



CMSIS & ML Partner Event

embedded world 2025

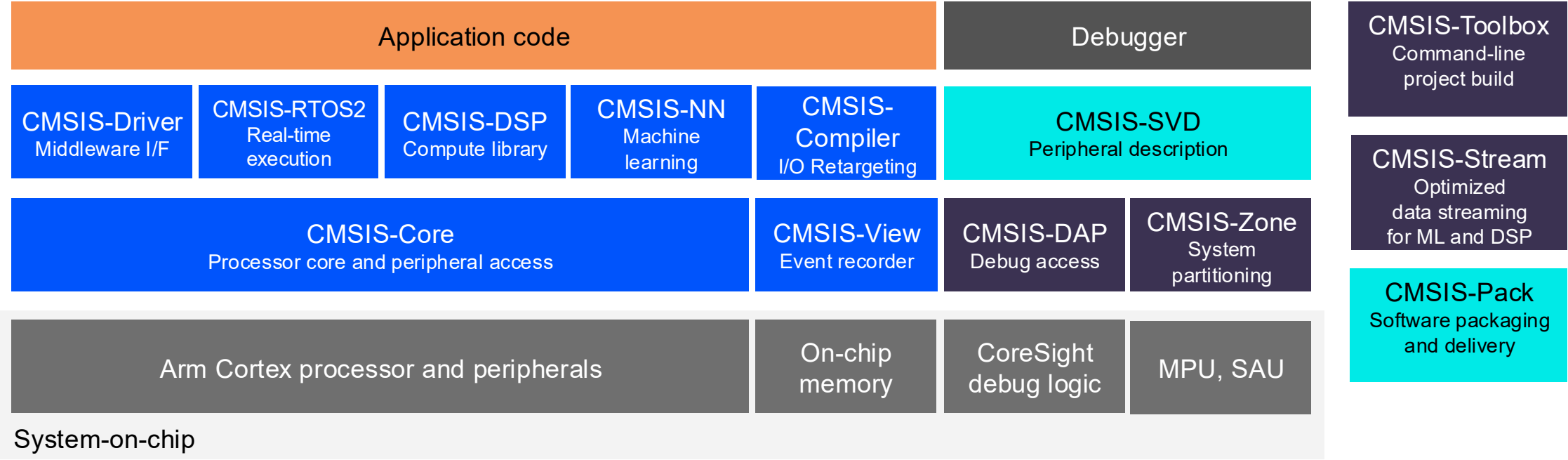
Reinhard Keil, Christopher Seidl, Joachim Krech
March 11th, 2025

Agenda

- State of CMSIS v6
- 2024 achievements
- CMSIS-Packs for device, board, and software support for scalable examples
- Arm commercial tooling
- Arm open-source tooling
- Roadmap
- Arm CMSIS Debug extension overview
- Collaboration with GitHub
- AI/ML tools and software with Edge Impulse
- Demo

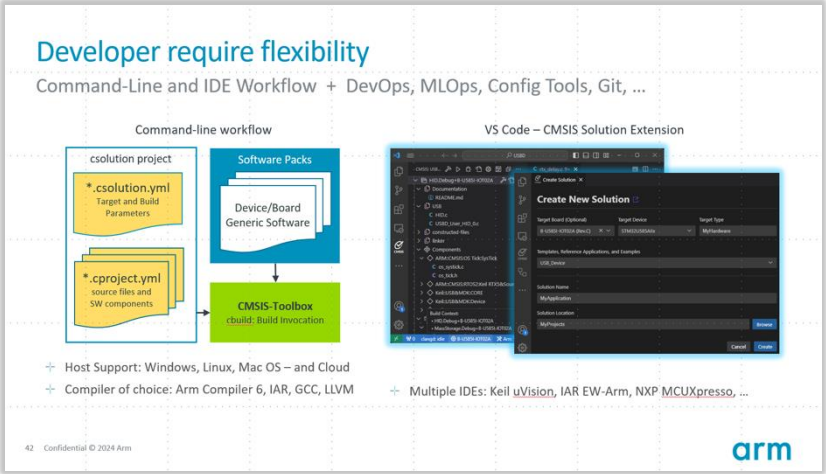
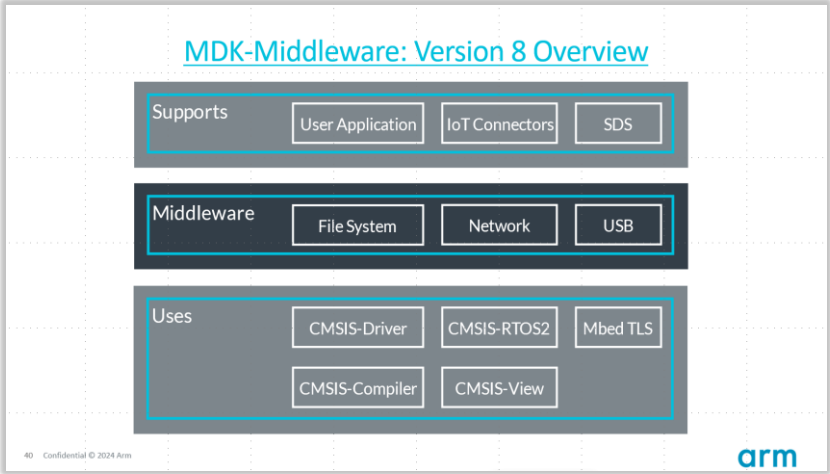
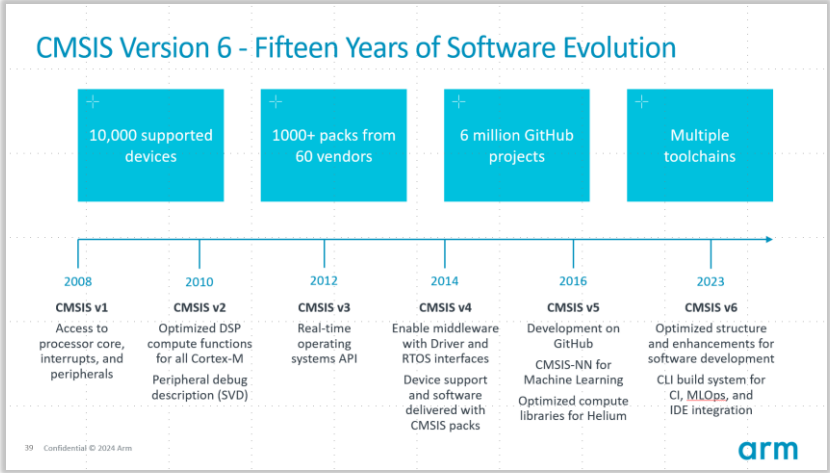
CMSIS Version 6

github.com/ARM-software/CMSIS_6



- Software components
- Tools for optimizing development flows
- Specifications

CMSIS – 2024 Achievements



2025 Focus

- Ease-of-Use
- Consistency
- Ecosystem
- VS Code Debug
- Zephyr
- Edge AI
- Arm Custom Instructions
- Cortex-A Transition



Create Consistent DFP and BSP – Training Material

Enables toolchain agnostic support for many third-party software components

Part 1

- Single core devices with C startup components
- Base-line contents of a BSP (documentation, tool-chain agnostic blinky example)
- [Recording](#)
- [Slides](#)

Part 2

- Devices that use a Configuration Generator
- Multi-core devices with tool-chain agnostic templates for different pre-configurations
- Create software layers based on driver standards to enable reference applications
- [Recording](#)
- [Slides](#)

Pack creation documentation: open-cmsis-pack.github.io/cmsis-toolbox/pack-tools/

CMSIS Example Applications

Exemplified on MDK-Middleware

MDK Middleware Pack

Reference Application Example

USB Device

RTOS

HID Class

CMSIS-View

connections:

- connect: USB Device HID

consumes:

- CMSIS_USB_Device
- CMSIS_VIO

Driver APIs

Layer Type: Board
(<board-name>.clayer.yml)

connections:

- connect: Board with USB

provides:

- CMSIS_USB_Device
- CMSIS_VIO

BSP Pack

CMSIS Ecosystem Software Stacks

[keil.arm.com/packs](https://www.keil.arm.com/packs)

