

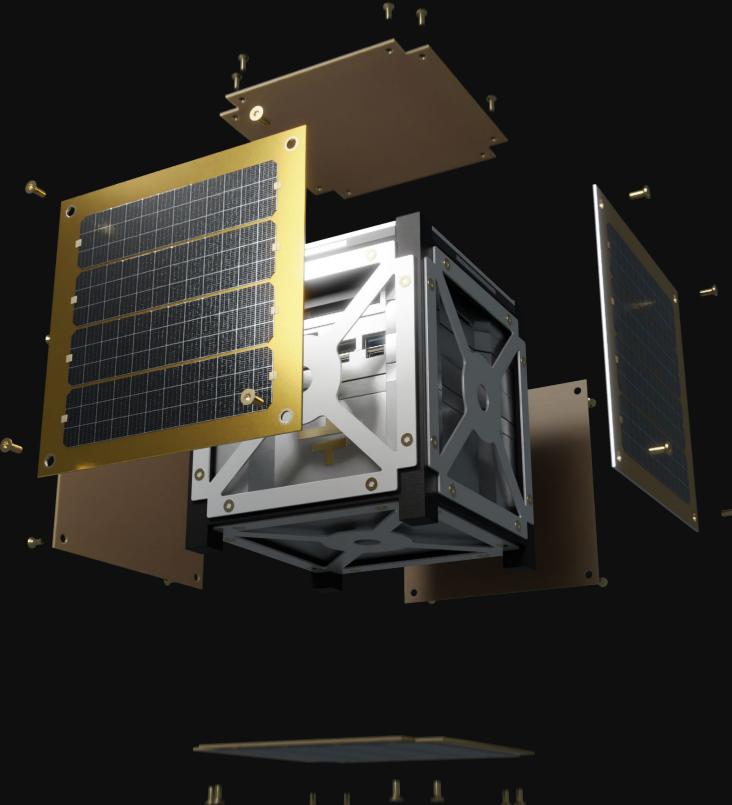
Generating Zephyr Platforms and Apps with Visual System Designer and Renode

Embedded Open Source Summit 2024, Seattle, 2024-04-17

Michael Gieda, mgienda@antmicro.com



**Helping build and support
complex products families
changes your perspective**



**Configurations, variants,
lifecycle BoM management,
inter-team/company
collaboration**



ST Nucleo C031C6



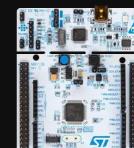
ST Nucleo F030R8



ST Nucleo F070RB



ST Nucleo F091RC



ST Nucleo F103RB



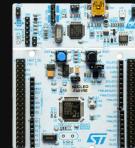
ST Nucleo F207ZG



ST Nucleo F302R8



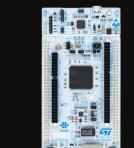
ST Nucleo F303RE



ST Nucleo F401RE



ST Nucleo F412ZG



ST Nucleo F446ZE



ST Nucleo G070RB

Hardware landscape
is complex and
expanding rapidly

We believe open source and
collaboration is the answer



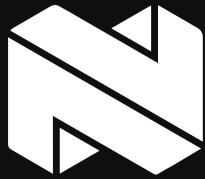
Zephyr, especially with HWMv2, tries to find a common denominator with structured data



NXP i.MX8M Plus

VENDOR	REVISION	SOC
NXP	2.1	i.MX8M Plus
BOARD QUALIFIER	CPU CORE	ARCHITECTURE
mimx8ml8/a53	Arm Cortex-A53	ARMv8-A
BOARD QUALIFIER	CPU CORE	ARCHITECTURE
mimx8ml8/m7	Arm Cortex-M7	ARMv7-M

