

NX Embedded Software Development

23/04/2024



Agenda

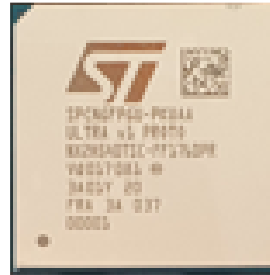
- Introduction
- Software Development Kit (SDK)
- NX embedded tools
- Documentation
- Summary

Introduction



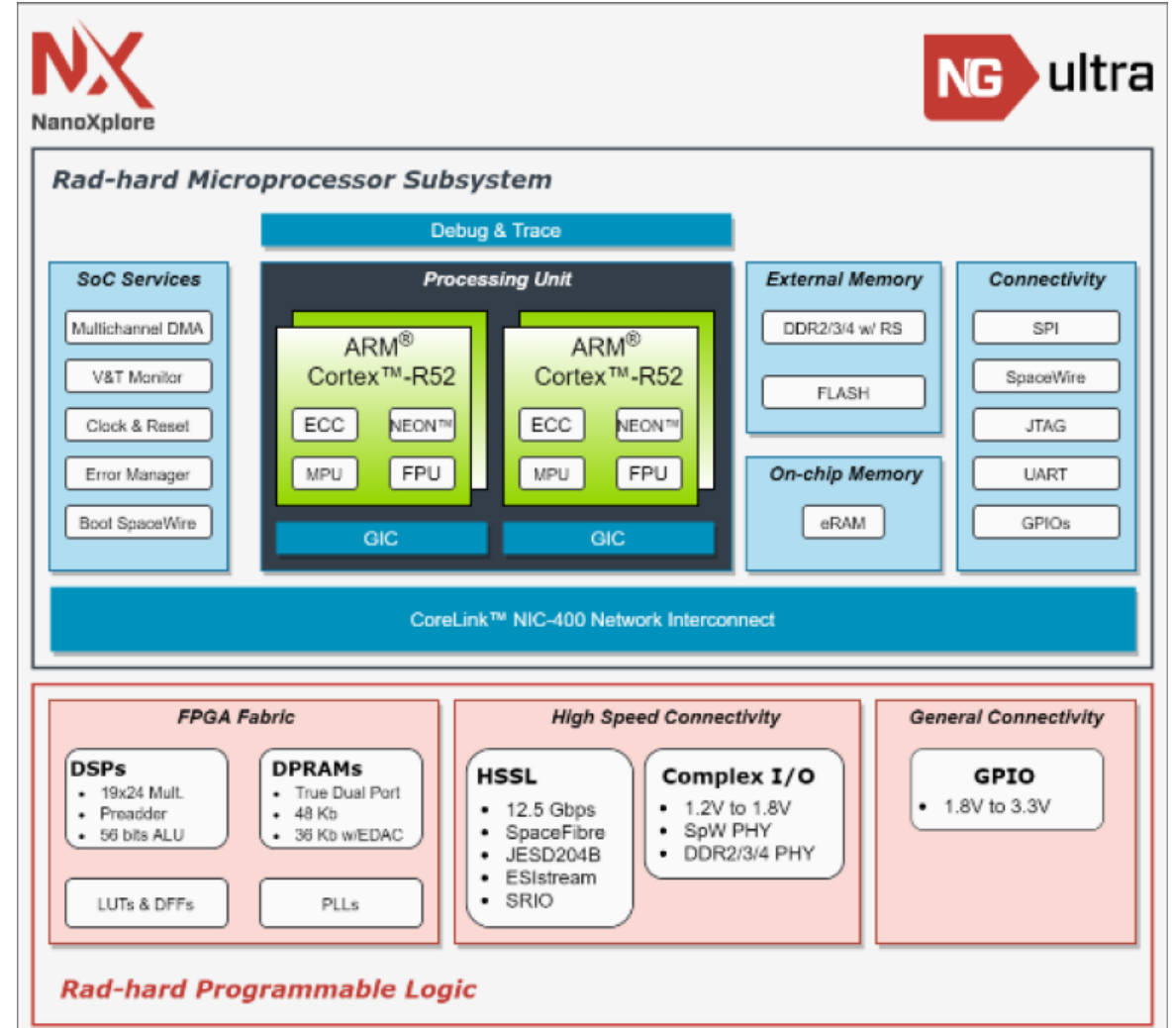
- **Programmable Logic (PL)**

- ~500K LUT&DFF
- 1344 DSP
- 32Mb DPRAM
- Up to 740 User I/O
- SpW & DDR2/3/4 & HSSL
- Radiation performances TID 50krads(Si)
- SEL and SEE immune