Graphics



Middleware



Machine Learning/DSP



RTOS



Other



CMSIS

CMSIS



CMSIS-RTX

CMSIS-DSP

CMSIS-View

CMSIS-NN

CMSIS-Stream

CMSIS-FreeRTOS

CMSIS-Compiler

Keil MDK Version 6

Tools

Keil Studio

Arm Compiler

CMSIS-Toolbox

Arm Virtual Hardware

µVision

Arm Debugger

Artifactory

Linux/macOS/Windows

Middleware

File System

USB

Network

Keil RTX5

Mbed TLS

CMSIS-Packs

CMSIS

Device Support

Board Support

Software Components

Functional Safety (FuSa)

FuSa RTS

FuSa Compiler

FuSa C Library

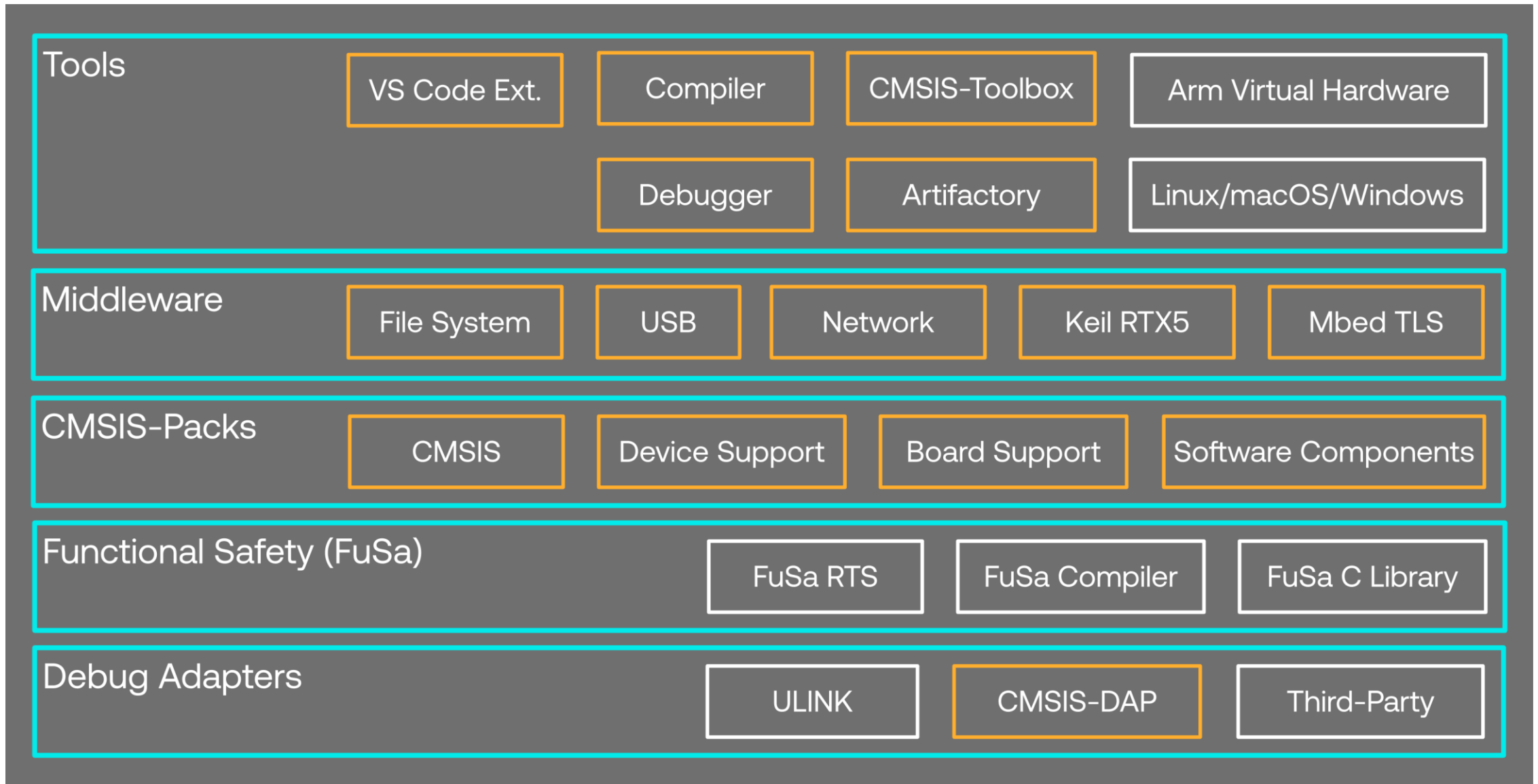
Debug Adapters

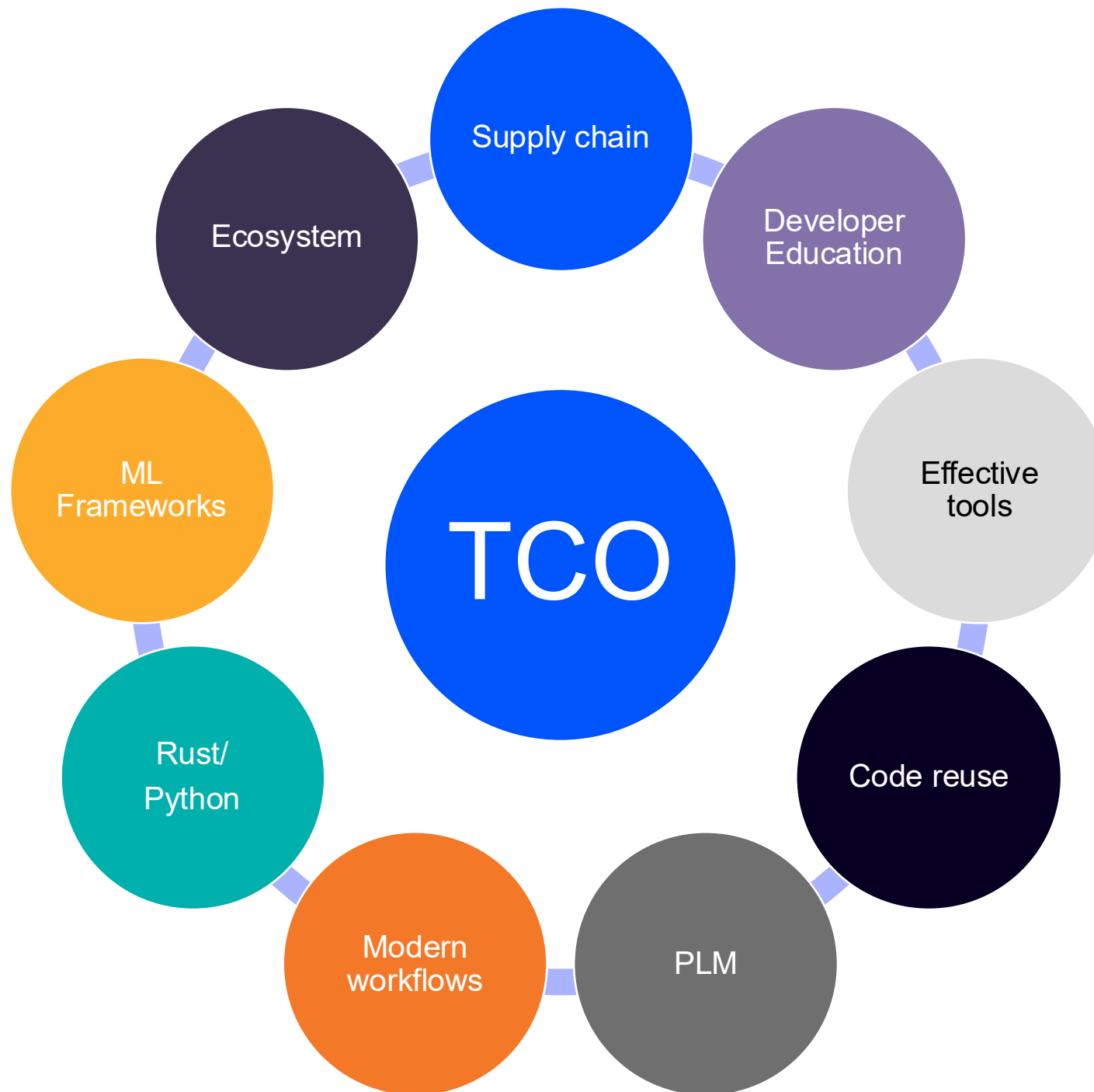