**HWMv2 migration: Thanks
Nordic!**

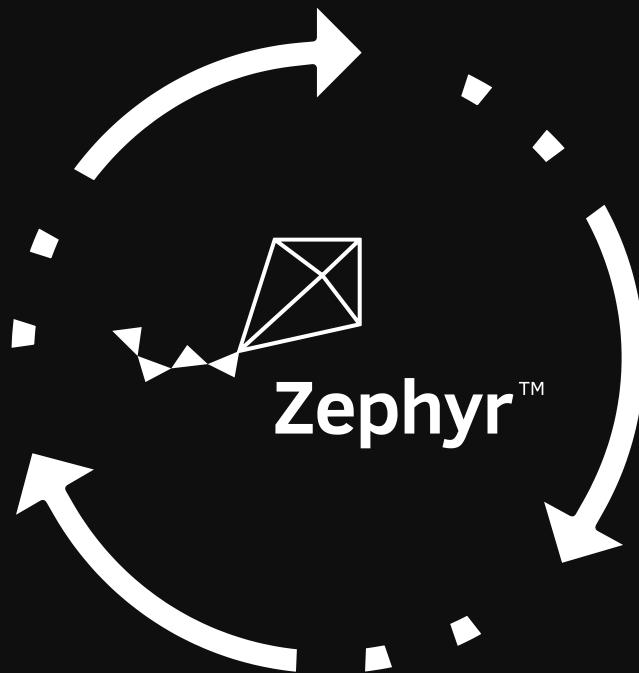


NORDIC®
SEMICONDUCTOR

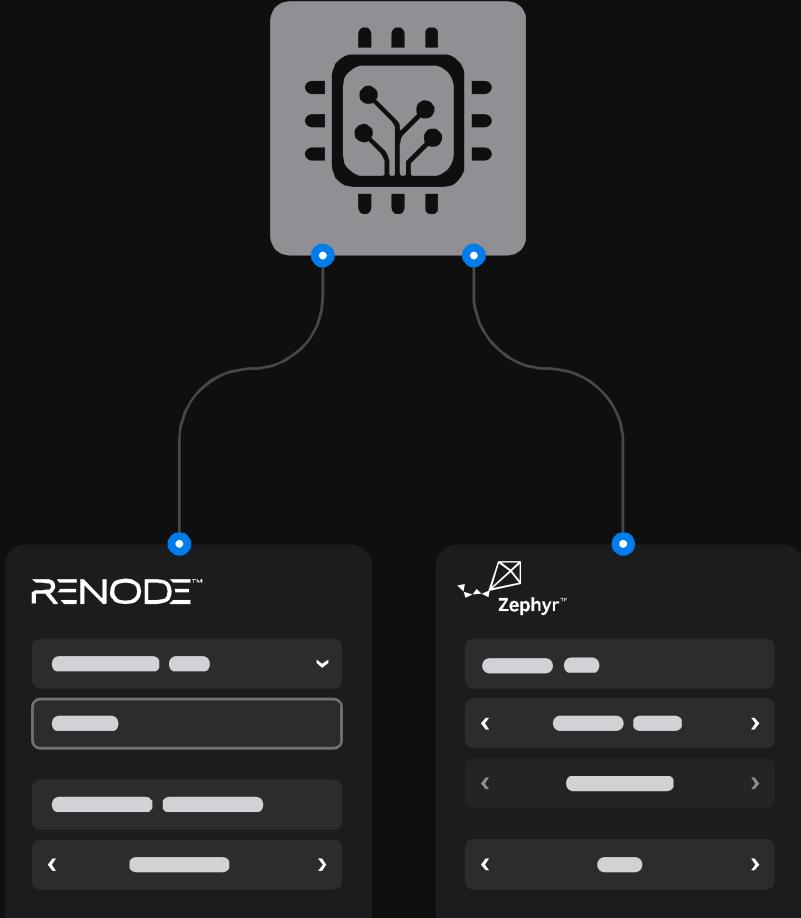
Renode does the same, lets you run SW across hundreds of virtual boards based on structured data

BOARD NAME	470 PASSED	439 PASSED	396 PASSED	463 PASSED	386 PASSED
ARC (20) ^					
ARM32 (508) ▾					
96Boards AeroCore 2	PASSED	PASSED	PASSED	PASSED	PASSED
96Boards Argonkey	PASSED	PASSED	PASSED	PASSED	PASSED
96Boards Avenger96	GENERATED	GENERATED	GENERATED	GENERATED	NOT BUILT
96Boards Carbon	PASSED	PASSED	PASSED	PASSED	PASSED
96Boards Carbon (nRF51)	PASSED	PASSED	PASSED	PASSED	PASSED
96Boards Meerkat96	PASSED	PASSED	NOT BUILT	NOT BUILT	NOT BUILT
96Boards Neonkey	PASSED	PASSED	PASSED	PASSED	PASSED
96Boards Nitrogen	PASSED	PASSED	PASSED	PASSED	PASSED
96Boards STM32 Sensor Mezzanine	PASSED	PASSED	PASSED	PASSED	PASSED
96boards WisTrio	PASSED	PASSED	PASSED	PASSED	PASSED
aconno acn52832	PASSED	PASSED	PASSED	PASSED	PASSED
Actinius Icarus 1.4.0	PASSED	PASSED	PASSED	PASSED	PASSED
Actinius Icarus 2.0.0	PASSED	PASSED	PASSED	PASSED	PASSED
Actinius Icarus Bee	PASSED	PASSED	PASSED	PASSED	PASSED
Actinius Icarus Bee Non-Secure	PASSED	PASSED	PASSED	PASSED	PASSED
Actinius Icarus Non-Secure 1.4.0	PASSED	PASSED	PASSED	PASSED	PASSED
Actinius Icarus Non-Secure 2.0.0	PASSED	PASSED	PASSED	PASSED	PASSED
Actinius Icarus SoM	PASSED	PASSED	PASSED	PASSED	PASSED
Actinius Icarus SoM DK	PASSED	PASSED	PASSED	PASSED	PASSED
Actinius Icarus SoM DK Non-Secure	PASSED	PASSED	PASSED	PASSED	PASSED

