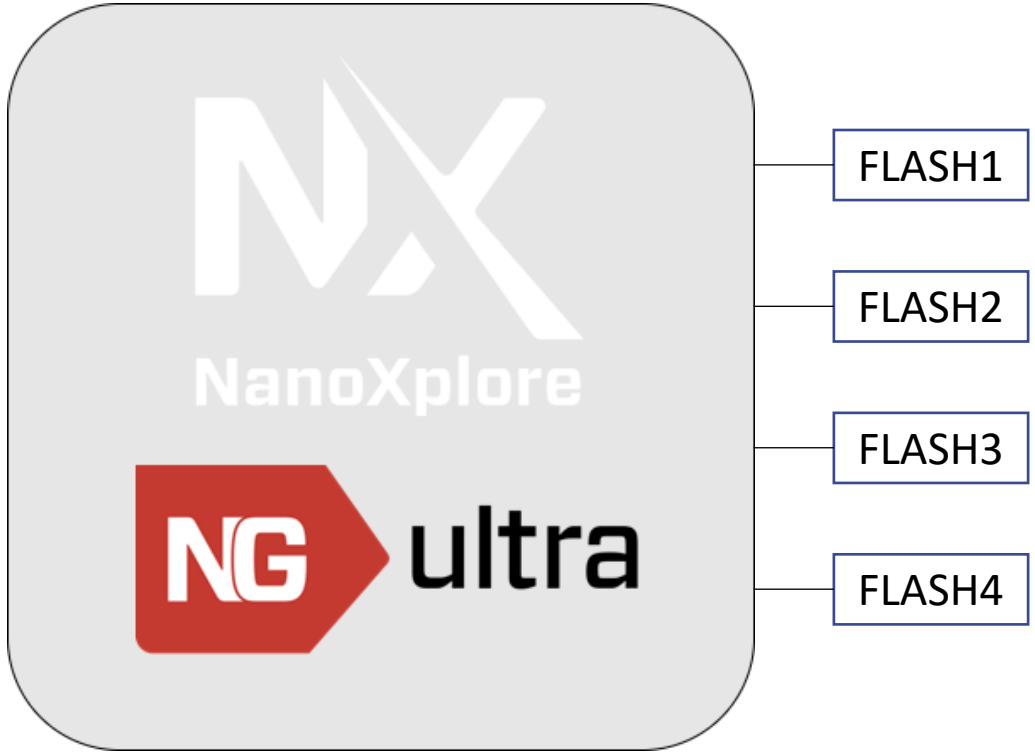




- 2 grades :
  - ESCC9030
  - JEDEC
- Dual SoC component :
  - Quad Cortex-R52 @600MHz
  - FPGA Fabric
- 28nm technology
- Amazing Radiation Testing Results
- Supply chain running
  - First flight models already delivered

NG-ULTRA Configuration

FLASH Loading



- 4 parallel SPI interfaces controlled by the boot loader
- FLASH mode:
  - SEQUENTIAL
  - TMR
- Parallel read
- NG-ULTRA performs the majority-voting
- The last memory can be used for an application purpose

NG-ULTRA

ESCC Qualification

Radiation tests
All sessions

NG-ULTRA FPGA Radiation test campaigns overview

2019		2020	2021	2023	2023	2023	2023	2024	2023
May	Nov	Dec	Jun	Apr	Jun	Sep	Dec	May	Dec
UCLouvain / HIF (BE)		UCLouvain / HIF (BE)		RADEF Jyväskylä (FI)					Protons Vancouver (CA)

DEMETER
Test chips

NG-ULTRA V1
1st prototypes

Parts thickness: 50, 70 µm
Tilt and roll possible

NG-ULTRA V2
final

Parts thickness: 100 µm
Tilt and roll not possible
or high energies

NG-ULTRA

ESCC Qualification

- ESCC process flow is running
- TID will be done in september
- Qualification expected in Q1/2025

NG-ULTRA Family

All-rounder FPGA made for Space	General purpose FPGA
NG ultra RH	NG ultra JEDEC
ESCC9030	JEDEC
SnPb Organic BGA 1760	Leadfree Organic BGA 1760
Fully Immune	Fully Immune
Space Grade Capacitors	General Purpose Capacitors
Space : Class 1 & Class 2	Space : Constellations Avionics Military & Defense

NG-ULTRA

Milestones

NG-ULTRA
Activities and availability

- New die with HSSL fix
  - Final phase of internal testing activities

Part Number	Designation	Status
NG-ULTRA SPACE SnPb ORGANIC PACKAGE FF1760		
NX2H540BTSC-FF1760PR	NX2H540 FF1760 Prototype	Q3’24
NX2H540BTSC-FF1760M	NX2H540 FF1760 3 temp tested Part	Q3’24
NX2H540BTSC-FF1760E	NX2H540 FF1760 eq. ESCC9030	Q4’24
NG-ULTRA EVAL KIT		
NX2H540BTSC-EK	NX2H540BTSC Evaluation Kit	Q3’24

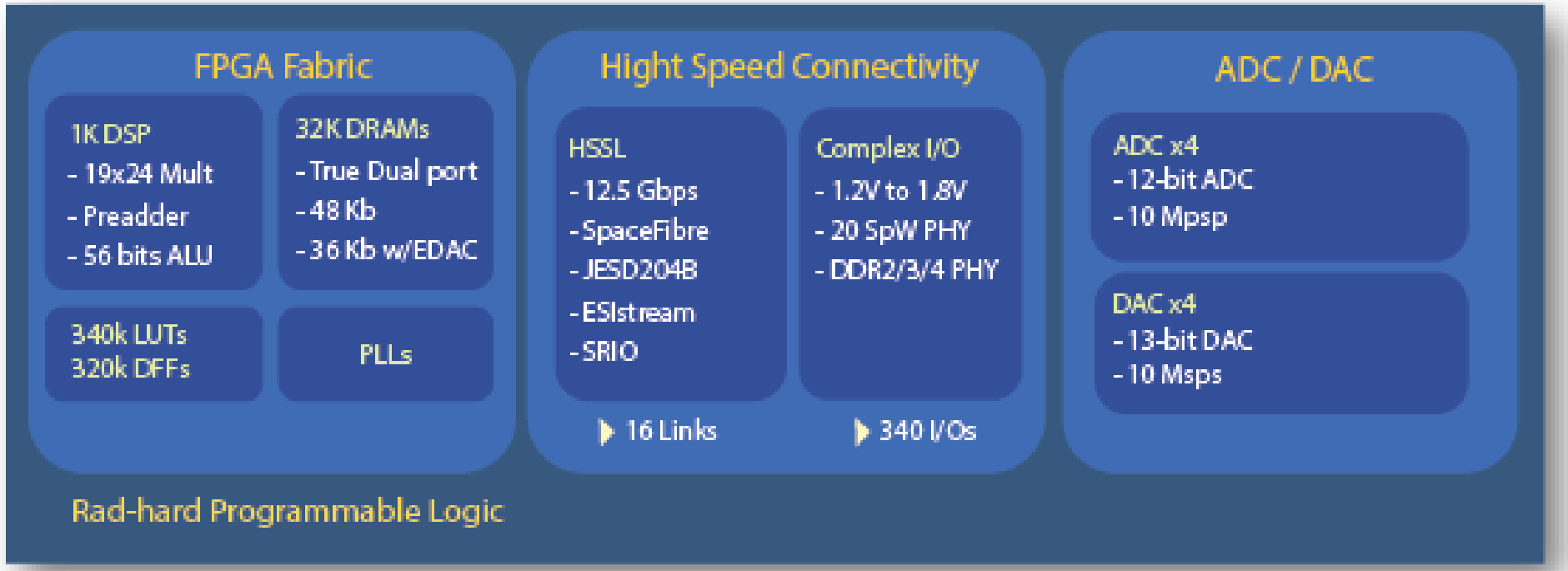
- JEDEC version is on final definition phase
  - First parts expected by Q4’2024 : NX2H540BTSC-FFG1760IS