ULINK

CMSIS-DAP

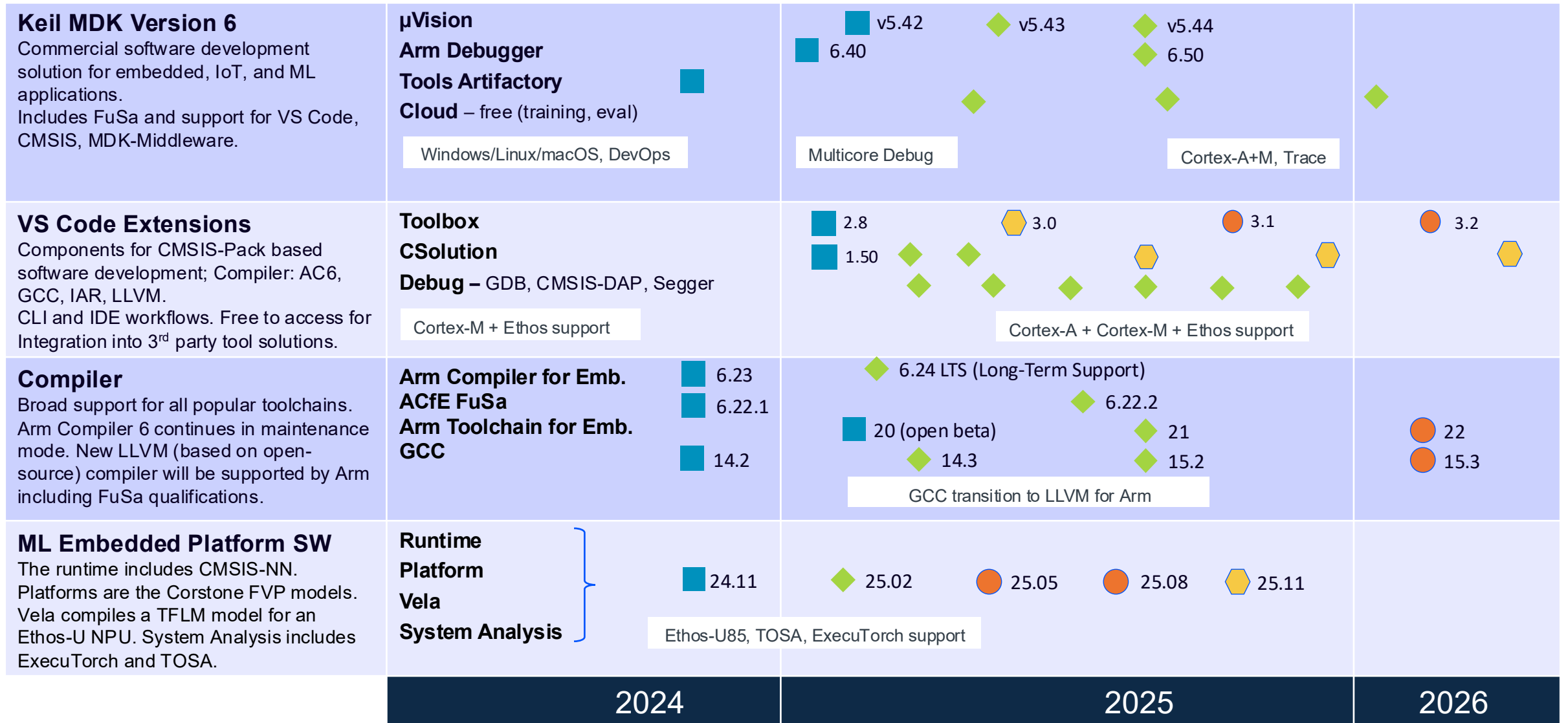
Third-Party

Keil MDK Version 6

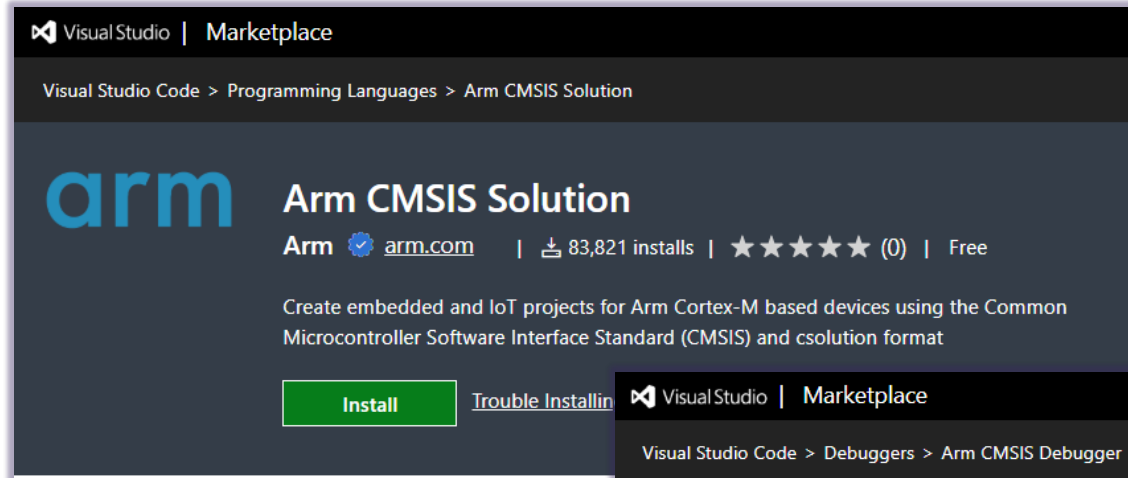




Tools Roadmap



Free to use Extensions – Available on VS Code Marketplace



Visual Studio | Marketplace

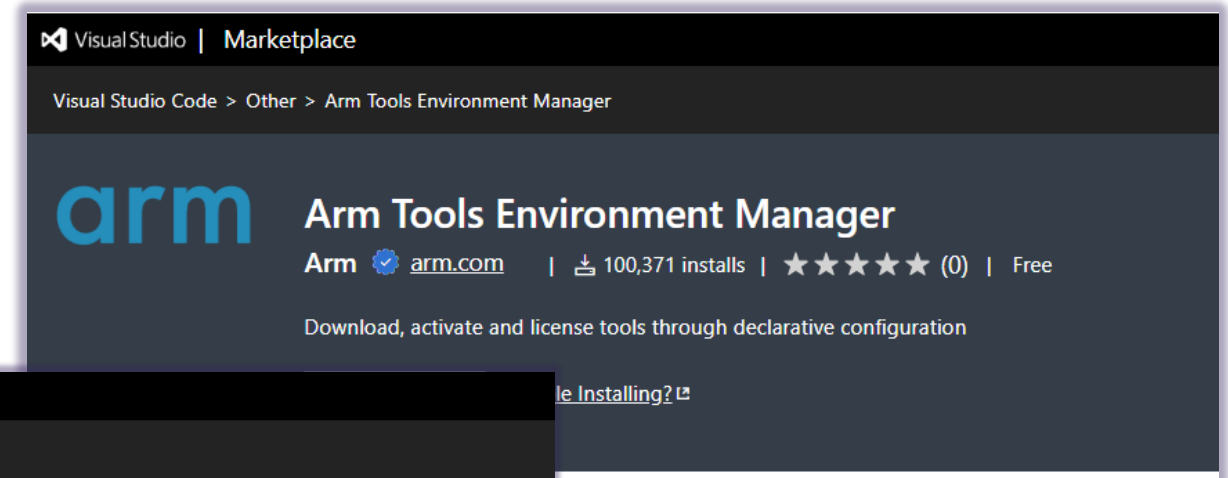
Visual Studio Code > Programming Languages > Arm CMSIS Solution

arm **Arm CMSIS Solution**

Arm  arm.com | 83,821 installs | ★★★★★ (0) | Free

Create embedded and IoT projects for Arm Cortex-M based devices using the Common Microcontroller Software Interface Standard (CMSIS) and csolution format

[Install](#) [Trouble Installing?](#)



