HIGHTEC

RISC-V Solutions for Automotive

For RISC-V Summit China – 18th July

HIGHTEC

Makes innovative open-source technology automotive grade for silicon vendors

Qualified tools for **C/C++** and **Rust**

Strong Support on **China Market**

Global Presence

30 years of leading innovation in open-source automotive-grade solutions

Multi-Architecture Compiler

Automotive Grade Compilers

ISO 26262 ASIL D Qualification

HIGHTEC

Long Term Support

40 Years of Safety Expertise

32-bit Compiler

Infineon

TC4x
TC3x
TC2x

arm

STMicroelectronics

Stellar

Texas Instruments

RENESAS

NXP

Z E
G K
R S

RISC-V

RENESAS

TriCore | HSM

Cortex Ax | Cortex Mx | Cortex Rx | PowerPC

64-bit Compiler

arm

RISC-V

HPC

android

Co-Processors

PPU | GTM/MCS | SCR | ...

Automotive Grade Toolchain

RISC-V

HIGHTEC

HighTec Commitment to LLVM Tools

HIGHTEC

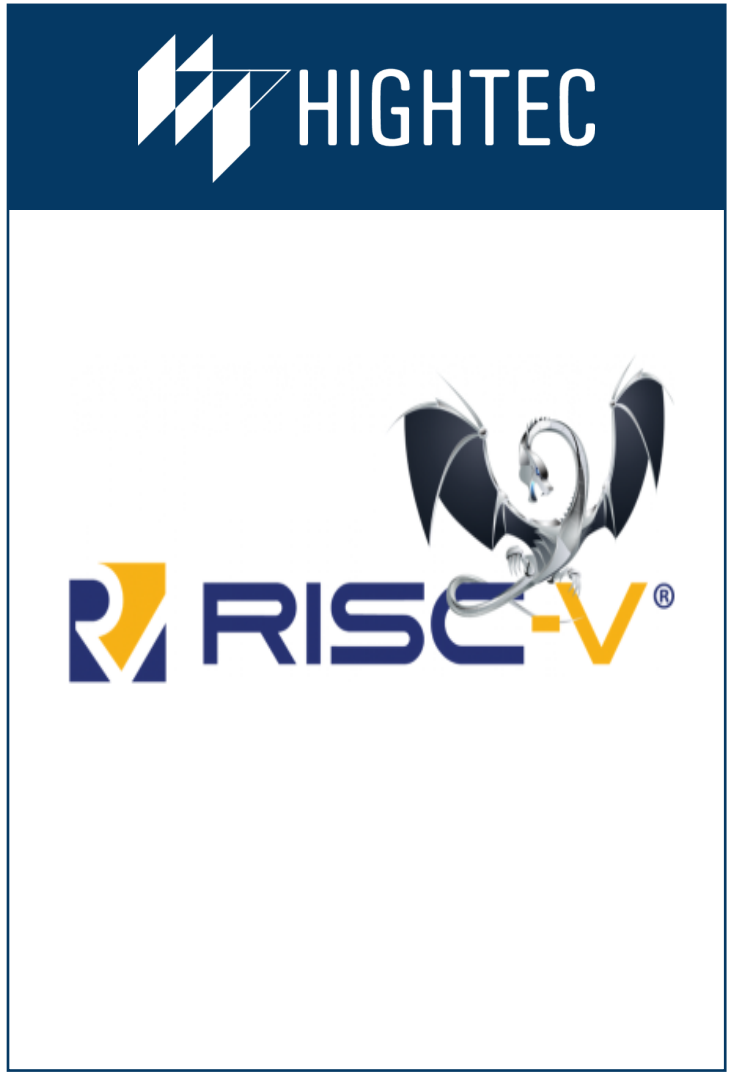
ISO 26262 ASIL D

C
C++

Automotive Grade Solution, Services and Support

Close Collaboration with IP and Silicon Vendors for optimizations	**Dedicated Development Team focused on** performance, safety, and security	**Enabling MCU Migration & Software Reuse** across different architectures
Seamless Migration to full serviced automotive products	**Frozen Branch & LTS**	**ASIL D Qualification** & Automotive-Grade Services