NanoXplore

Ultra 300

Overview

Ultra 300

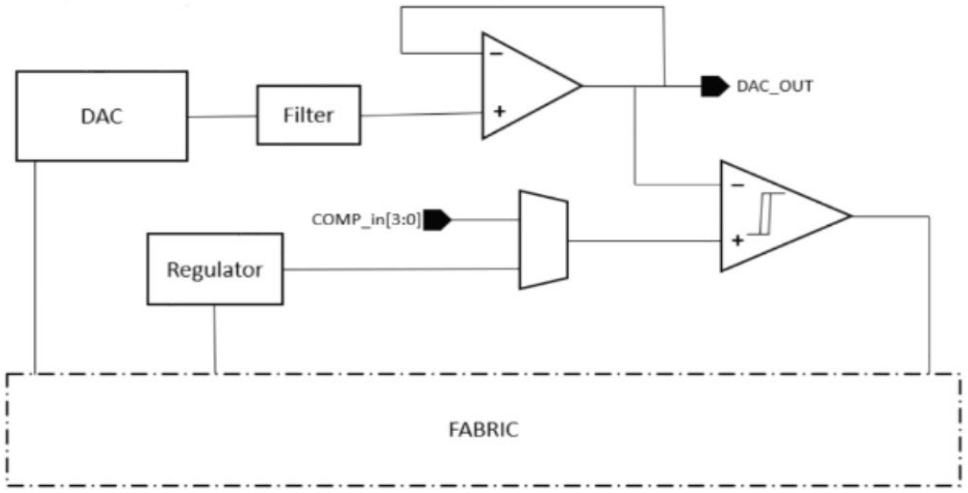


- Our latest product : our All-Rounder
- HSSL @ 12 Gbps, compatible with SpaceFibre, JESD204B, ESIstream, SRIO
- ADC and DAC
- 2 Great Formats : BGA 484 (27mm*27mm) and BGA 1152 (35mm*35mm)
- Benefits from NG-ULTRA experience
  - Radiation / Library / Testing / Supply Chain