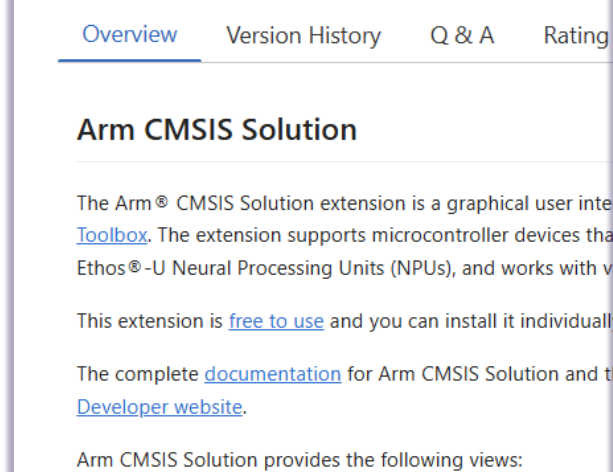
Visual Studio | Marketplace

Visual Studio Code > Other > Arm Tools Environment Manager

arm **Arm Tools Environment Manager**

Arm  arm.com | 100,371 installs | ★★★★★ (0) | Free

Download, activate and license tools through declarative configuration



Overview Version History Q & A Rating

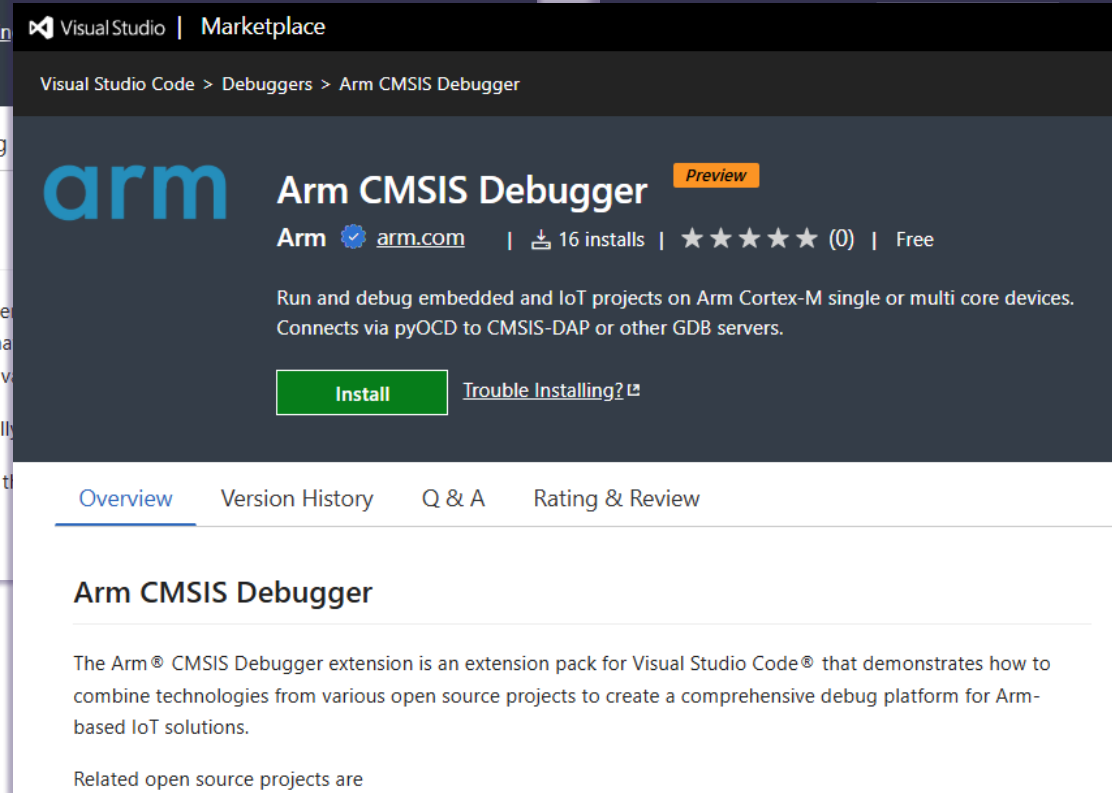
Arm CMSIS Solution

The Arm® CMSIS Solution extension is a graphical user interface for the Arm CMSIS Solution. The extension supports microcontroller devices that are based on Arm Cortex-M, Arm Ethos®-U Neural Processing Units (NPUs), and works with various development tools.

This extension is [free to use](#) and you can install it individually or as part of the [Arm Keil® Studio Pack](#).

The complete [documentation](#) for Arm CMSIS Solution and the [Developer website](#).

Arm CMSIS Solution provides the following views:



Visual Studio | Marketplace

Visual Studio Code > Debuggers > Arm CMSIS Debugger

arm **Arm CMSIS Debugger** Preview

Arm  arm.com | 16 installs | ★★★★★ (0) | Free

Run and debug embedded and IoT projects on Arm Cortex-M single or multi core devices. Connects via pyOCD to CMSIS-DAP or other GDB servers.

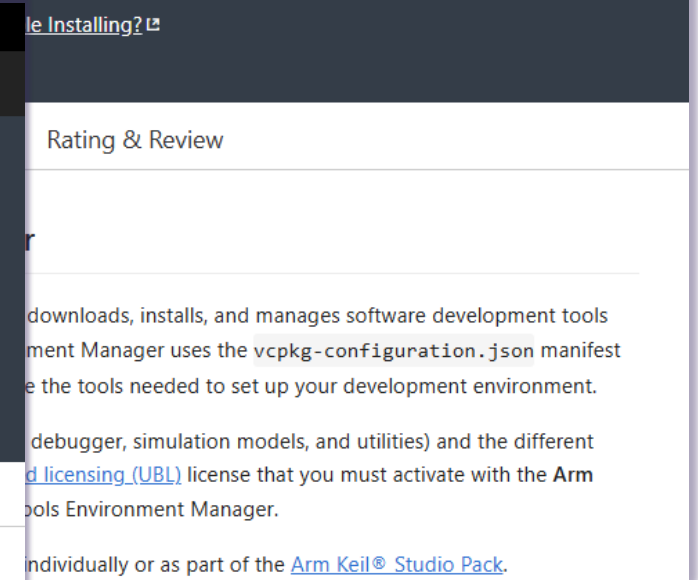
[Install](#) [Trouble Installing?](#)

Overview Version History Q & A Rating & Review

Arm CMSIS Debugger

The Arm® CMSIS Debugger extension is an extension pack for Visual Studio Code® that demonstrates how to combine technologies from various open source projects to create a comprehensive debug platform for Arm-based IoT solutions.