Scratch my back... feeding
improvements back into
Zephyr



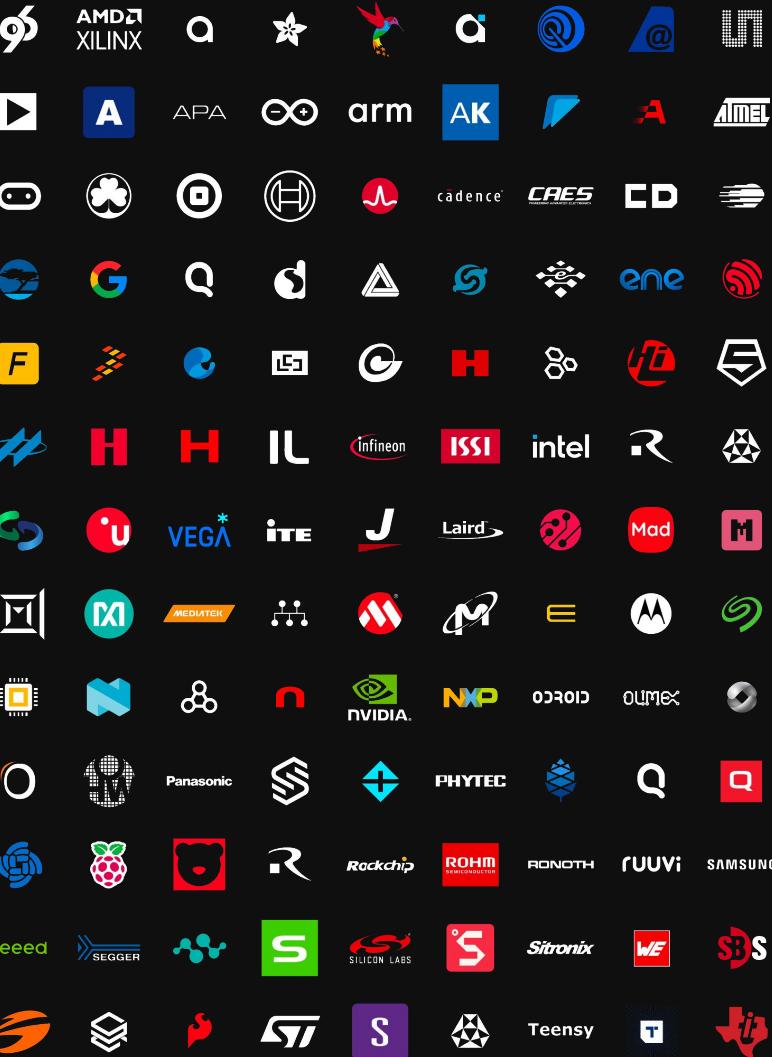
In real-world product development, structure and “single source of truth” is not just useful but essential



Quest for find structure in
HW landscape took us
through many efforts - now
united into one new
framework

The screenshot displays the HiFive Unleashed platform interface, which integrates Visual System Designer and Renode. The top section shows a 'Nodes browser' sidebar with categories like Antenna, Connector, Debugger, Display, FPGA, Interfacing, IO, Memory, and Power. A main workspace shows a schematic diagram of the Freedom U540 board, featuring components such as DDR4 x32 (8GB), QSPI Flash (M25L10068M-I5C), and SD Card (Amphenol 10067847-001RF). Below the schematic is a photograph of the 96Boards AeroCore 2 hardware. The interface includes tabs for Software, Hardware, and Peripherals, with the Software tab currently selected. Under 'Zephyr samples', there are three entries: 'Hello World' (a simple sample that prints "Hello World"), 'Shell Module' (Zephyr shell interface demonstration), and 'Philosophers'. The 'Hello World' sample has a note: 'A simple sample that prints "Hello World" to the console. Run locally.' It also includes instructions: 'You can run the Hello World demo on the 96Boards AeroCore 2 board by following the instructions below. Assuming you have Python 3 and pip installed on your Linux machine, run the following commands to download Renode and the prebuilt binaries for this demo, and then run the simulation in Renode on your own machine.' The bottom section features a detailed view of the ARTIX DC-SCM board, showing its complex circuitry and components. On the right side of the board, there are several small icons: a gear, a square, a triangle, and a double-headed arrow.

Not only Zephyr -
aggregation of multiple data
sources (U-Boot, Linux,
vendor data, platformio...)