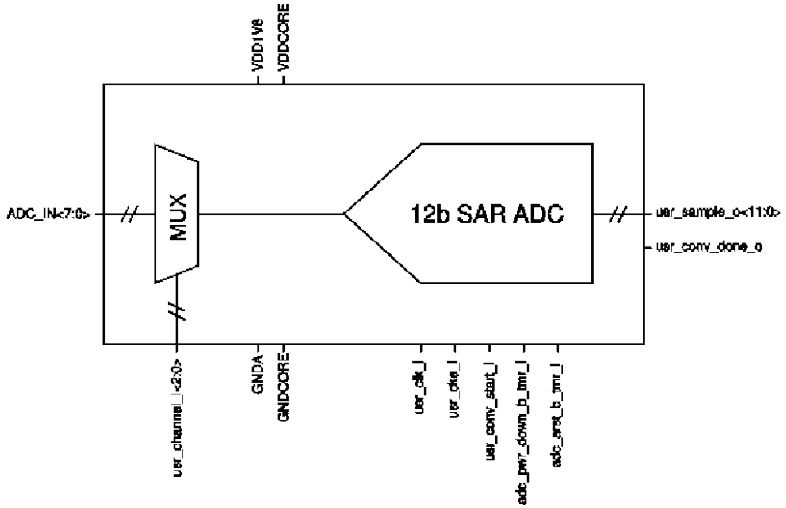
Ultra 300

ADC & DAC

13—bit DAC, 1-10 MSPS

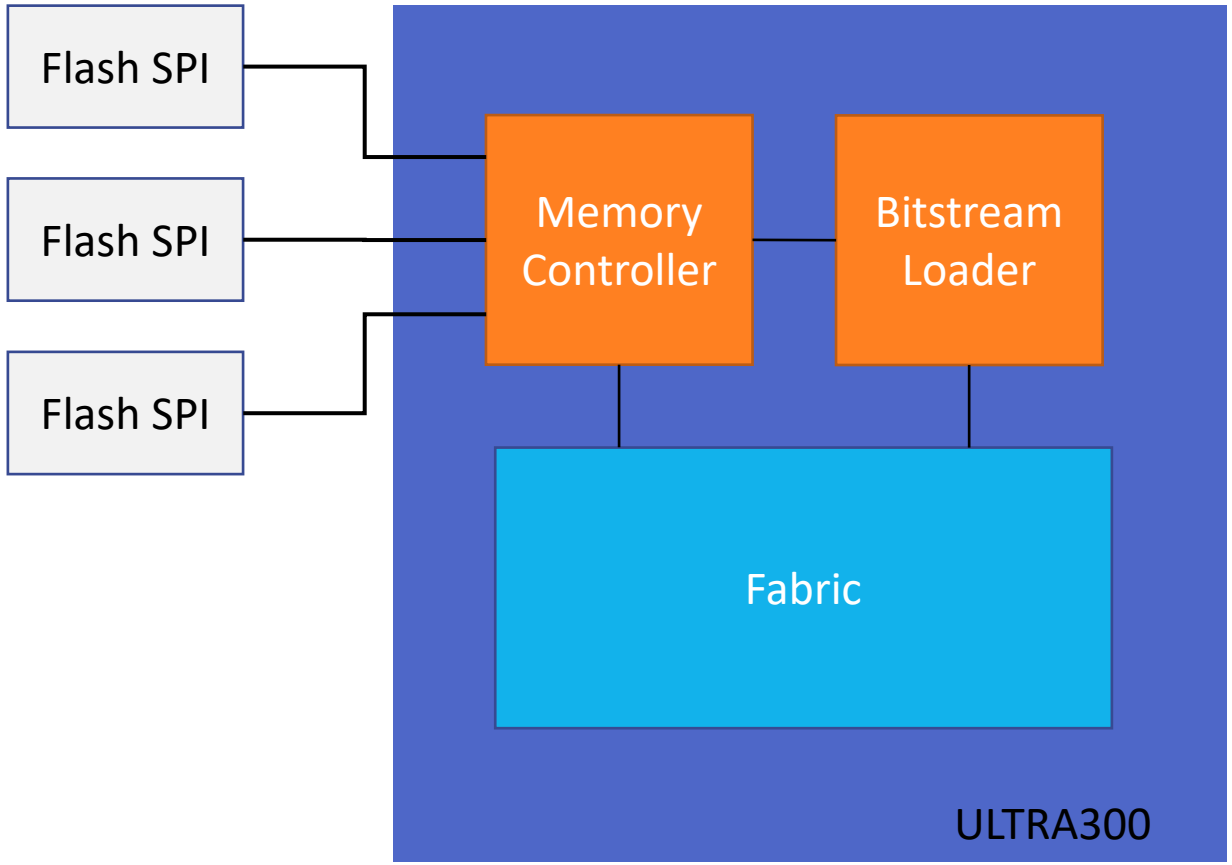


12—bit ADC, 1-10 MSPS up to 8 inputs



ULTRA300

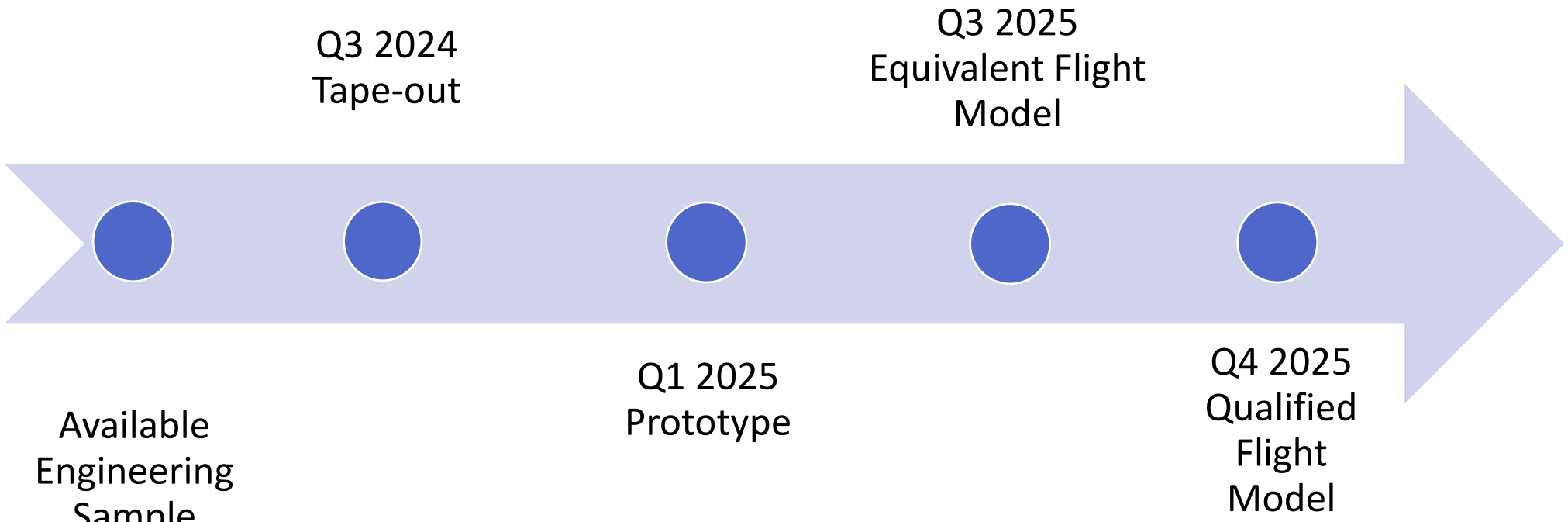
QSPI System



- TMR Mode
- Legacy / Standard Mode
- Bit ordering (Endianness)
- Configurable clock phase and polarity
- Debug facilities
  - Internal loopback
- Power Management and latchup detection
  - SPI VCC (enable / disable)

Ultra 300

Milestones



Ultra 300 Family

All-rounder FPGA made for Space	General purpose FPGA
ultra 300 RH	ultra 300 JEDEC
ESCC9030	JEDEC
SnPb Organic BGA 484 & 1152	Leadfree Organic BGA 484 & 1152
Fully Immune	Fully Immune
Space Grade Capacitors	General Purpose Capacitors
Space : Class 1 & Class 2	Space : Constellations Avionics Military & Defense

Ultra 300

Product family members availability

Part Number	Designation	Status
	ULTRA 300ES EVAL KIT	
NX2H300TSA-EK0ES	NX2H300ES Evaluation Kit without any spacewire connectors	Q3-2024
NX2H300TSA-EKES	NX2H300ES Evaluation Kit with 2 Spacewire connectors (Config + User)	Q3-2024
	ULTRA 300ES Lead Free ORGANIC PACKAGE FBGA 484 SAC305	
NX2H300TSA-FFG484ES	NX2H300ES Lead Free FBGA 484 Engineering Sample	Q3-2024

Part Number	Designation	Status
	ULTRA 300 ORGANIC PACKAGE FBGA 484 SnPb	
NX2H300TSA-FF484PR	NX2H300 SnPb FBGA 484 Prototype	Q1-2025
NX2H300TSA-FF484M	NX2H300 SnPb FBGA 484 - 3 temperatures tested Part (-40 -> +125°c)	Q2-2025
NX2H300TSA-FF484E	NX2H300 SnPb FBGA 484 eq.ESCC9030 Class 1	Q3-2025
	ULTRA 300 ORGANIC PACKAGE FBGA 1152 SnPb	
NX2H300TSA-FF1152PR	NX2H300 SnPb FBGA 1152 Prototype	Q1-2025
NX2H300TSA-FF1152M	NX2H300 SnPb FBGA 1152 - 3 temperatures tested Part (-40 -> +125°c)	Q2-2025
NX2H300TSA-FF1152E	NX2H300 SnPb FBGA 1152 eq.ESCC9030 Class 1	Q3-2025
	ULTRA 300 Lead Free ORGANIC PACKAGE FBGA 484 SACN306	
NX2H300TSA-FFG484IS	NX2H300 Lead Free FBGA 484 Industrial Space Part (-40 -> +125°c)	Q2-2025
	ULTRA 300 Lead Free ORGANIC PACKAGE FBGA 1152 SACN306	
NX2H300TSA-FFG1152IS	NX2H300 Lead Free FBGA 1152 Industrial Space Part (-40 -> +125°c)	Q2-2025