Related open source projects are

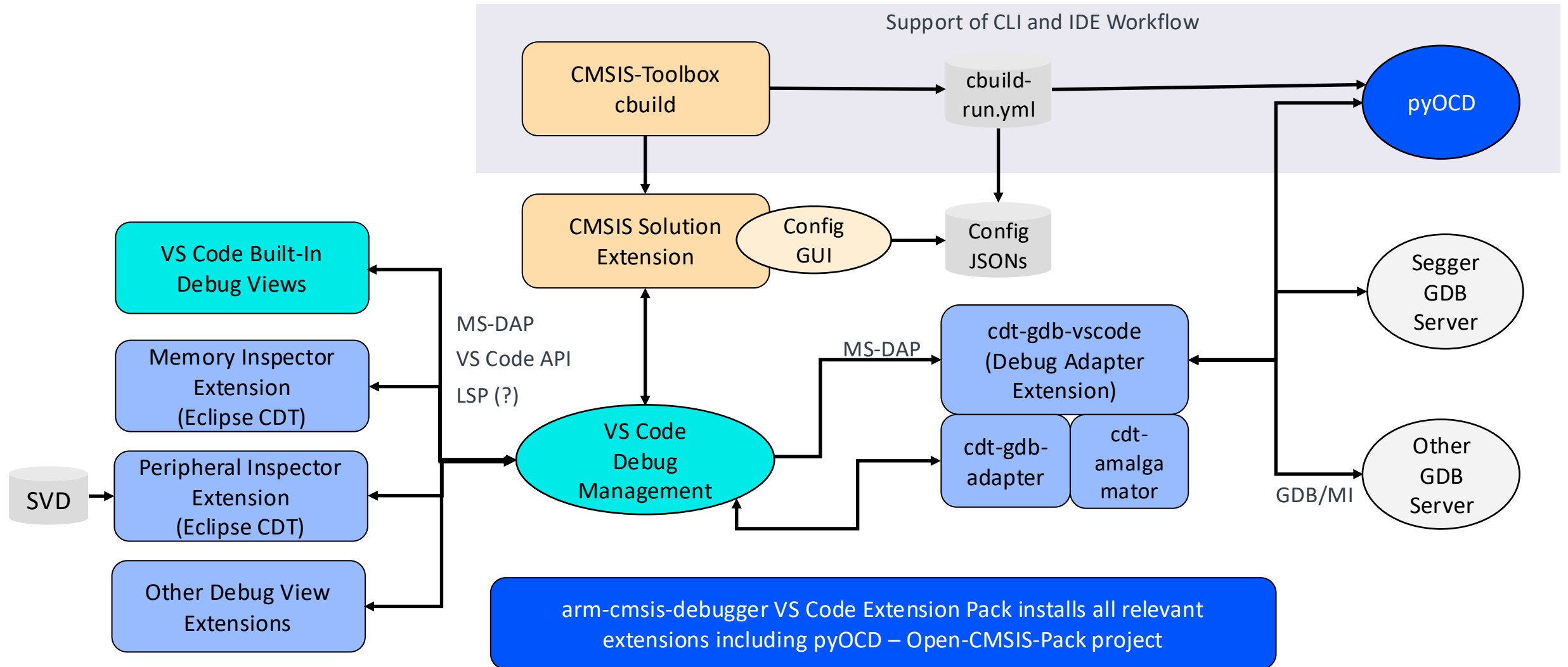


Rating & Review

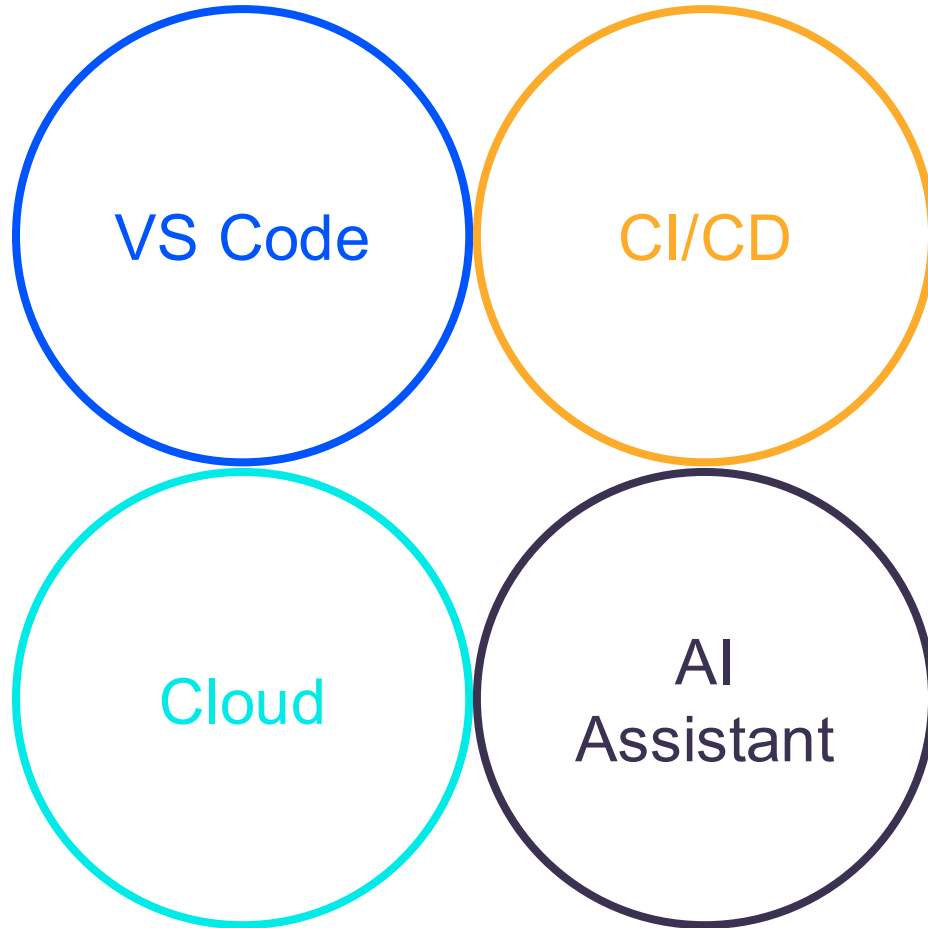
downloads, installs, and manages software development tools. The Arm Tools Environment Manager uses the `vcpkg-configuration.json` manifest file to define the tools needed to set up your development environment. This includes the debugger, simulation models, and utilities) and the different [licensing \(UBL\)](#) license that you must activate with the Arm Tools Environment Manager.

individually or as part of the [Arm Keil® Studio Pack](#).

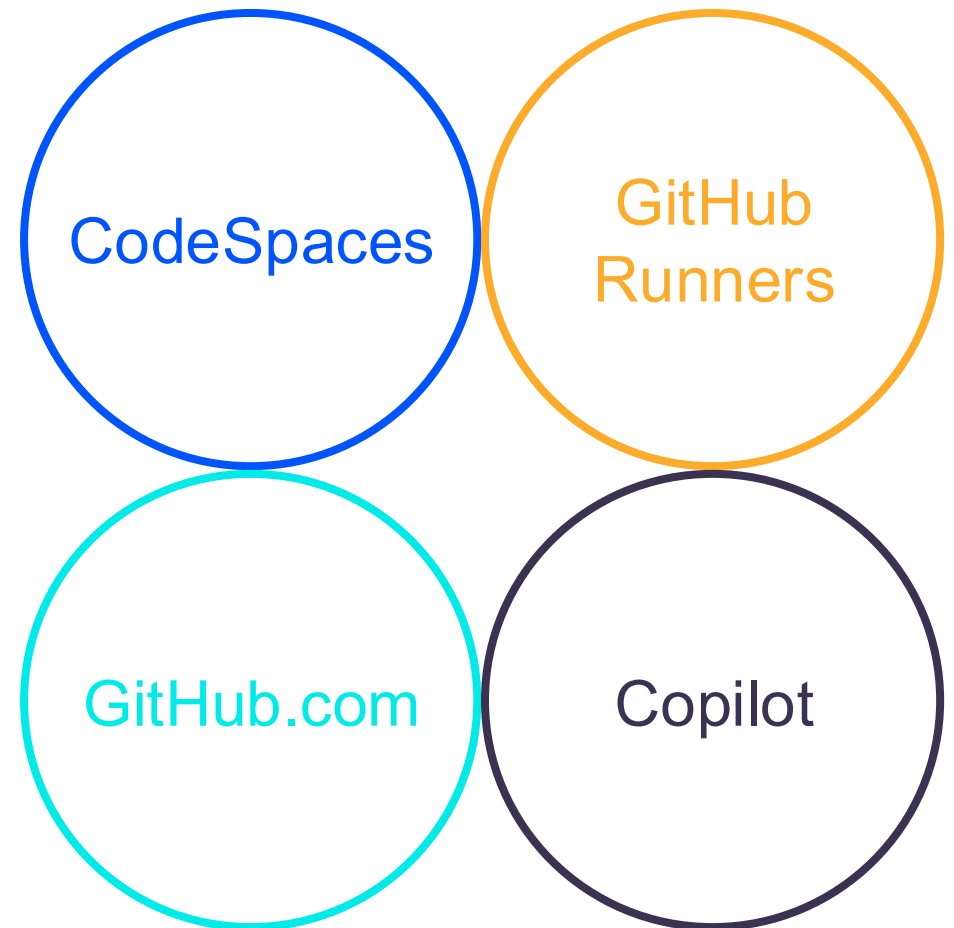
VS Code Extensions and Tools for CMSIS Software Development