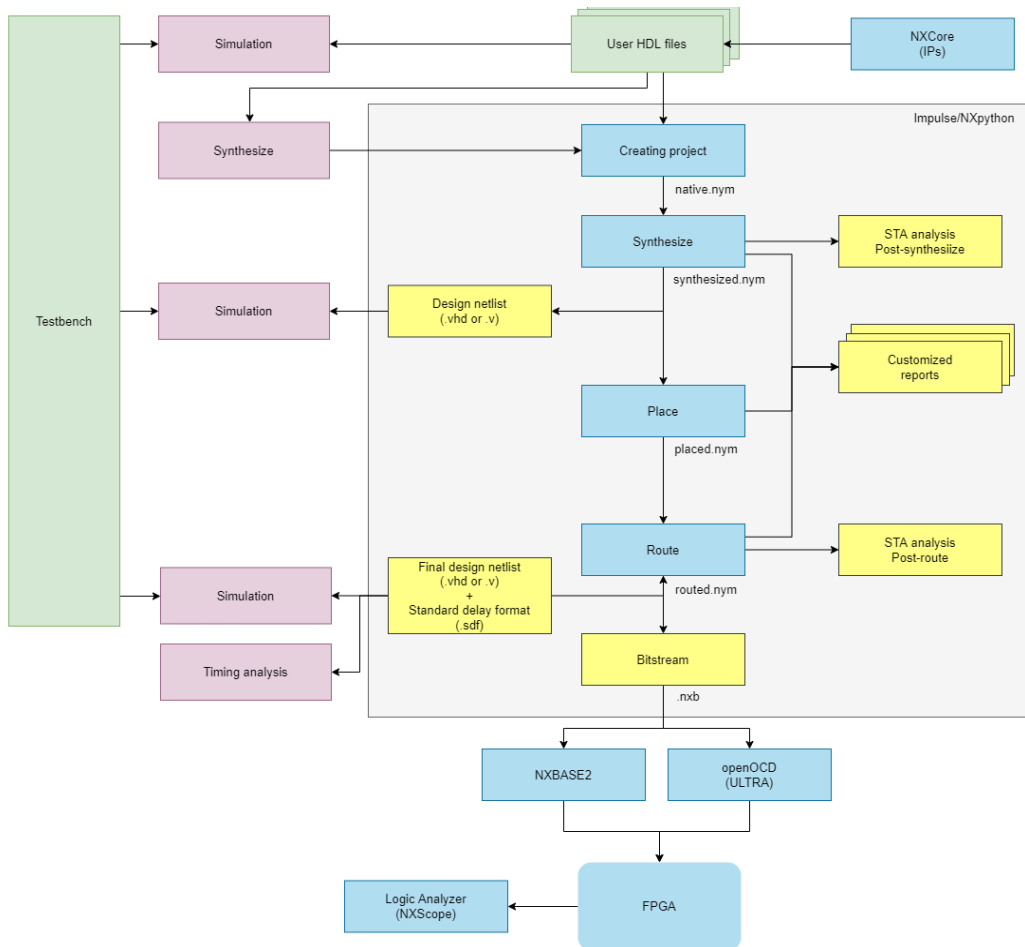


- **Processing System (PS)**

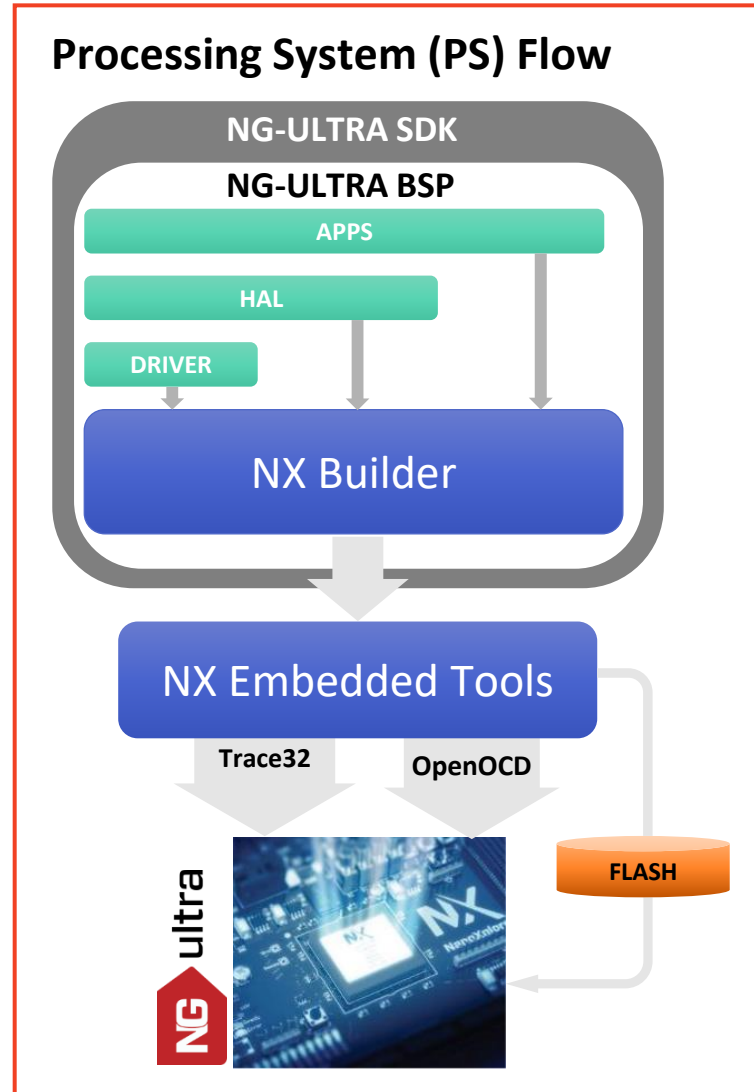
- Rad-Hardened SoC/FPGA
- Quadcore ARM R52 @ 600MHz each
- Up to 4200 DMIPS
- 2MB eRAM with ECC
- 16 DMA channels
- FLASH TMR