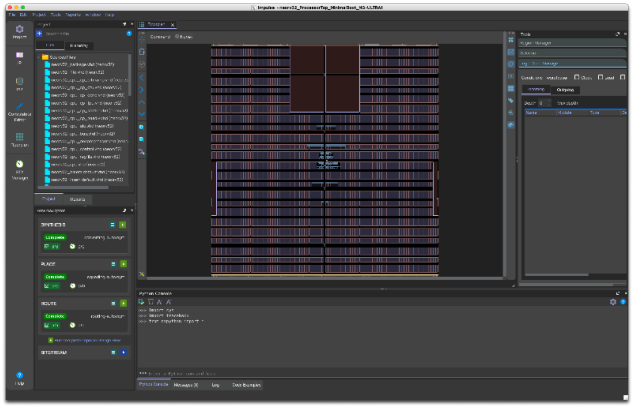
Activities

Overview

Activities

Impulse

New release end of June 2024



IPs

Clock Configuration

PLL and frequency calculator	NG medium NG ultra Ultra 300

NX Scope

Scope v2	NG medium NG ultra Ultra 300

Memory

DFI DDR2	NG medium
Asynchronous FIFO	NG medium

Interface

APB Slave controller	NG medium
HSSL Spacefiber Interface 64 bits	NG ultra
QSPI U300 Controller	Ultra 300
I2C APB	NG medium NG ultra Ultra 300

Interface

SpaceWire Core (400Mbps)	NG medium NG ultra Ultra 300
DDR3 CTRL	NG ultra Ultra 300
Aurora	NG ultra Ultra 300

Bridge

AXI4 to AHB	NG medium NG ultra Ultra 300
AHB to AXI4	NG medium NG ultra Ultra 300
AHB to IP1RW	NG medium NG ultra Ultra 300

Company Roadmap

2024

NanoXplore

Introduction

- Overview of NX five years roadmap
- Take benefit of NG-ULTRA development
- Continue investing in 28 FD-SOI and moving to 7nm FinFET
- 110M€ investment in the next 4 years

Current FPGA Details

Low to high end rad-hard FPGA complexity

2017

NG MEDIUM (NX1H35S)

Low-End FPGA

- 35kLUTs/32kDFFs
- 3Mb RAM
- 112 DSP
- No HSSL
- No Hard IP Processor

2021

NG-ULTRA (NX2H520TSP)

High-End FPGA

- 537kLUTs/505kDFFs
- 32Mb RAM
- 1344 DSP
- 32x HSSL 12G
- Quad-core ARM-R52 (DAHLIA SoC)

2024

ULTRA-300 (NX2H300TSA)

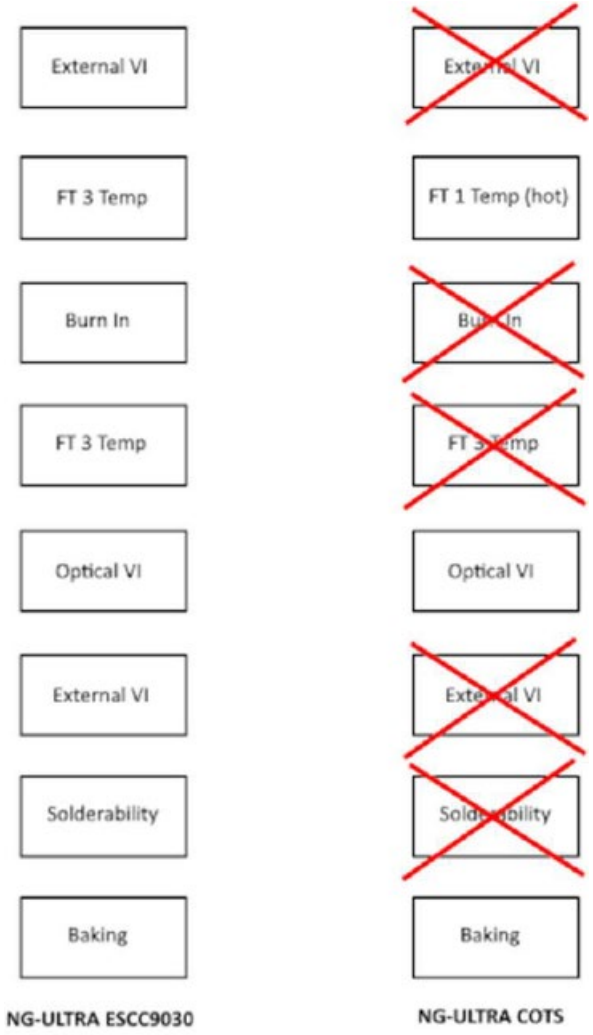
Mid-End FPGA

- 290kLUTs/273kDFFs
- 21Mb RAM
- 896 DSP
- 16x HSSL 12G
- ADC/DAC

SPACE vs JEDEC

Flows and screening comparison

	NG-ULTRA COTS	NG-ULTRA ESCC9030
Mission profile	Life Time duration 7 years @85°C Tj 30 krads	Life Time duration 18 years @85C Tj (GEO1) 50 krads Life Time duration 16 years @105C Tj (GEO2) 25 krads
Die	28FD-SOI GEO	
Package	45x45 TEFBGA non hermetic	
Solder balls	Lead free - SACN306	SnPb
Capacitors embedded in package	General purpose capacitors	Space grade capacitor
Visual die sorting	NO	YES
Precap	NO	YES
Marking ID Serialization	YES	YES
Thermal cycling	NO	YES
SAM	Standard Control Plan	ESCC9030 Control Plan
XRAY and VI post-assy	NO	YES
Qualification referential	JEDEC	ESCC9030
Qualification maintenance	NO	YES (as defined in ESCC9030)
Screening for customer parts	EWS ambient – FT hot T°	ESCC9030 EWS ambient + FT 3T/BI/3T
VI before shipment to customer	Automatic Optical VI	External VI + CoC
Datapack	NO	YES