New way for describing
and managing entire
multi-device systems

GPU Cluster

VENDOR
 antmicro

DESCRIPTION
A open source GPU cluster setup, consisting of a new Thunderbolt to GPU adapter, a custom GPU cluster backplane supporting up to 8 GPUs and a custom enclosure, which together provide a modular, scalable and expandable GPU compute in the LLM era. Desing is optimized for NVIDIA Tesla T4 and P4, as well as L4 and A2 Tensor Core GPUs dedicated for server applications

Boards within this device

-  GPU Cluster backplane
Antmicro [...](#)
-  Thunderbolt to GPU adapter
Antmicro [...](#)

Components within this device

-  NVIDIA Tesla T4
NVIDIA [...](#)
-  Delta 1600W PSU
DELL [...](#)

**Open data: explore SoCs,
SoMs, boards,
components, sensors,
cores, peripherals, and
how they are interrelated**



NRF 5340

VENDOR



CORES

Arm Cortex-M33F

Boards containing this SoC



NRF5340-DK-NRF5340-application-MCU-Non-Secure
Nordic

...



PAN1783-EVB-network-MCU
Panasonic

...



RAYTAC MDBT53V-DB-40-NRF5340-network-MCU
Raytac

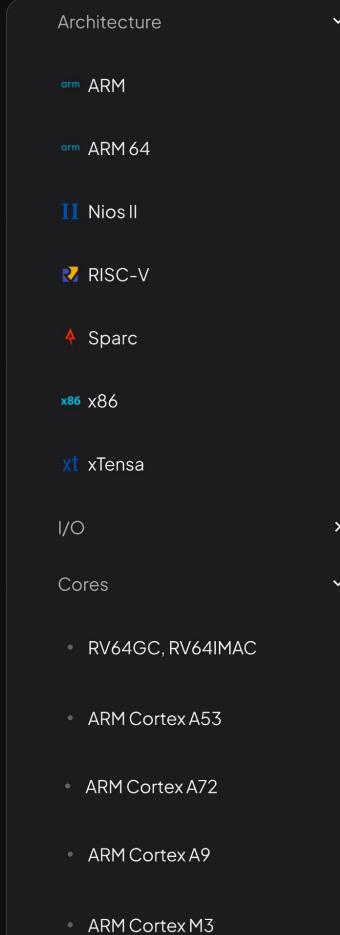
...



PAN1783A-EVB-network-MCU
Panasonic

...

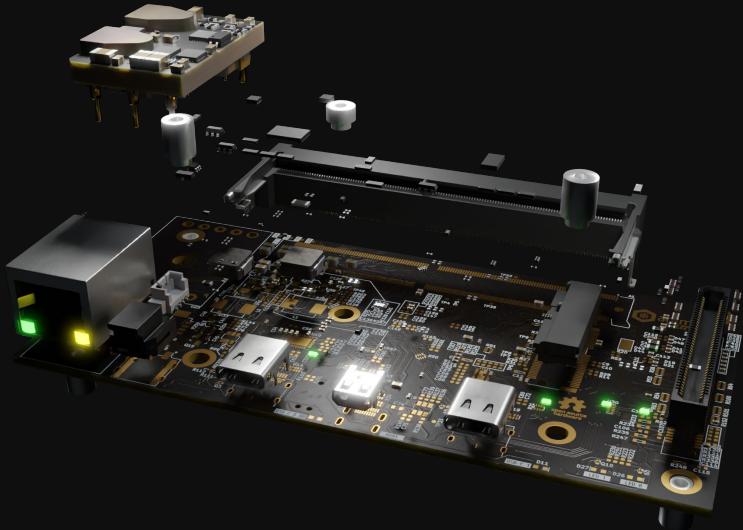
Filter e.g. SoCs by cores
and I/O, make design
decisions