Commitment on RISC-V LLVM Tools

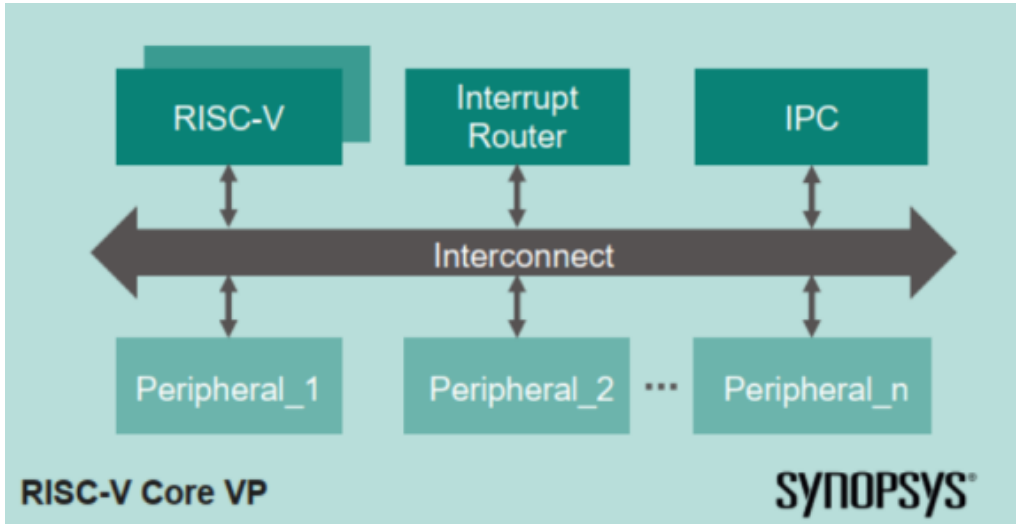


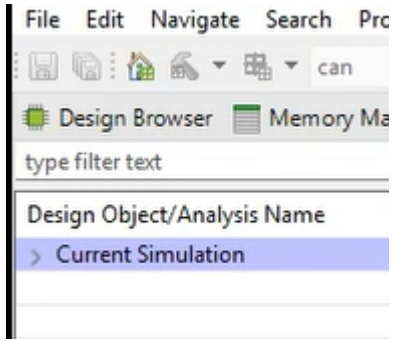
- **Dedicated development team**
  - Performance
  - Safety
  - Security
- **Collaboration with IP vendors and silicon partners:**
  - Dedicated optimizations
- **Seamless migration from free community solutions to a full serviced automotive product**
  - ASIL D qualified
  - Enabling MCU migration
  - Automotive grade services
  - Bases to re-use SW across architectures

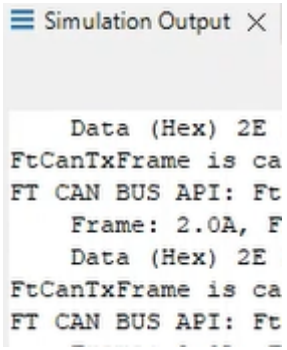
Extensions Supported (RISC-V ISA)

Feature Group	Extensions
Base ISA	I (RV32I, RV64I), E (RV32E)
Integer & Float	M (Multiply/Divide), A (Atomics), F (Single-FP), D (Double-FP), Q (Quad-FP)
Compressed	C (Compressed 16-bit ISA)
Shorthand	G
System-Level	Zicsr (CSR ops), Zifencei (Fence), Ztso (TSO model)
Bit Manipulation	B (includes sub-extensions Zba, Zbb, Zbc, Zbs, etc.)
Vector	V
Hypervisor	H
Half-Precision & Integer-FP	Zfh, Zfhmin, Zfinx
Crypto	Zk (sub-extensions like Zkne, Zknd, Zksed, etc.)