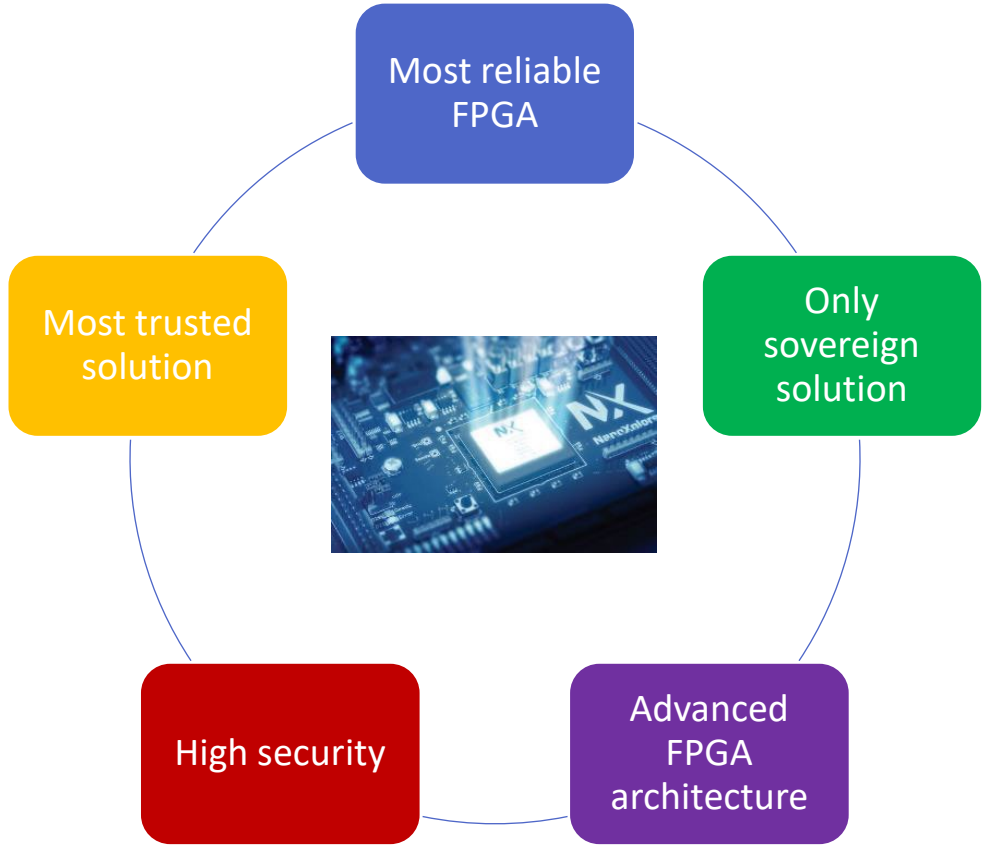


NX Key Differentiators vs. Competition

Key technologies differentiators for the only sovereign offering

- Compared to current competition, NX offers key differentiators

1. Expert in design reliability (radiation, aging etc) -> main reason why end-users are selecting NX offering in Space
2. Sovereign offering -> most trusted FPGA vendor for European end-users
3. High security features -> more and more required for strategic markets
4. Leverage STMicroelectronics supply chain to benefit from previous FPGA development
5. Improve our low-power and high-density FPGA architecture
    - Better address application at the edge
    - Clear differentiator vs. high end FPGA



5 Years Objectives

- Offer the best high-reliable SoC FPGA offering in the world to address the relevant markets
- Address low to high ends application complexity
- Have a dominant position in Europe in all identified strategic markets
- Worldwide footprint in the Space market
  - Good presence in the US, China, South Korea, Japan
  - Leader in India
- 70M€+ revenues with strong profitability