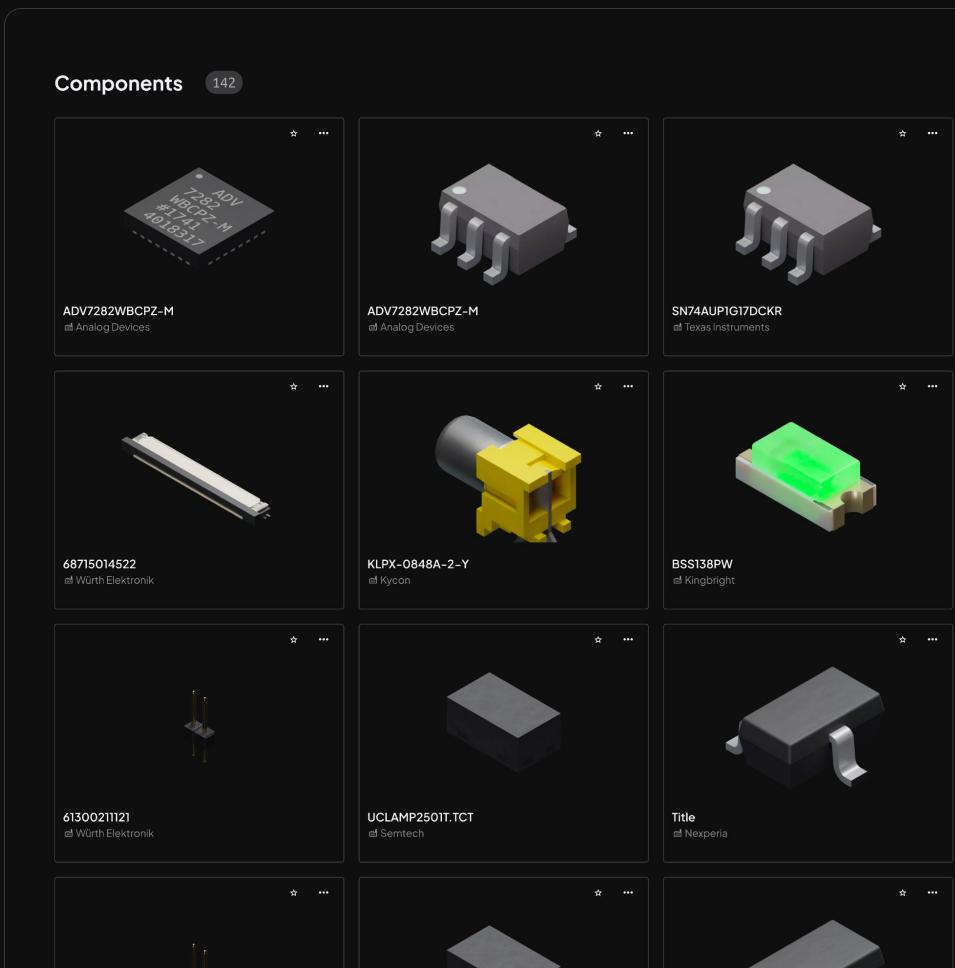
View results and reproduce demos for existing boards

 Hello World A simple sample that prints "Hello World"	PASSED •
 Shell module Zephyr shell interface demonstration	PASSED •
 Philosophers Solution to the Dining Philosophers problem	PASSED •
 TensorFlow Lite Micro Sample application replicating sine function	PASSED •
 MicroPython MicroPython Zephyr port demonstration	PASSED •
 Blinky LED blinking using the Zephyr GPIO API	PASSED •
 Hello World (user) Hello World from userspace	NOT BUILT •
 Synchronization Thread synchronization and timing sample	PASSED •
 LZ4 LZ4 compression and decompression	BUILT •
 Rust application Rust API bindings and libstd	PASSED •
 Kenning microTVM Gesture recognition using Kenning Zephyr Runtime	PASSED •
 Kenning TFLite Micro Gesture recognition using Kenning Zephyr Runtime	BUILT •
 Kenning IREE Gesture recognition using Kenning Zephyr Runtime	NOT BUILT •
 U-Boot	NOT BUILT •