Automotive RISC-V Virtual Prototype

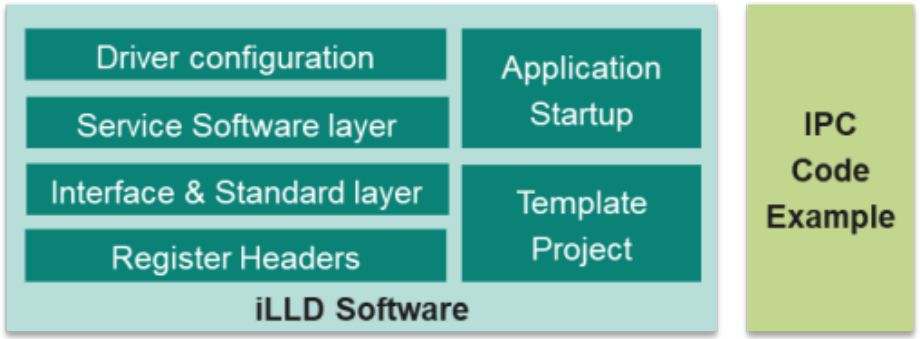






- **Virtual Prototype represents a multi core automotive Core System**
  - RISC-V cores
  - Peripheral set derived from AURIX
- **Virtual Prototype is integrated in Synopsys Virtualizer SDK**
  - Simulation control
  - Flexible signal capture and stimulation
  - Connecting of stand tools like debuggers, CANoe,..