4 Years Roadmap Summary

Clear roadmap to address strategic markets with our differentiators

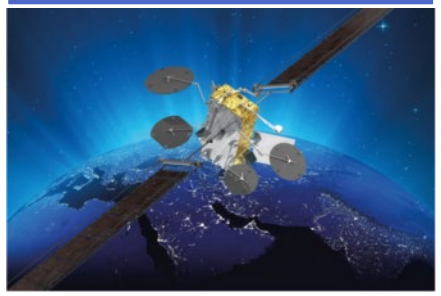
Today | **2025** | **2026** | **2027**

Exceed test chip

New SoC FPGA / FPGA in 28nm FD-SOI

ULTRA7
7nm FinFET

Space

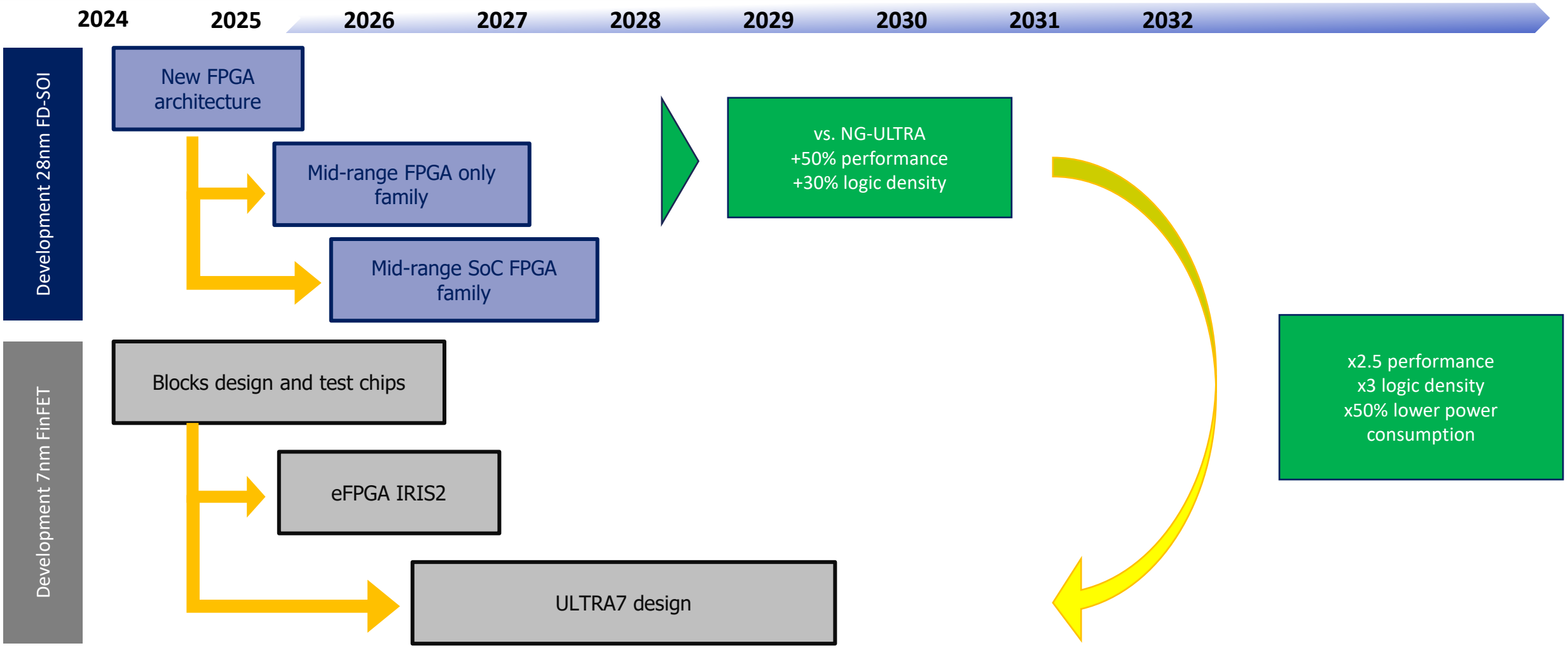


Défense

Industrial

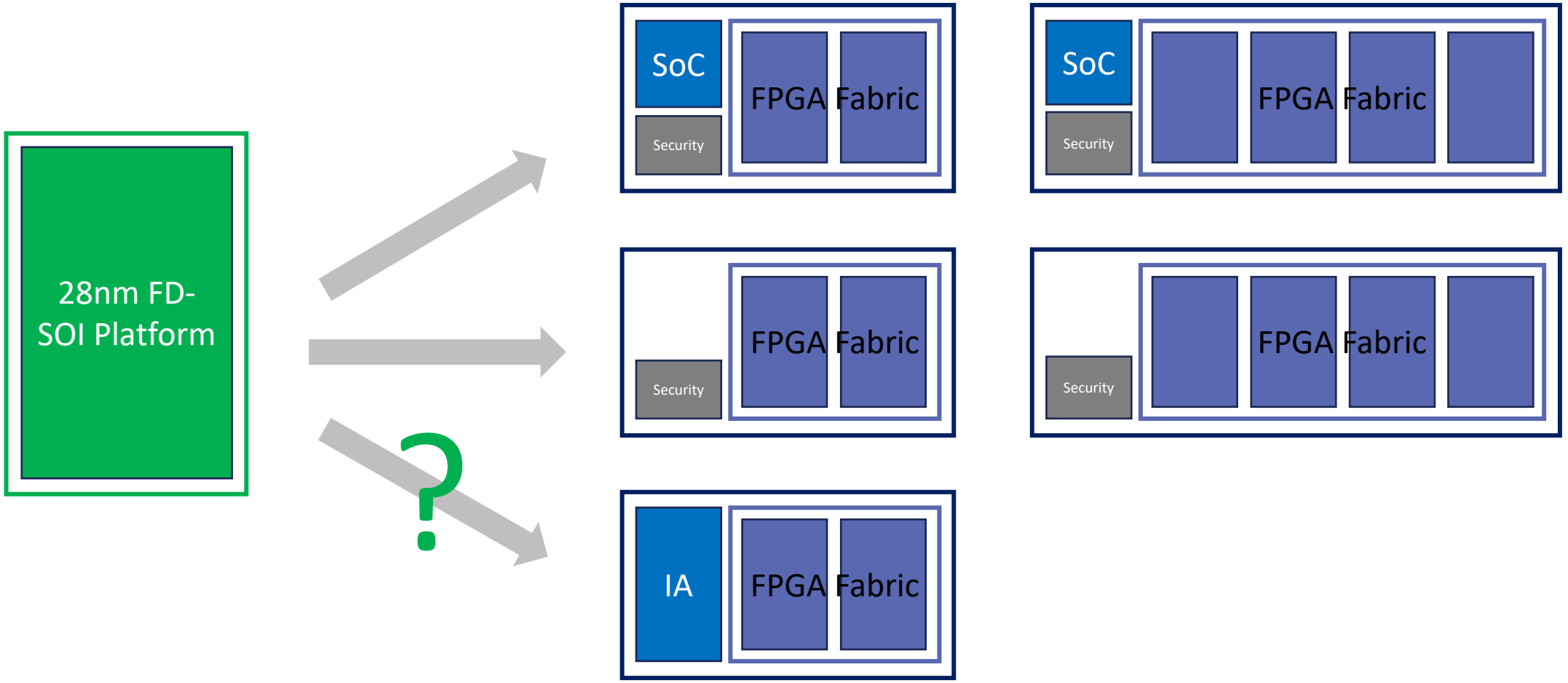
Avionic

Roadmap Summary

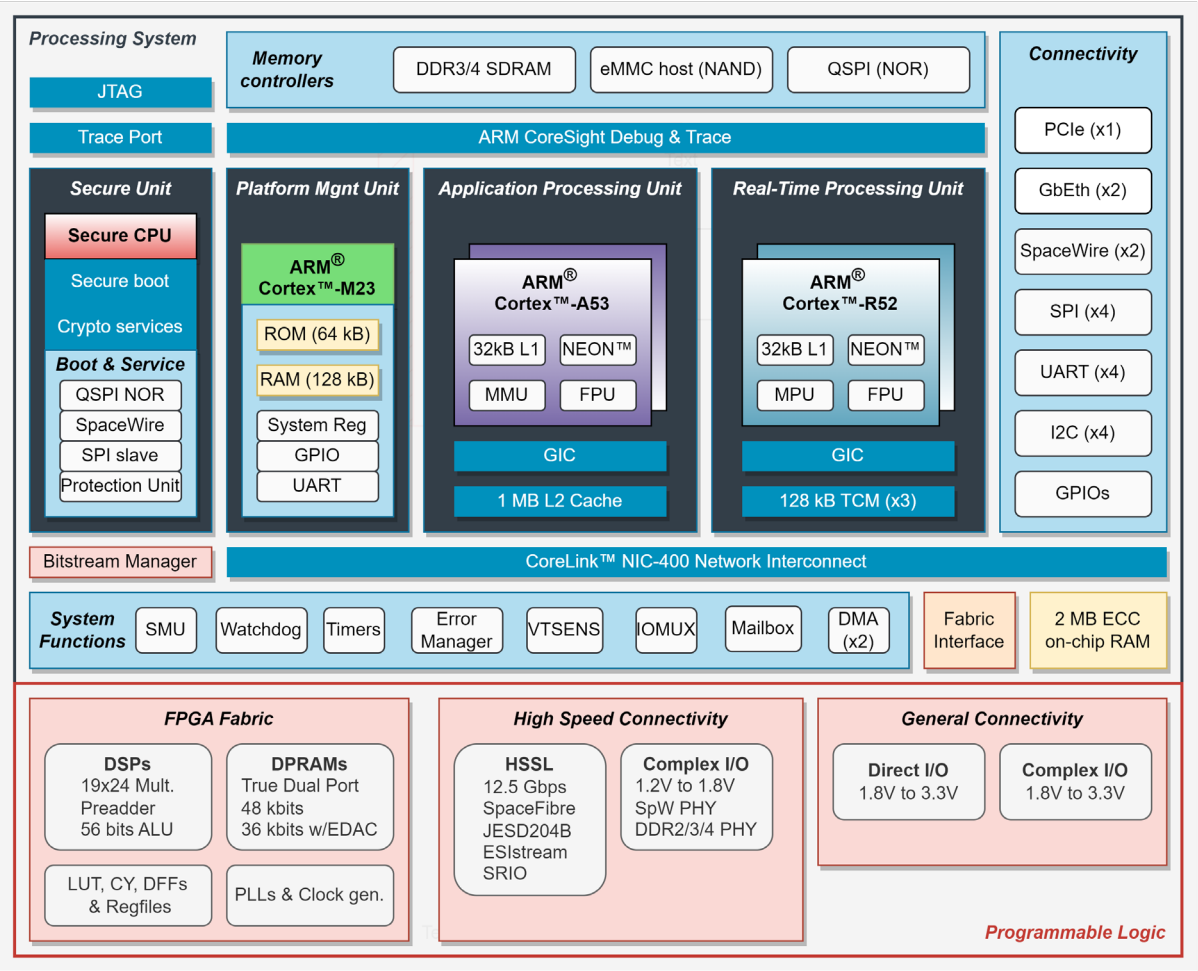


28nm FD-SOI Roadmap Objectives

First samples in 2025

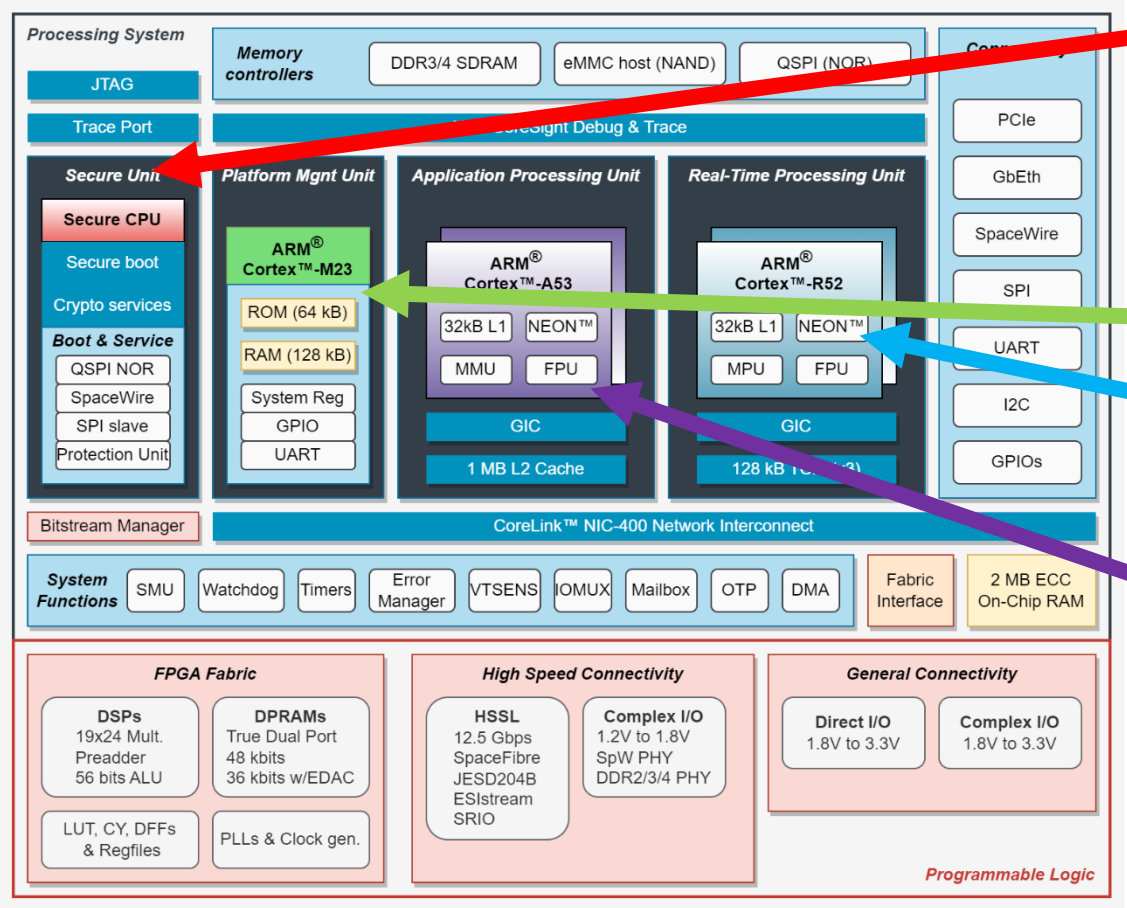


Next SoC Generation in 28nm FD-SOI