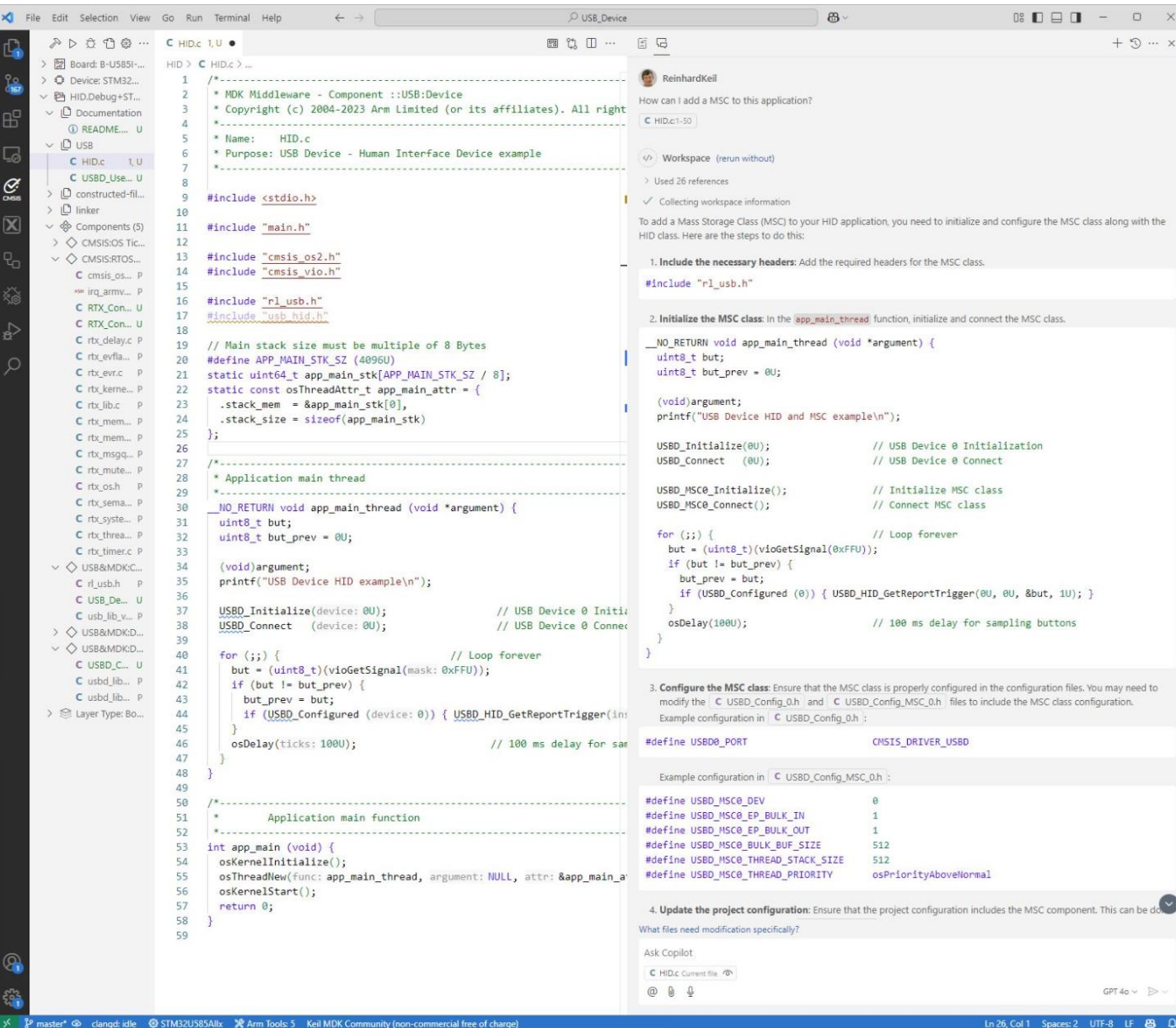


Modernized Workflows



GitHub Collaboration





Reinhard Keil · 1st
Senior Director of Embedded Technology a...
2W ·



Does [GitHub #Copilot](#) help [#embedded](#) programmers?

Recently, I experimented with Copilot in [#VSCode](#). As Copilot is trained using [#CMSIS](#) and [#MDK-Middleware](#), I expected that this is useful. But the result exceeded my expectations.

I started from an USB HID Device example provided with MDK Middleware and entered the prompt: "How can I add a MSC to this application?" As Copilot understands the CMSIS *csolution project*, the answer was right to the point. It gave me instructions for adding a USB Mass Storage Class with required files, components, and configuration settings. An amazing result. My conclusion: Copilot does not repla ...more

253

13 comments · 9 reposts



Like



Comment



Repost



Send



Add a comment...