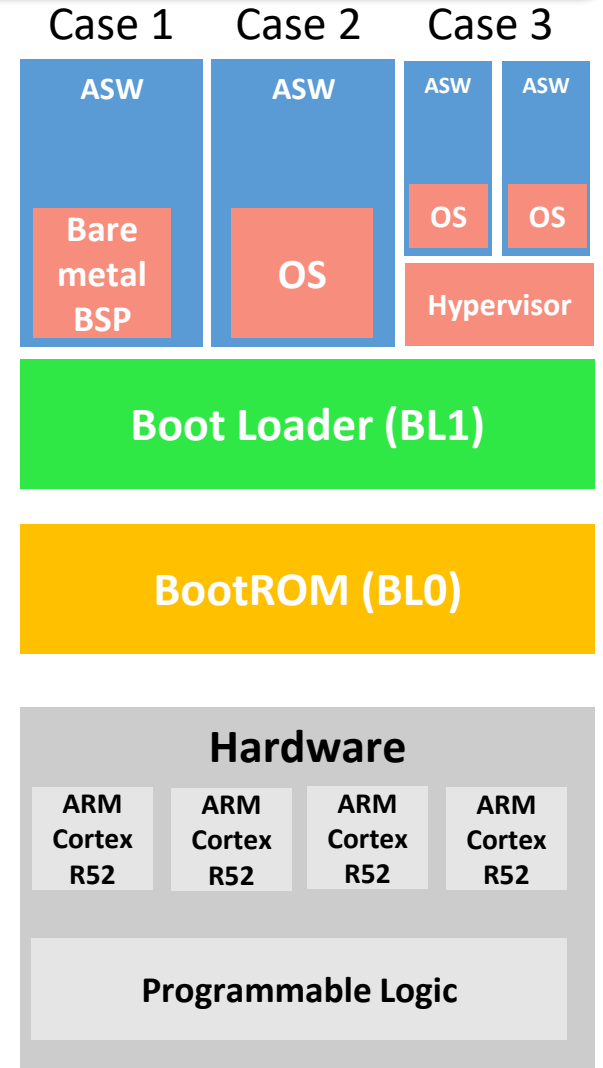
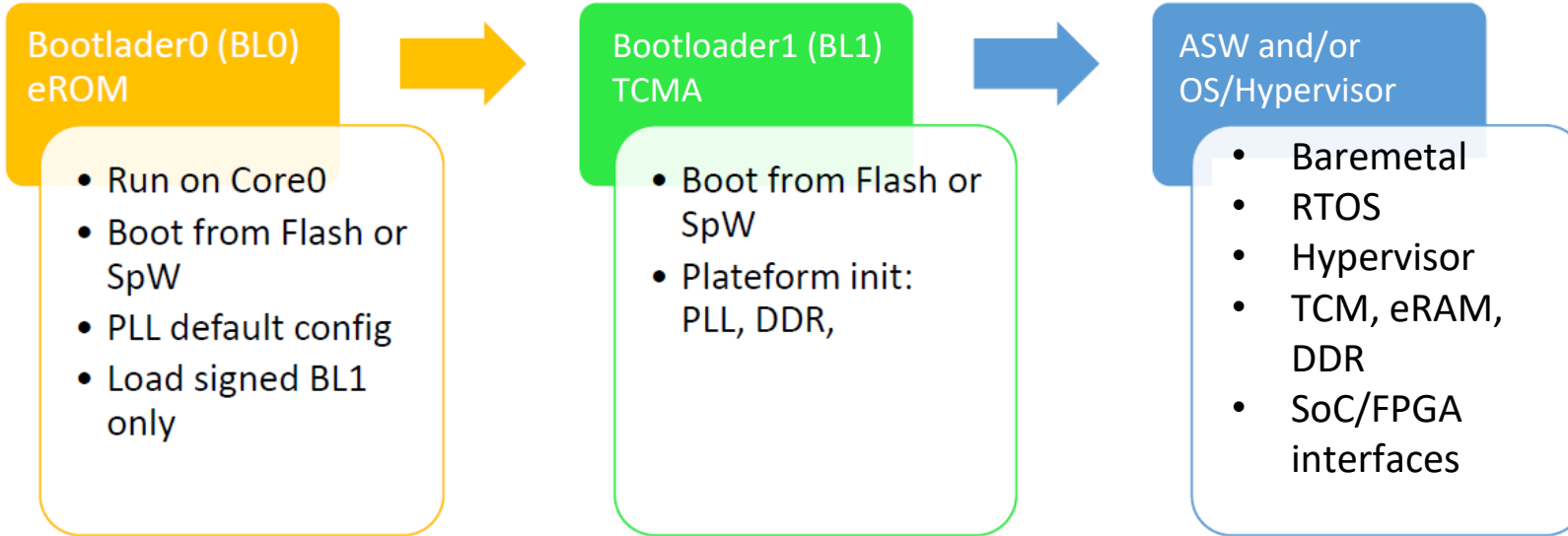
Programmable Logic (PL) Flow