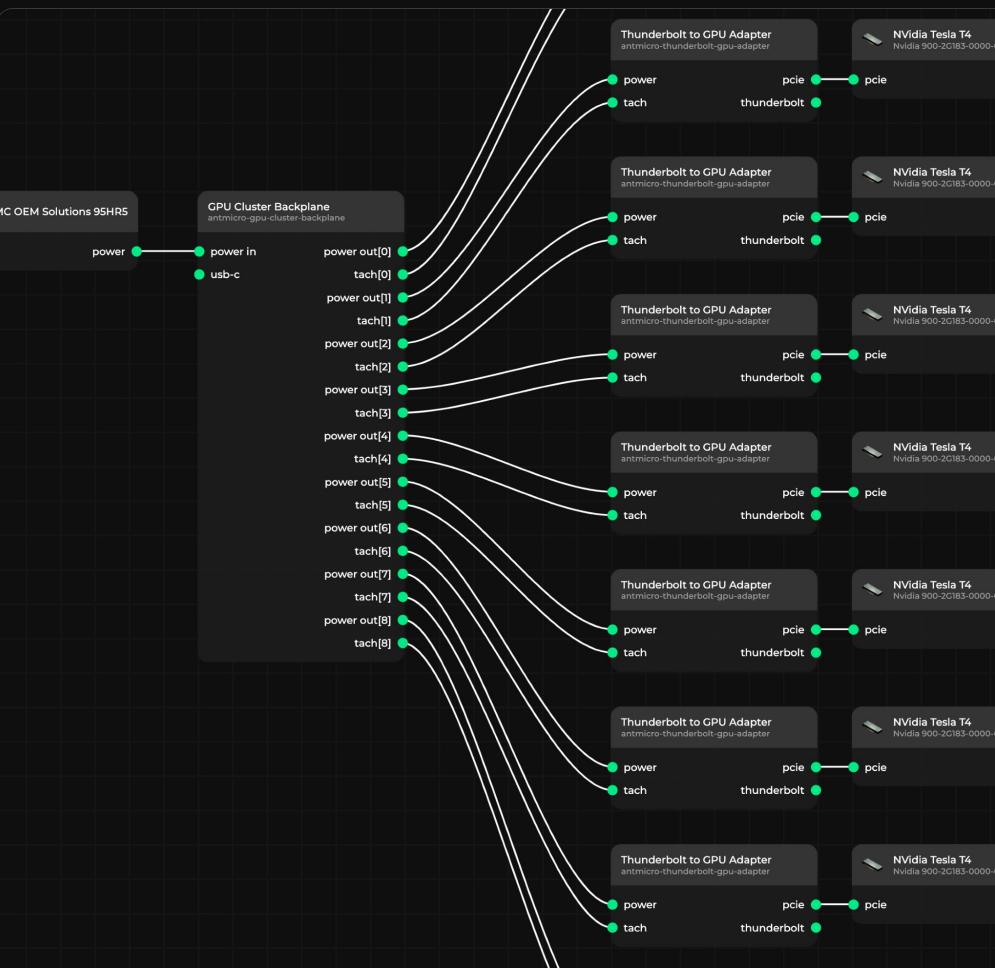
For our open HW boards,
also link back to real
components, provide renders,
hot areas, datasheets, stackup,
schematics preview



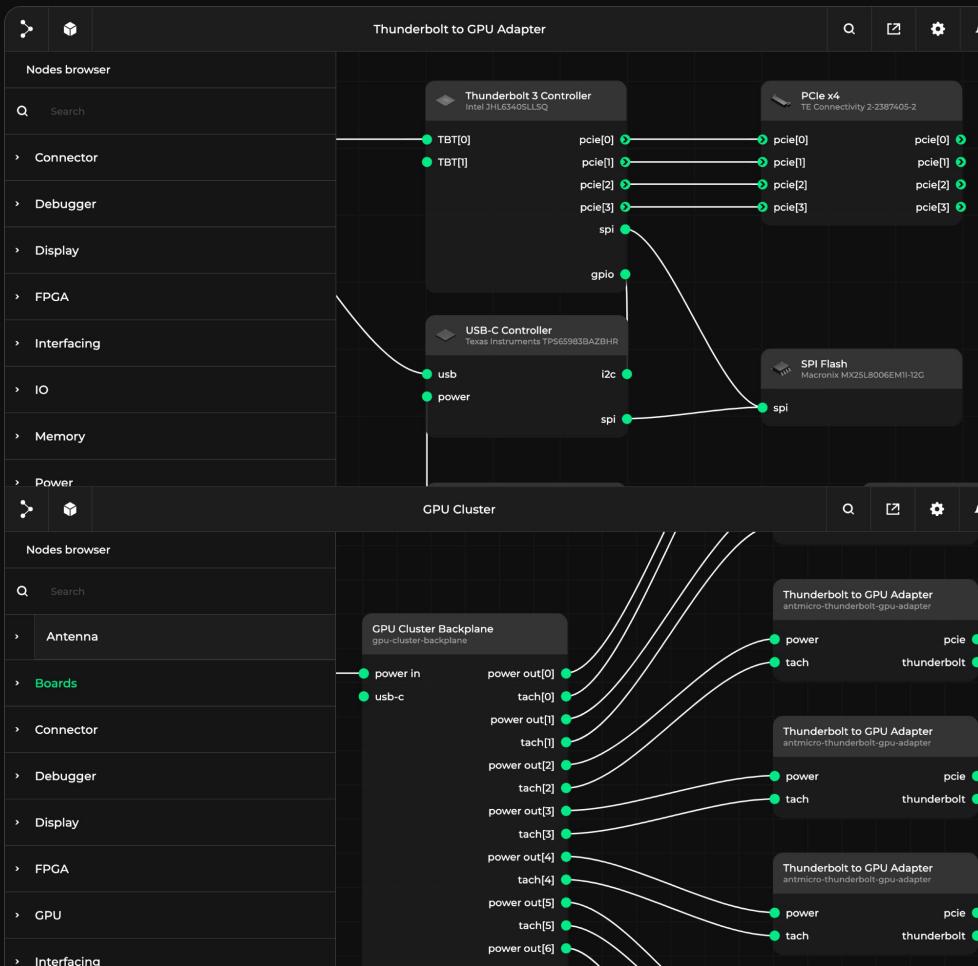
Generate SW & HW BOMs (thanks to Zephyr, HBOM workgroup)