arm

GitHub

Clay Nelson, GitHub
March 11th, 2025

Development Flow for Edge AI Devices



Watch the
webinar



Sensor



Audio



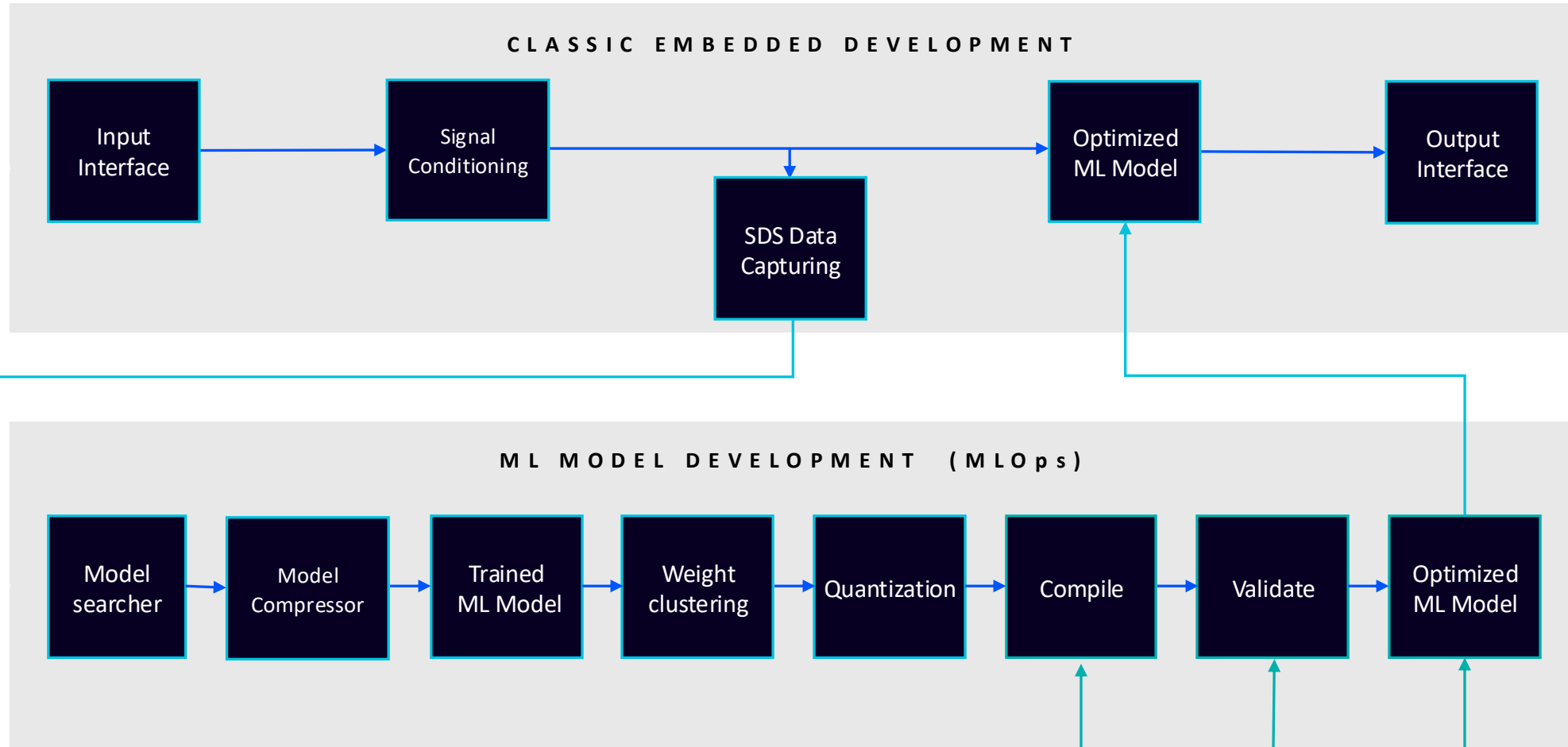
Video



Data



Use-Case



EDGE IMPULSE

docs.edgeimpulse.com/docs/run-inference/arm-keil-cmsis

Arm tools integrate
here

CMSIS Packs in Edge Impulse

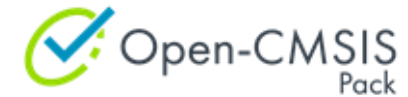
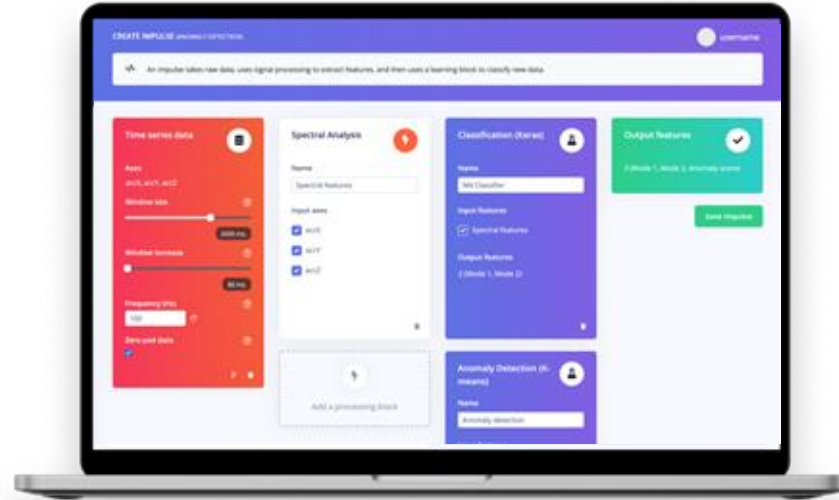
Arjan Kamphuis

Embedded Lead, Edge Impulse



Gartner
COOL
VENDOR
2022

Edge AI with Edge Impulse



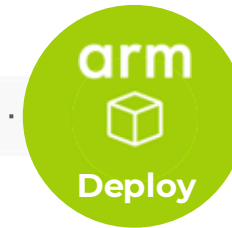
Build a high-quality datasets



Find optimal DSP and model within constraints



Tune model for on-device performance



Configure and package for chosen edge device

CMSIS pack deployment

Library deployment options



Open CMSIS pack

Generates a CMSIS Software Component pack.



Ethos-U55-128 Open CMSIS Pack

A C++ library in Open CMSIS pack format with for devices with an Ethos-U55-128 NPU, High End Embedded with shared SRAM. For example: Alif E7 RTSS-HE.



Alif AI/ML Kit Gen2 HP core

Binaries containing both the Edge Impulse data acquisition client and your full impulse.

Thanks!

HAL 4
Booth #4-505

arjan@edgeimpulse.com



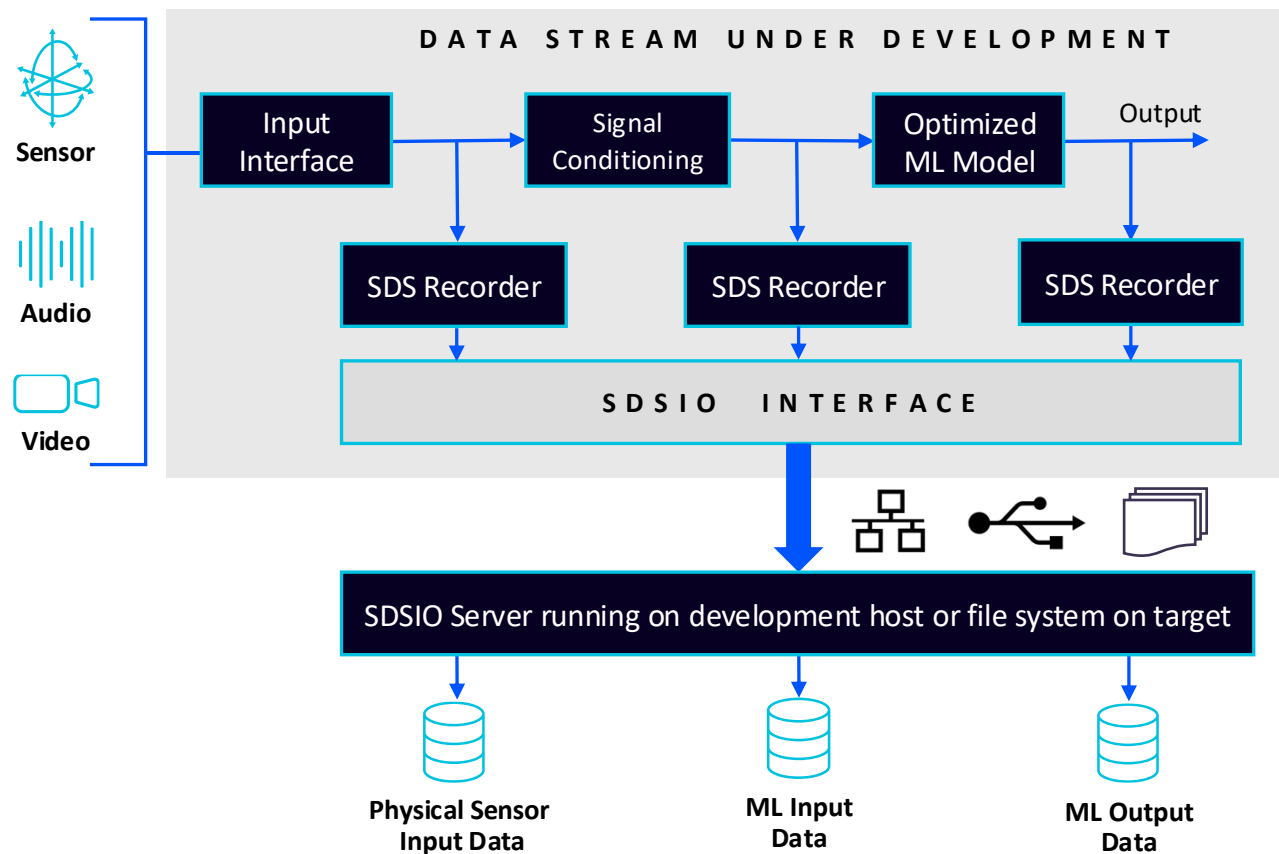
hello@edgeimpulse.com

3031 Tisch Way
110 Plaza West
San Jose, CA 95128
USA

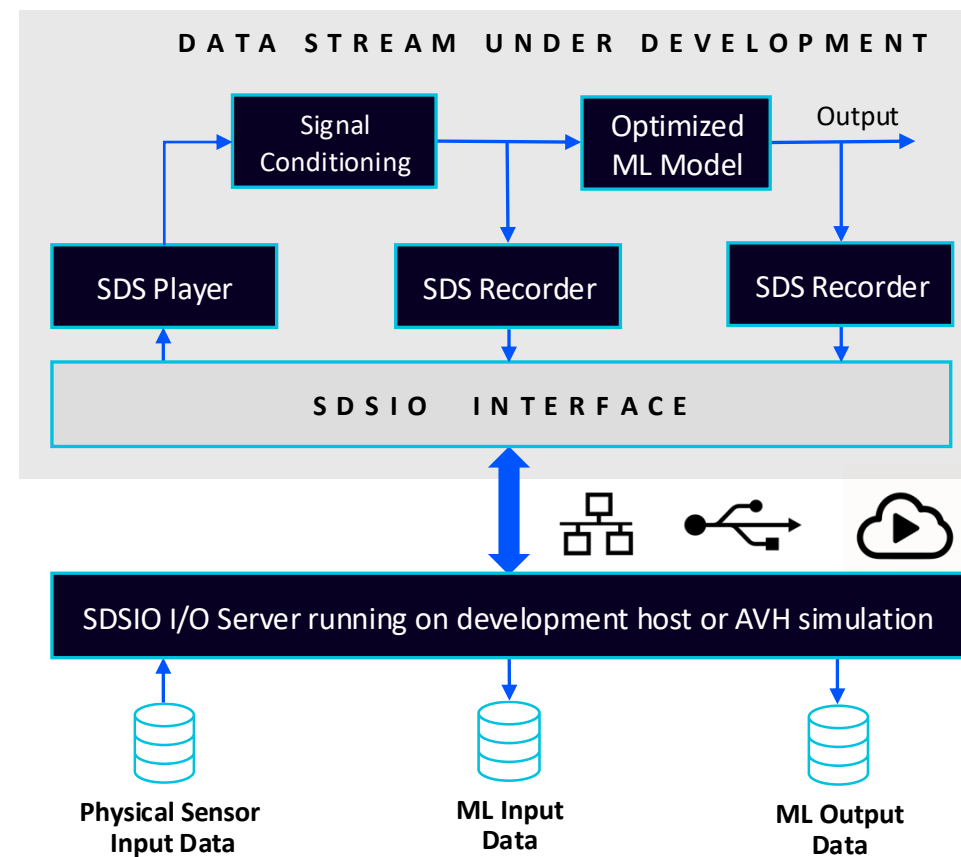
Challenge: Validate and Optimize Algorithms with Real World Data