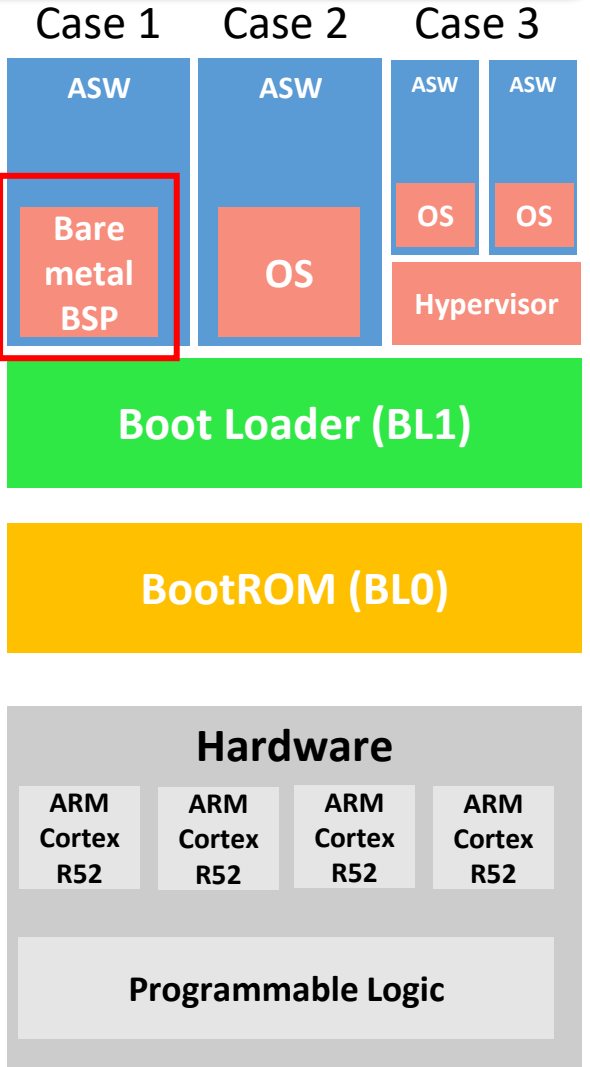
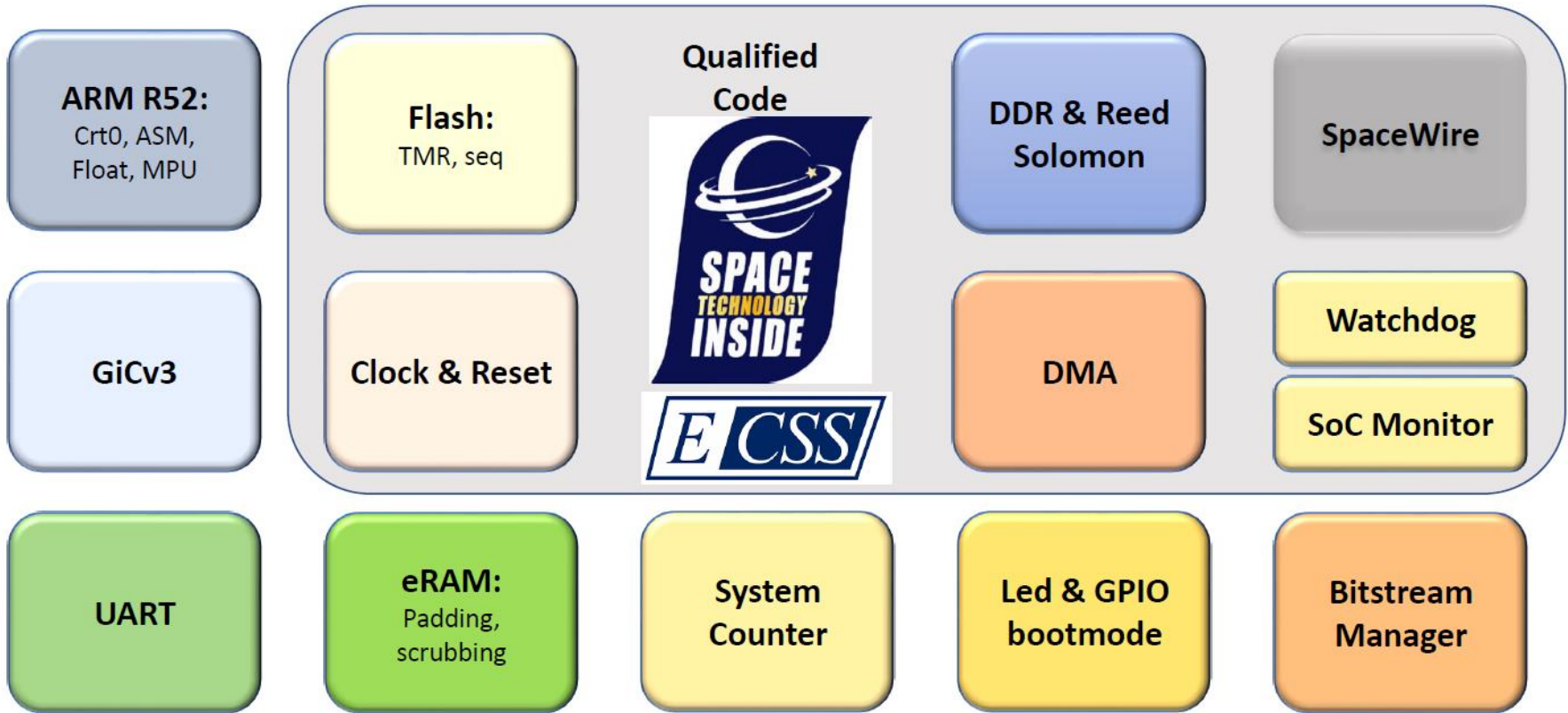