Representing structure: describing your device with the Visual System Designer



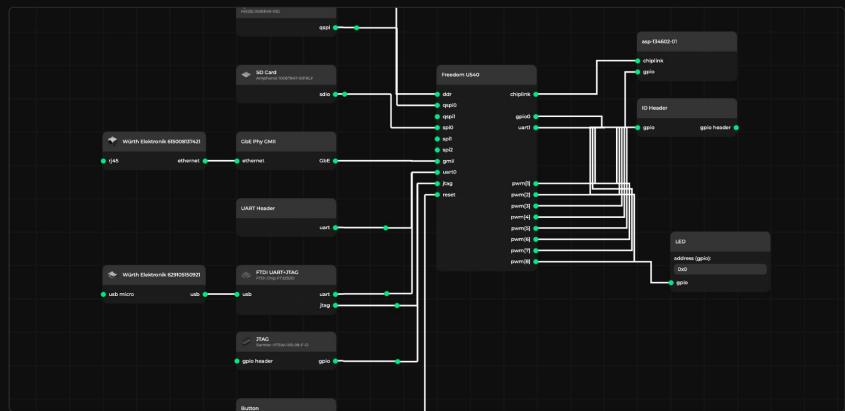
Combine SoCs, sensors and actuators from the database into boards, boards into systems



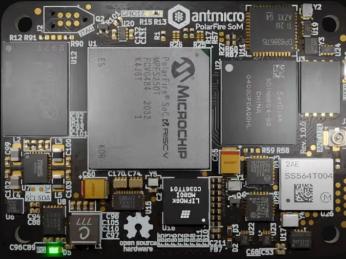
Generate Zephyr board files, dts and test binaries based on the diagram

Block diagram

Generate Zephyr DTS



Simulate in Renode with interactive GUI



PolarFire SoM

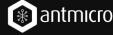
PUBLISHED

2023/03/11

SOC

MPFS250T

VENDOR



DOCUMENTATION

github.com

REVISION

1.02

SCHEMATICS

github.com

	Blinky	PASSED
	Hello World	PASSED
	LZ4	BUILT
	MicroPython	PASSED
	Philosophers	PASSED
	Rust application	PASSED
	Synchronization	PASSED
	TensorFlow Lite Micro	PASSED

UART output

*** Booting Zephyr OS build b573f447f04f ***

LED state: OFF

LED state: ON

LED state: OFF

LED state: ON

DEMO

WEDNESDAY, APRIL 17 | 11:55 AM PDT

Automated, Simulation-Based Flow for Low-Cost FPGA-Accelerated Devices with Zephyr on BeagleV-Fire



Piotr Zierhoffer
Antmicro

Seattle Convention Center | Seattle, Washington | USA

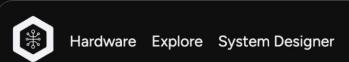
[>> Watch live](#)



FUTURE PLANS

Public release (but the
Zephyr / Renode
generation flow is already
open source!)

github.com/antmicro/visual-system-designer-app



Home / Hardware / Boards

Categories

Devices

1

Boards

1506

Socs

623

Soc components

4092

Components

2257

Vendors

132

Boards

Search...