github.com/ARM-software/SDS-Framework

Capture real-world data streams in hardware

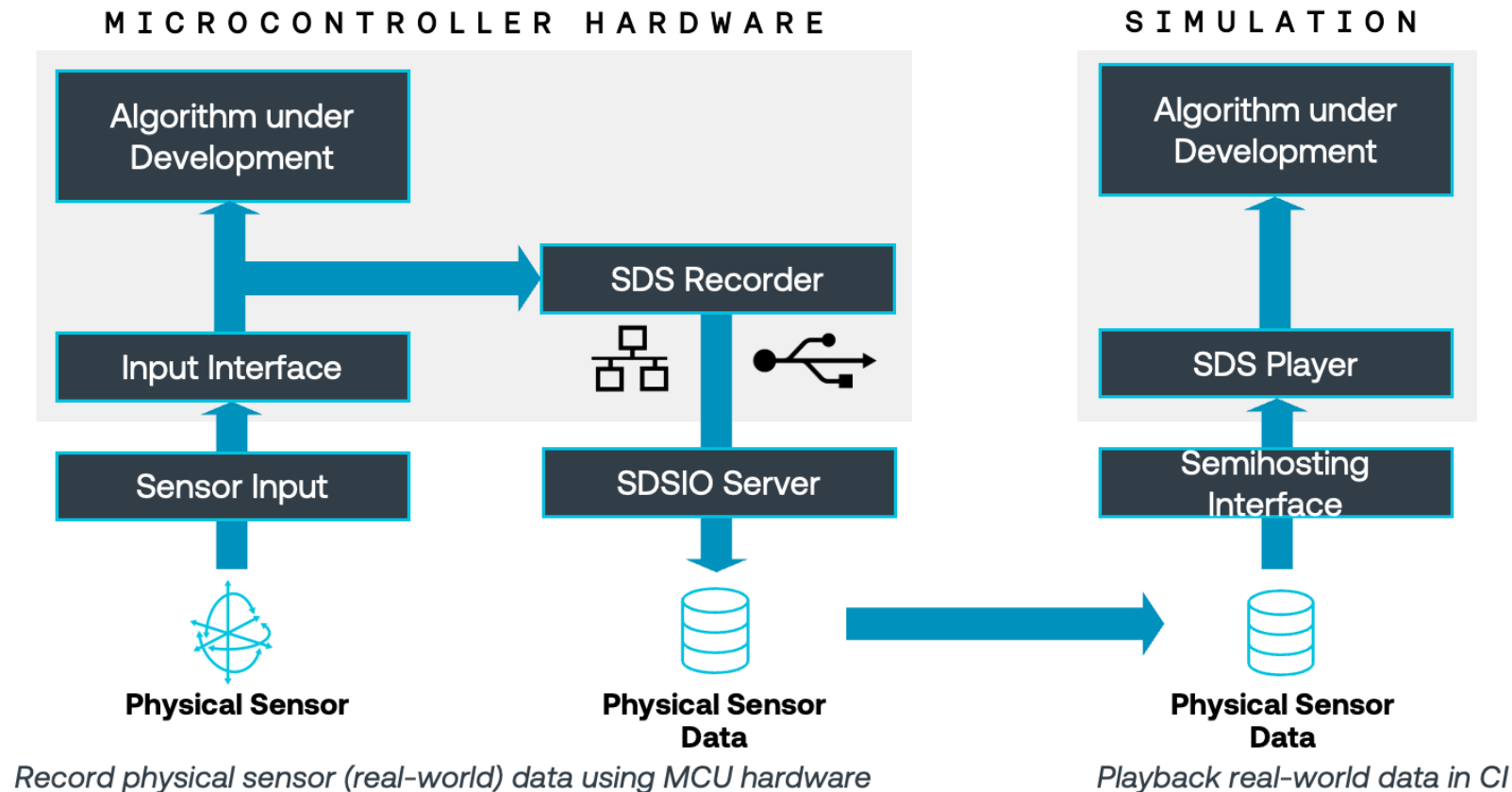


Use same data streams to repeat tests



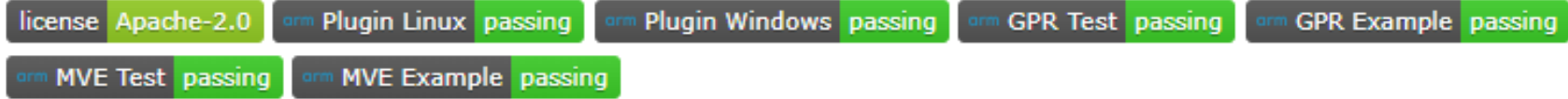
SDS-Framework Usage

- Validate physical input signals from sensors or output of algorithms.
- Input to DSP development tools (such as filter designers) or MLOps systems (for AI model training).
- CI test automation using Arm Virtual Hardware (AVH-FVP).



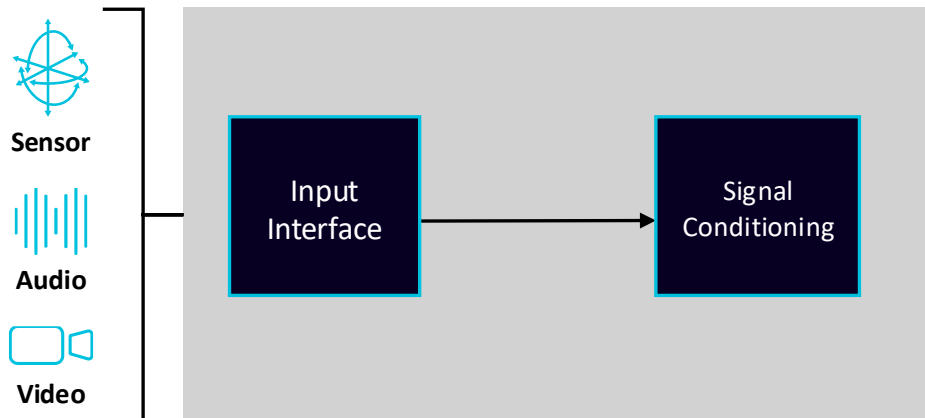
Arm Custom Instructions – Made Easy

github.com/Arm-Software/ACI-GetStarted



Get Started with Arm Custom Instructions (ACI)

[Arm Custom Instructions \(ACI\)](#) extend Arm processors with application-specific instructions to optimize the performance of algorithms. ACI is currently implemented on Cortex-M33, Cortex-M52, Cortex-M55, and Cortex-M85 processors using the **Custom Datapath Extension (CDE)**. It extends the processor with a custom compute pipeline for accelerators that avoids the overhead of the co-processor interface.



- Example use cases:
- Sine and cosine trigonometric functions
- Image pixel manipulations
- CRC
- ...

Please fill in

2025 Edge AI Developer Survey



This survey is prepared by

arm

With generous support from our partners



PyTorch



Raspberry Pi



EDGE IMPULSE



arm

Demo

Joachim Krech
March 11th, 2025

arm

Merci

Danke

Gracias

Grazie

谢谢

ありがとう

Asante

Thank You

감사합니다

धन्यवाद

Kiitos

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