Processing System (PS) Flow



Software Development Kit (SDK)





https://gitlabext.nanoxplore.com/nx_sw_embedded/baremetal/bsps/ngultra_bsp/-/tree/main/drivers?ref_type=heads

- Test apps

UART

GPIO LED

FPU

- Driver examples

Test Flash

Test DDR

Test SPW

Test DMA

Test GIC

- Benchmarks

Coremark

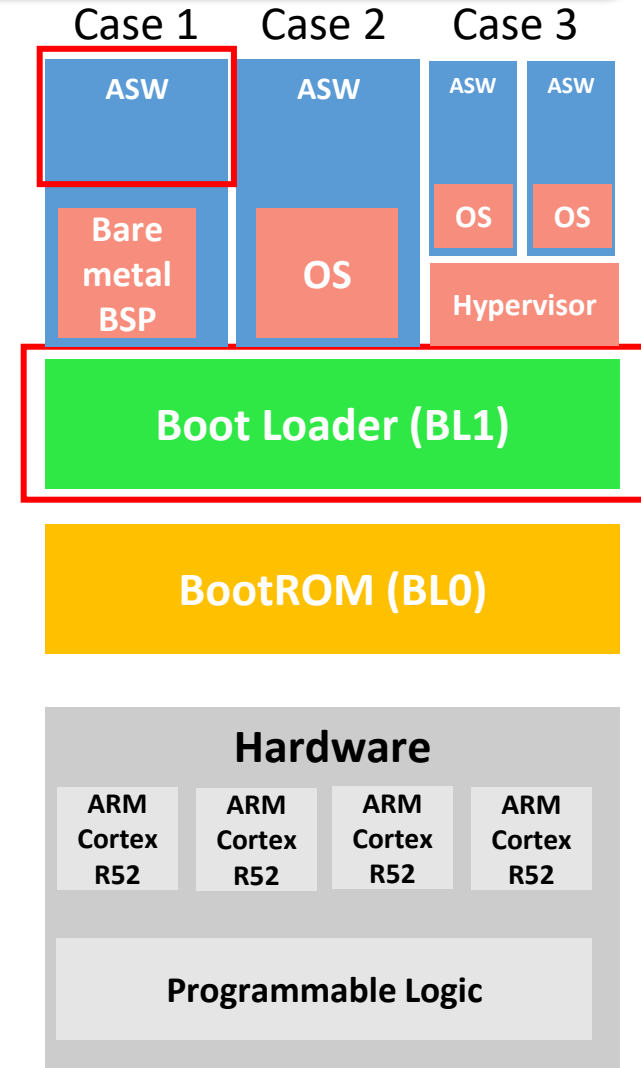
Dhrystone

- Loaders/init

BSP demo

Nx loader

NG-Ultra init



https://gitlabext.nanoxplore.com/nx_sw_embedded/baremetal/bsps/ngultra_bsp/-/tree/main/apps?ref_type=heads