Automotive RISC-V Virtual Prototype

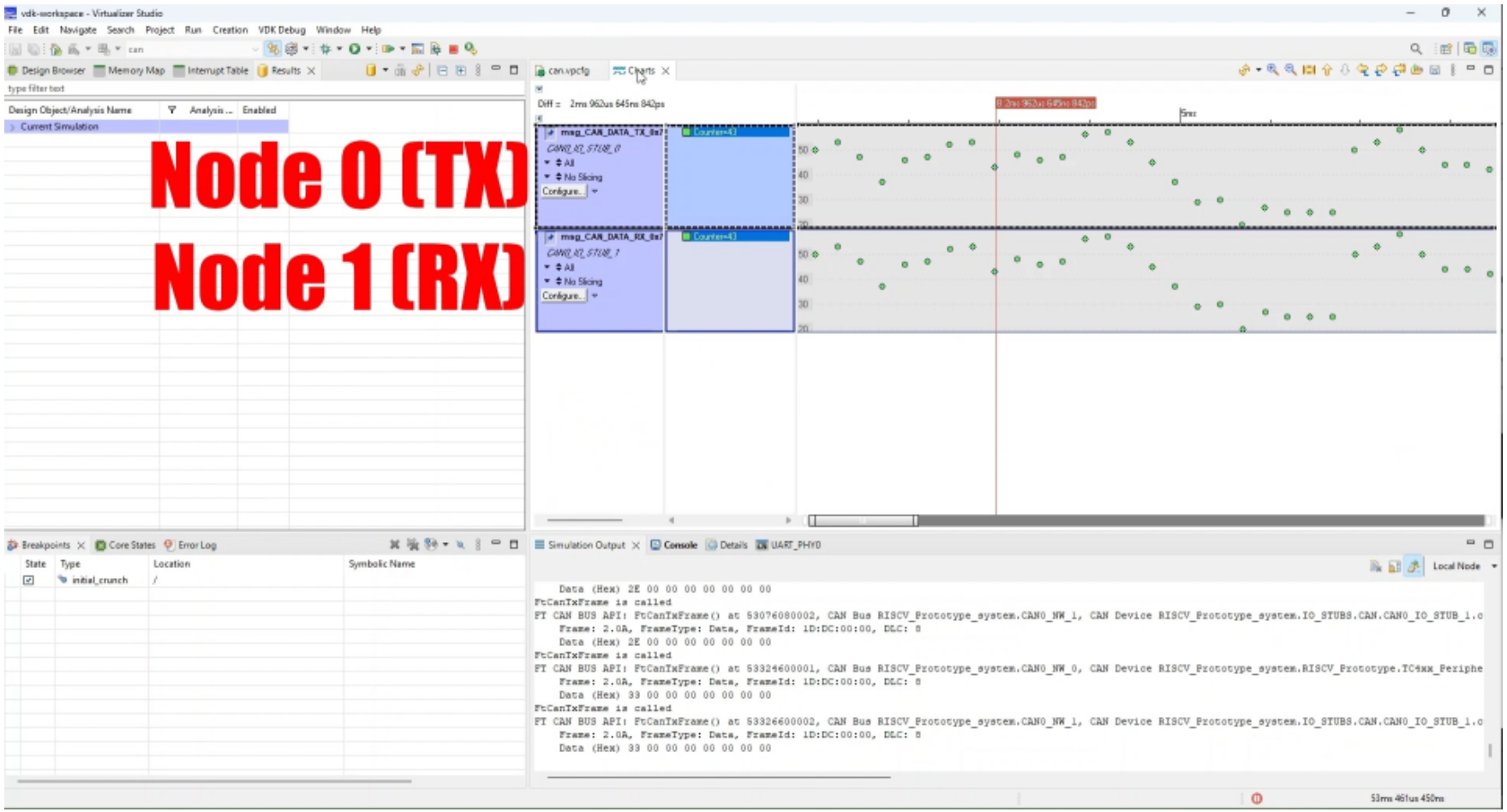


Demo Example

Virtual external signal connection supported by Virtualizer

- **Set of SW drivers**
  - Enables first experiments and evaluation
- **Explorations and evaluations**
  - Code size evaluations
  - SW migration
  - Functional tests

RISC-V VDK Demo



Automotive RISC-V Virtual Prototype

HighTec is preparing a complete bundle to start with

RISC-VP Bundle

- RISC-V virtual prototype
- Synopsys Virtualizer
- HighTec Compiler Tools
- Examples and drivers
- Getting Started
- Tech support

- **Pre-Silicon Enablement**
  - Evaluation and explorations
  - Benchmarking
  - SW development
- **Providing cutting edge improvement**

Automotive RISC-V Virtual Prototype

Base for digital twins and post silicon use case

- **Digital twins requires use of Virtual prototypes**
- **Post silicon use case can foster efficient SW development**
  - Full automated integration and regression tests
  - Safety verifications based on fault injections
  - Analysis of hidden signals

Active Members and Contributors

HighTec – Member of LLVM Security Group

HighTec – Member of Rust Safety Working Group

HighTec – RISC-V (Strategic Member)

HighTec Contribution to the Community

HIGHTEC

- **70 accepted LLVM patches** (6 currently on going)
  - **Target independent** optimization
  - Fixes for Bugs (e.g. found by **Fuzz Testing**)
- **Main Phases:**
  - Patch development and internal review
  - Contribution submission and community review
  - Integration and post-integration support

ISO 26262 Tool Qualification Pedigree

HIGHTEC

TÜV SÜD ISO 26262 IEC 61508

Over 13 years of ISO 26262 qualification expertise for ASIL D automotive applications

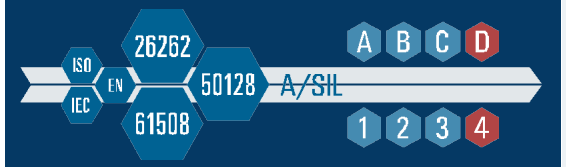
First company to achieve ISO 26262 ASIL D qualification for both GCC and LLVM toolchains

Pioneering the first ISO 26262 ASIL D certified Rust compiler

Developed an intuitive and efficient ISO 26262 qualification path for customers

HighTec – Safety Certificates

Addressing the increased demand for safety applications



- Software
- C-Library
- ISO 26262:2018

- Software
- Operating System
- ISO 26262 (ASIL D)
- IEC 61508 (SIL3)

- Functional Safety
- ISO 26262 (ASIL D)
- IEC 61508

- Functional Safety
- ISO 26262 (ASIL D)