- New FPGA architecture
  - Up to 40-50% more performance vs. NG-ULTRA
  - Improve logic density
  - Very reliable (temperature, aging, radiation immune)
  - AI friendly for NN inference -> target smart vision application
- Security at state of the art vs. other commercial FPGA
- More advanced SoC based on ARM A53 and R52

Architecture



Secure Unit

- Root of Thrust
- Cryptographic services
- Life cycle management

PMU

- System Initialization
- Low power Processing

APU

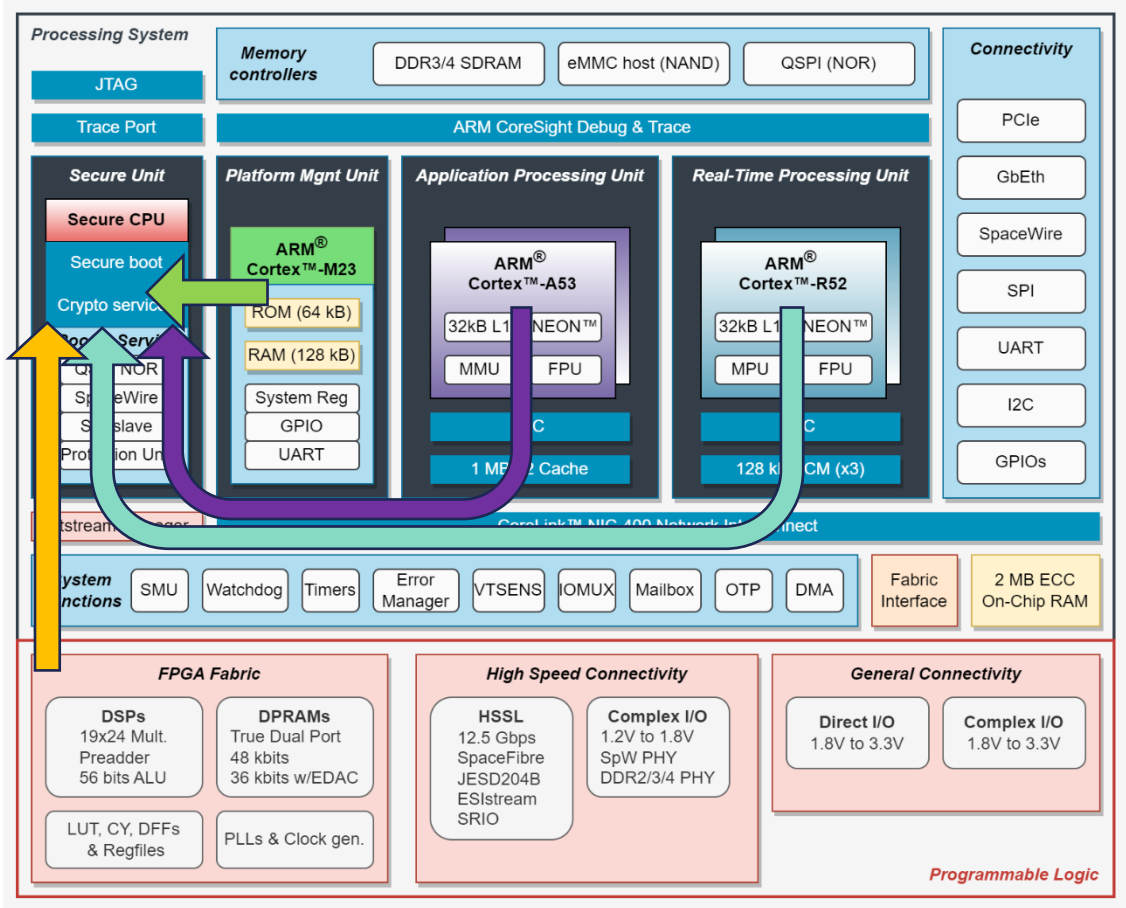
- Rich OS applications
- Virtual Memory
- Cache Coherency