Supported OS

Open-source OS



Zephyr® Project

Proprietary OS



PikeOS for MPU

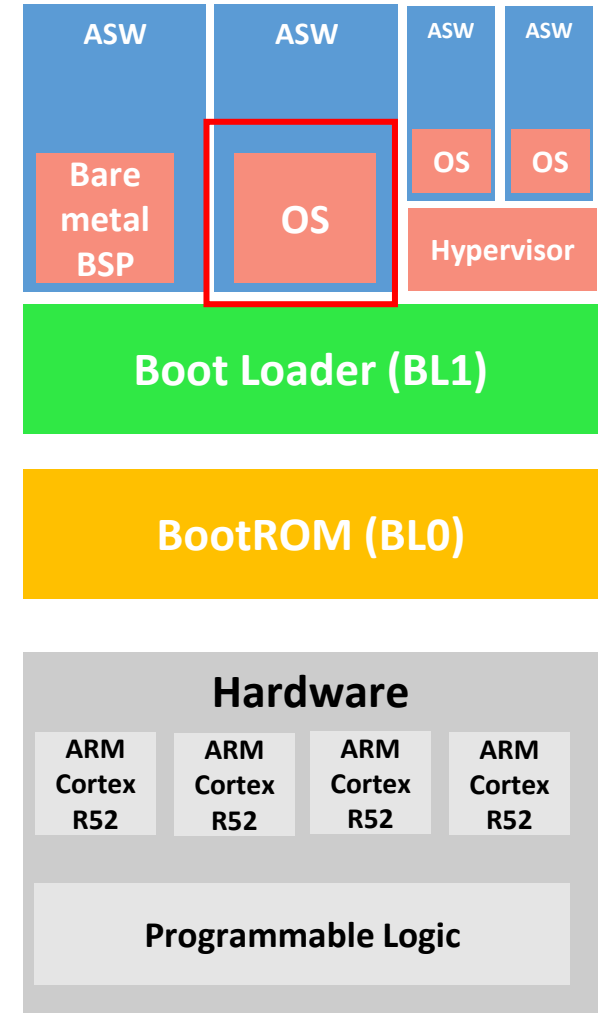
Supported by



Provided by



Case 1 Case 2 Case 3

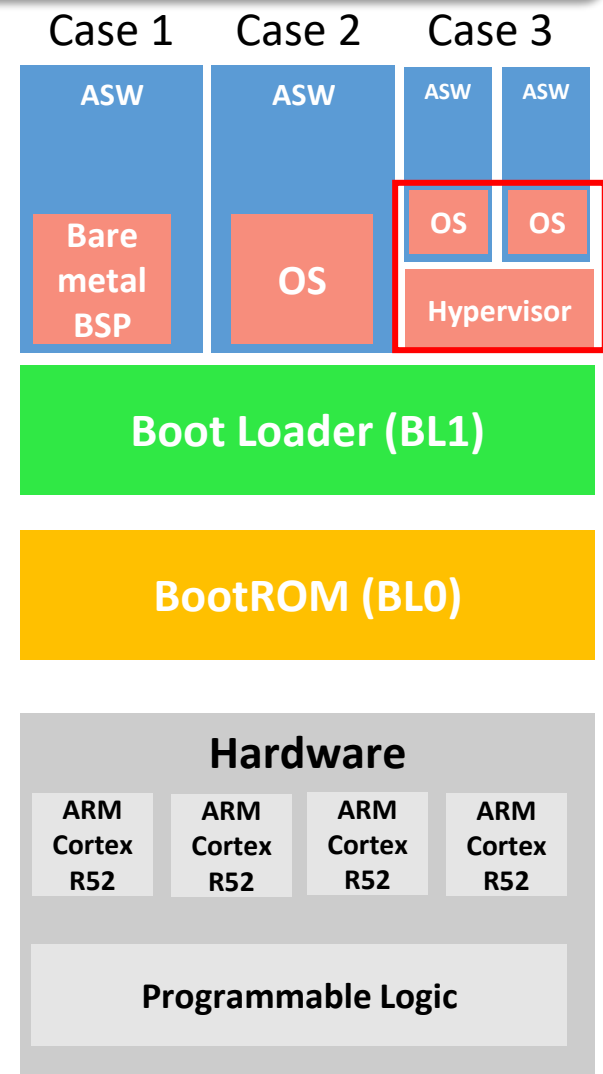
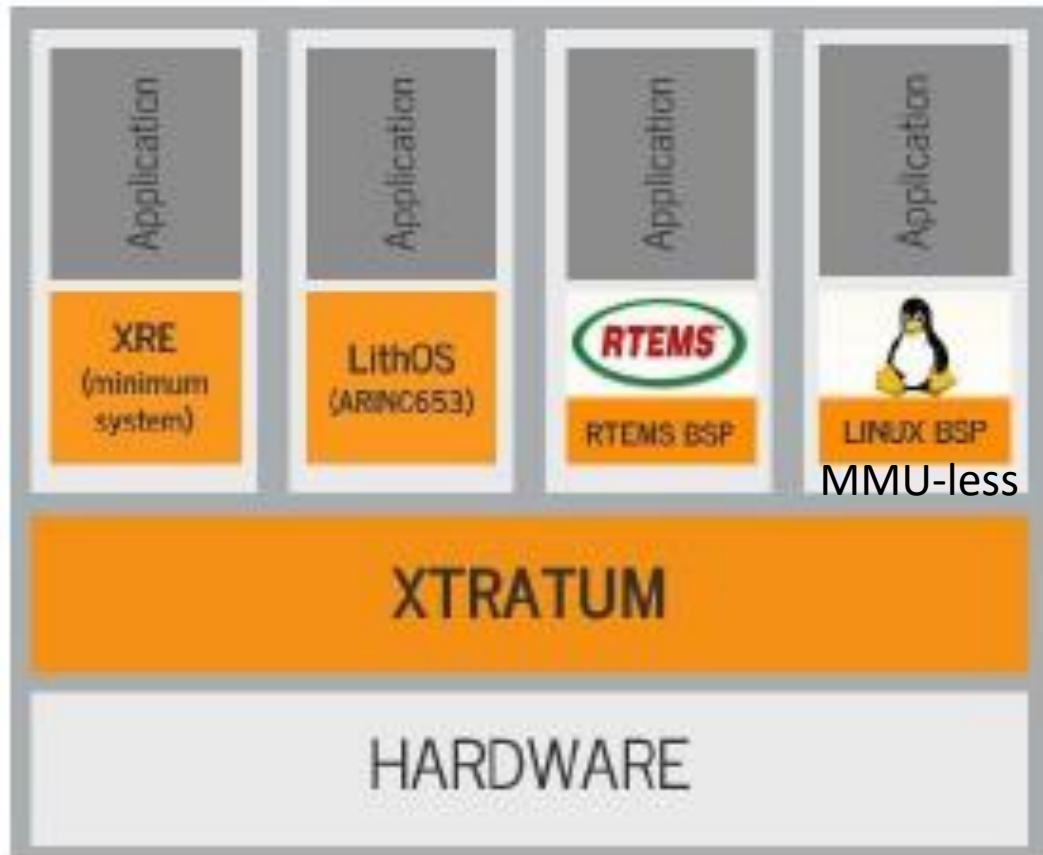