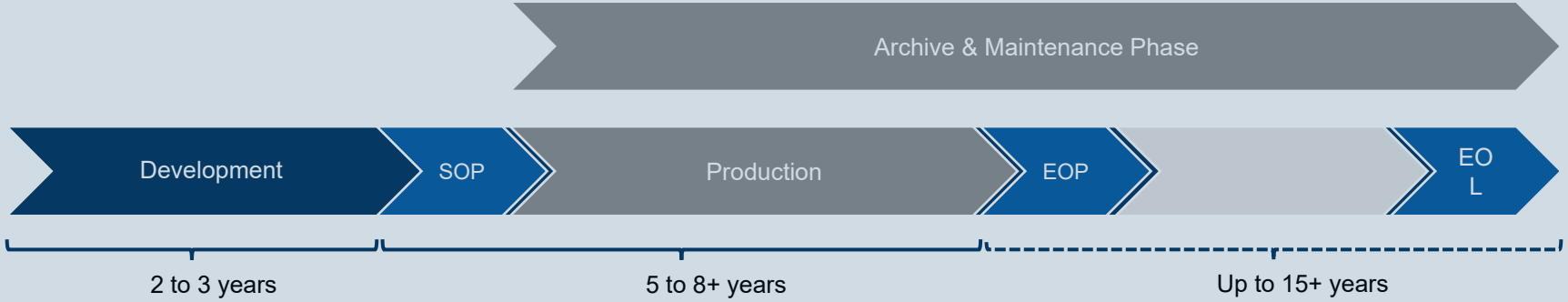
- ISO/IEC 27001
- Security

- ISO 9001

- Software
- Rust
- ISO 26262 (ASIL D)

Automotive – Product Life Cycle Support

Typical automotive life cycle



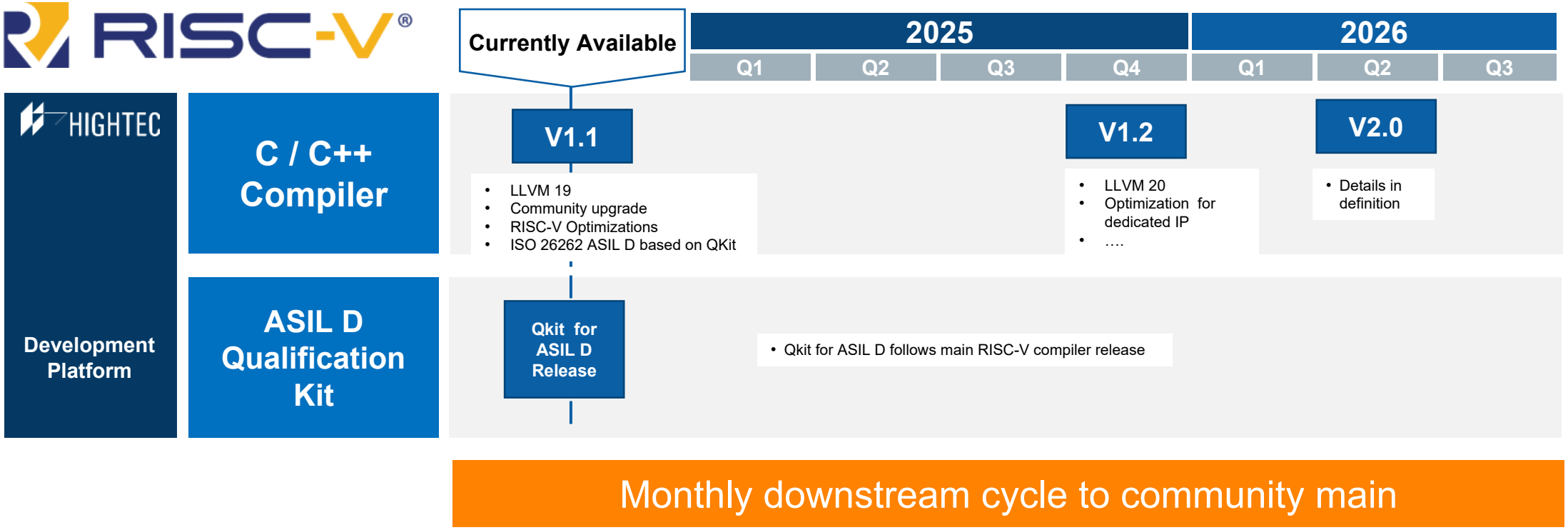
HighTec covers the complete automotive life cycle