96Boards AeroCore 2
96Boards



96Boards Argonkey
96Boards



96Boards Avenger96
96Boards



96Boards Carbon
96Boards



96Boards Carbon (nRF51)
96Boards

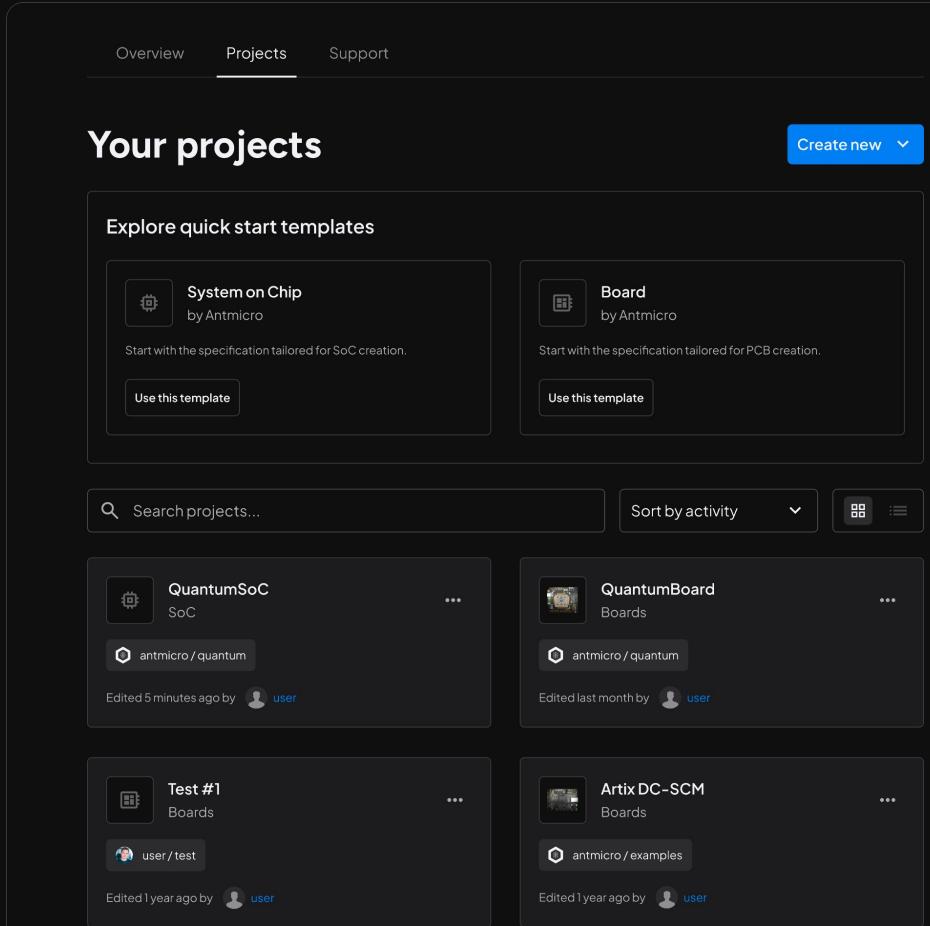


96Boards Meerkat96
96Boards



96Boards Neonkey

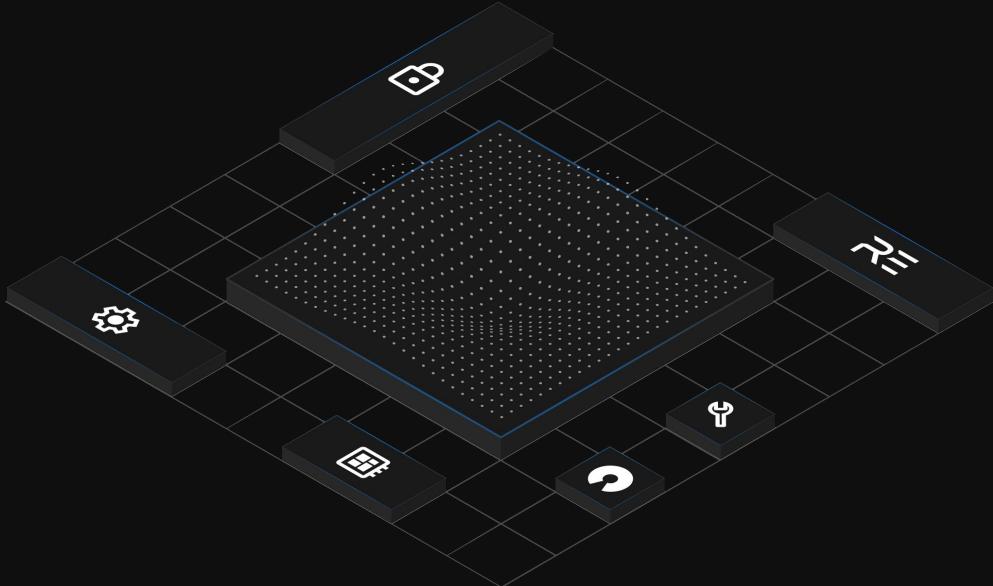
User profiles with saved, private projects



The screenshot shows the antmicro project management interface. At the top, there are three navigation tabs: Overview, Projects (which is selected), and Support. Below the tabs, a large heading says "Your projects" with a "Create new" button. A section titled "Explore quick start templates" offers two options: "System on Chip" by Antmicro and "Board" by Antmicro, both with "Use this template" buttons. Below this are search and sorting tools: a search bar with a magnifying glass icon and placeholder "Search projects...", a dropdown menu for "Sort by activity", and icons for filters and more options. The main area displays four project cards:

- QuantumSoC** (SoC) by antmicro / quantum. Last edited 5 minutes ago by a user. Three dots indicate more options.
- QuantumBoard** (Boards) by antmicro / quantum. Last edited last month by a user. Three dots indicate more options.
- Test #1** (Boards) by user / test. Last edited 1 year ago by a user. Three dots indicate more options.
- Artix DC-SCM** (Boards) by antmicro / examples. Last edited 1 year ago by a user. Three dots indicate more options.

**Express your system, get
our help to build it - HW,
simulation, Renode,
Zephyr, OTA etc.**





antmicro

**THANK YOU FOR
YOUR ATTENTION!**