<https://www.sysgo.com/pikeos-for-mpu>

<https://github.com/zephyrproject-rtos/zephyr/pull/46468>

<https://www.fentiss.com/xtratum/#>

- Proprietary Hypervisor

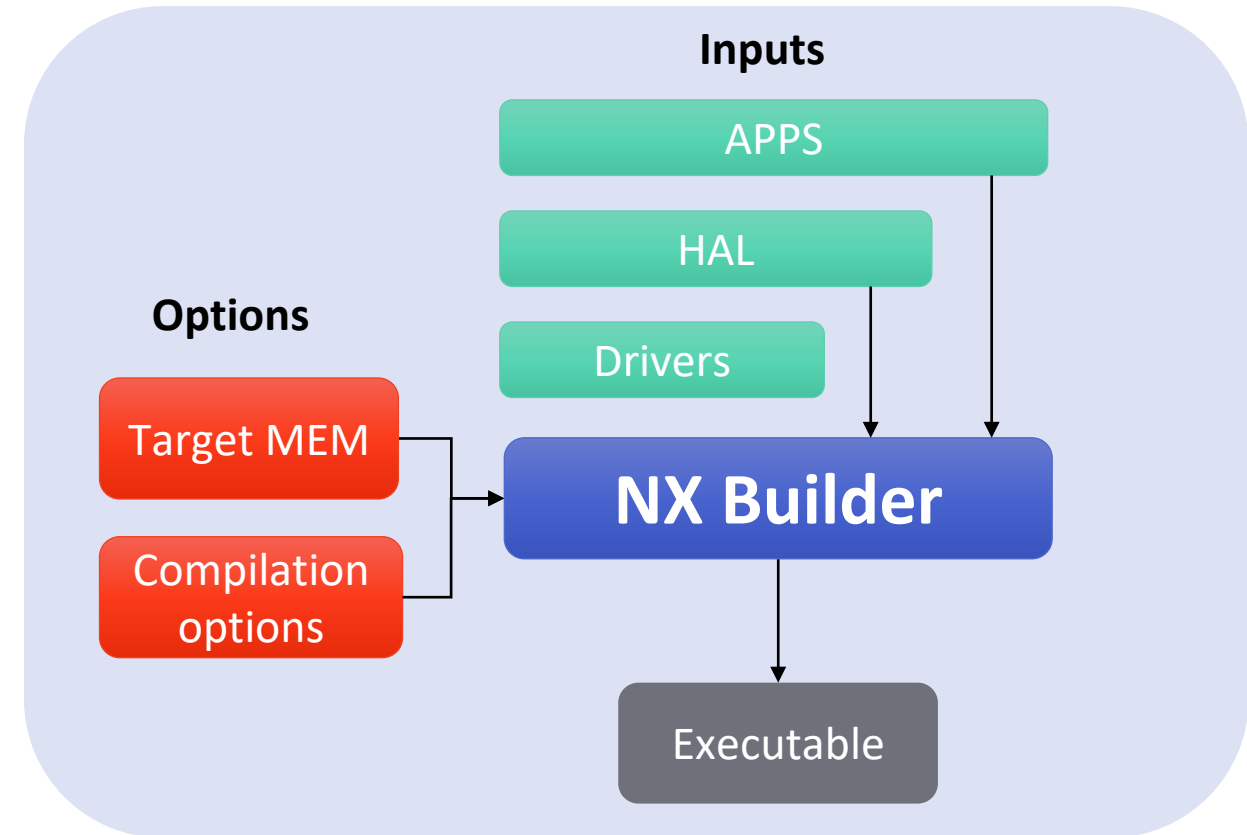


Provided by



<https://www.sysgo.com/pikeos-for-mpu>
<https://github.com/zephyrproject-rtos/zephyr/pull/46468>
<https://www.fentiss.com/xtratum/#>

- Simplify the Makefiles and compile options
- Support of GCC and armclang toolchains
- ARM and Host targets (for HW mocking or code coverage)
- Flexible linker script for different memory destinations
- Conditional compilation per feature

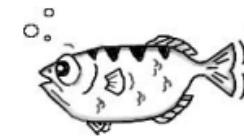


https://gitlabext.nanoxplore.com/nx_sw_embedded/baremetal/nxbuilder

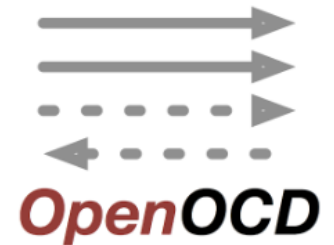
NX embedded tools



- **Nx_embedded_tools** is a tool suite to boost your productivity
- It supports both **Lauterbach** and **OpenOCD** back-ends using the same Python scrips:
 - Bitstream loader
 - Flash programmer
 - BL1 signer
 - Memory dumper using DAP (Debug Access Port)
 - Debugging facilities:
 - Lauterbach (Debug & Trace)
 - OpenOCD support
 - Read temperature sensor