HIGHTEC

C
C++

- Development : Automotive Grade Compilers for C/C++ and Rust
- Safety: ISO 26262 ASILD Qualification/ Certification
- Until End of Life: Long Term Support

RISC-V C/C++ Compiler Roadmap



RISC V Rust Compiler considered for Q4 2025

Ecosystem Building

Support Automotive IP and MCU Vendor

IP Vendor

SYNOPSYS®

芯来科技 NUCLEI

ANDES™

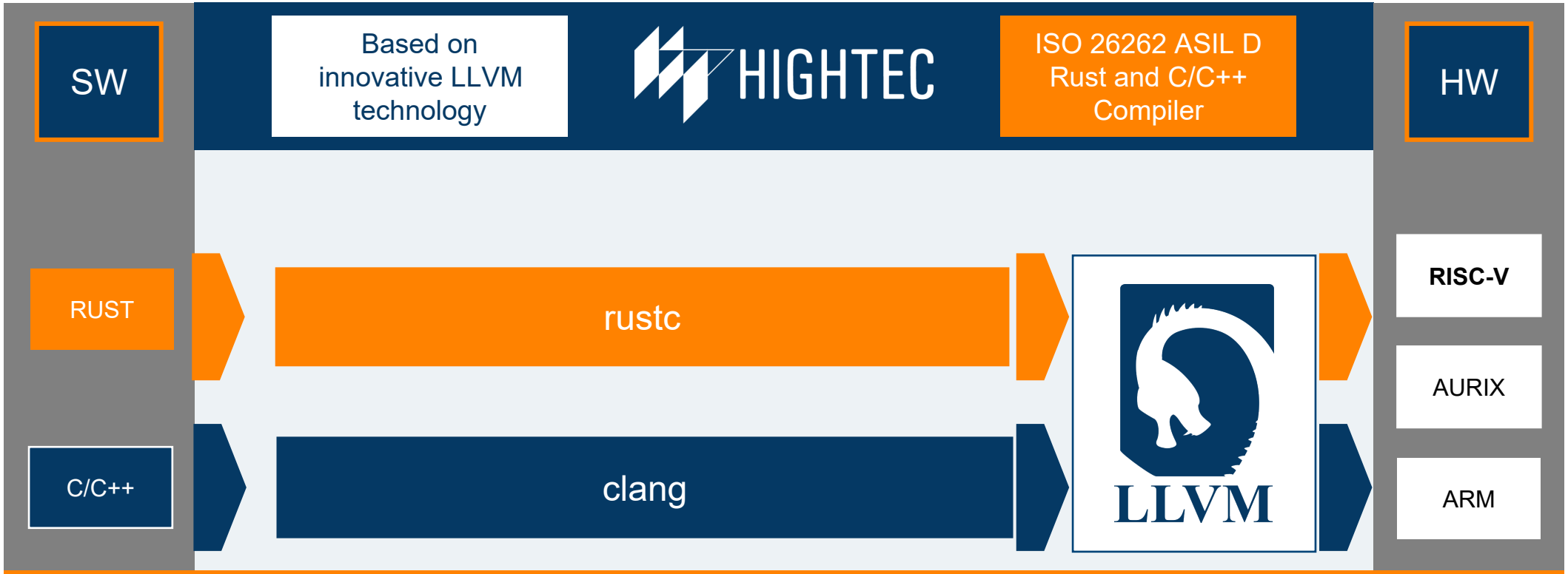
MCU Vendor

Infineon

SILERGY

HighTec – Rust and C/C++ Compiler

Interoperability



USP: HighTec provides the automotive grade compiler for hybrid Rust and C/C++ development