RPU

- Deterministic Real-time applications
- Safety Features (Lock Step)

freeRTOS

Cryptographic Services



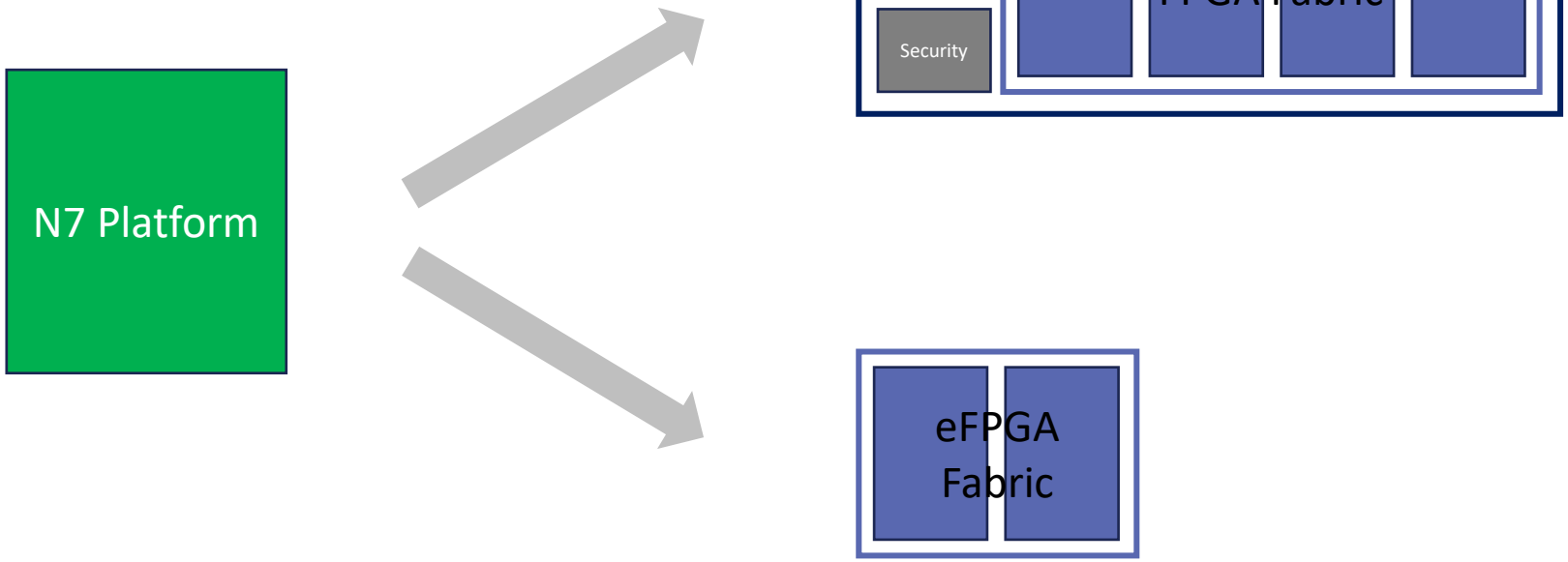
- Cryptography
  - AES 128, 192, 256b
  - RSA 1024, 2048, 3072b
  - Key generation / derivation
  - HASH : SHA 256/384/512
  - MAC
  - Signature (ECDSA / DSA)
- Random generation
  - DRNG (Hardware 32b rng)
  - DRBG (SHA256 based rng)
- User applications
  - Key injection / provisions
  - Update binaries

28nm FD-SOI Roadmap

Product family

	NX 50	NX 100	NX 200	NX 300	NX SoC 100	NX SoC 300
LUTs (4)	50k	100k	200K	300K	100k	300K
DSP	100	200	300	400	200	400
RAM	3 Mbits	6 Mbits	9 Mbits	12 Mbits	6 Mbits	12 Mbits
HSSL @ 12,5GBs	4	8	16	24	8	24
PCIe Gen2	1 PCI	1 PCI	1 PCI	1 PCI	1 PCI	1 PCI
Packages						
BGA 256 (1 mm)	☑	☑			☑	
BGA 484 (1 mm)	☑	☑	☑	☑	☑	☑
BGA 784 (1 mm)		☑	☑	☑	☑	☑
BGA 1152 (1 mm)			☑	☑		☑

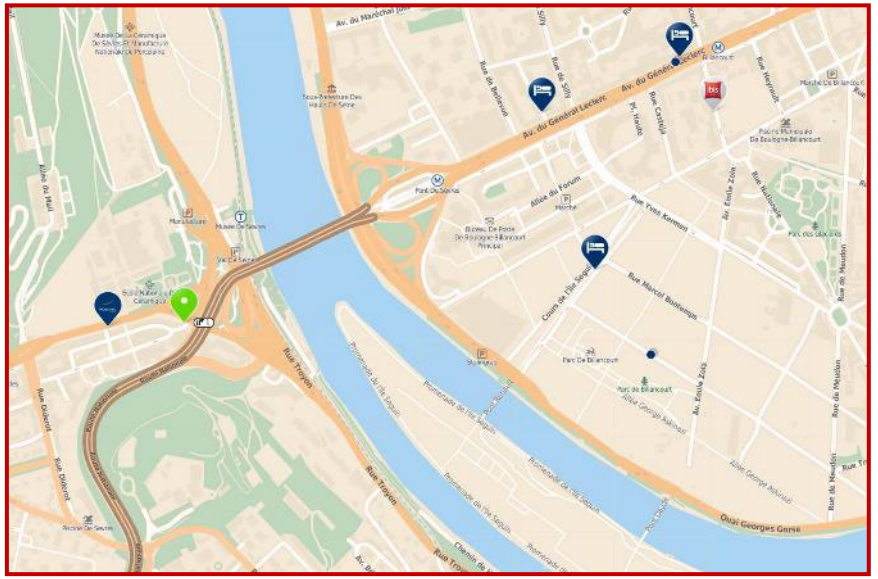
N7 Objectives



- ✓ Min X4 perf vs. NG-ULTRA
- ✓ 1M LUTs
- ✓ PCIe GEN4/5
- ✓ DDR 4/5
- ✓ HSSL 56G / 112G

Our trusted Customers

Thank you for your time



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