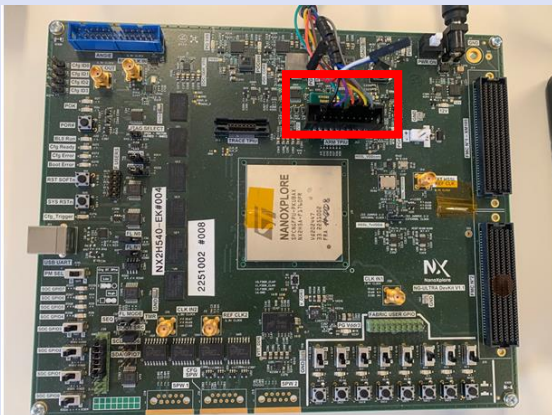


GDB
The GNU Project
Debugger



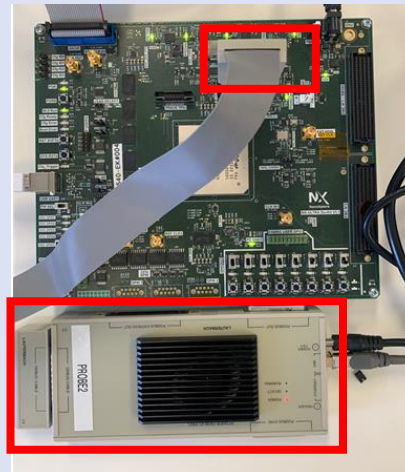
• Mictor + FTDI cable

- JTAG-Mictor adapter required
- Based open-source tools
 - OpenOCD, GDB



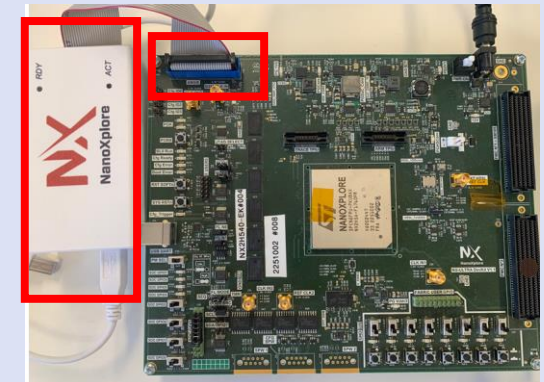
• Mictor + Lauterbach

- HE10-Mictor adapter required
- Proprietary Lauterbach solution
 - Debug Cable
 - T32 GUI tool



• ANGIE connector + cable

- NX ANGIE cable required
- Supported **nxembeddedtools**
- Required for using **NxScope**



Documentation



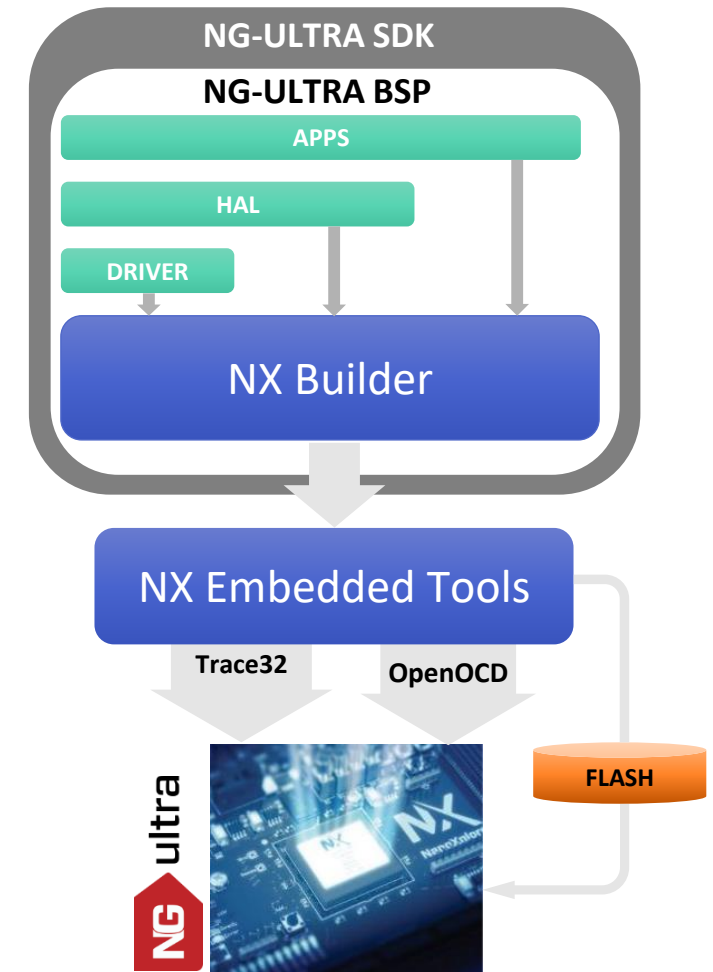
- Several documentations are available in addition to those slides:
- Baremetal BSP:
 - A Welcome guide (README) to load a simple application bitstream on top of ngultra_bsp
 - A README for complex apps in ngultra_bsp/apps/<app_name>
 - A doxygen doc in ngultra_bsp/doc
- nx_embedded_tools:
 - A README for setup and command usage
 - Read the doc in docs/build/html
- Nanoxplore Wiki
 - Release note
 - Test report
 - gcov report (open-source code coverage)

Link: <https://nanoxplore-wiki.atlassian.net/wiki/spaces/NAN/pages/246546703/NG-ULTRA+SDK>

Summary



- Generic build system for embedded software
 - Including Makefiles and generation instructions
 - Generic linker script
- Ready to use drivers
 - Flash, Clock & Reset, DMA, DDR, UART, eRAM, GIC...
 - ARM R52 init (crt0, handler, MPUs, stack...)
 - HAL and Helpers
- Example applications & demo





Thank you