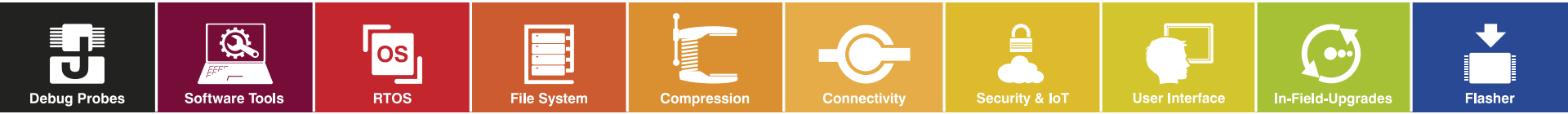
SEGGER开发工具助力完善RISC-V MCU生态系统

RISC-V® Summit China 2023

SEGGER



盛磊

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Embedded Experts — SEGGER嵌入式软件与工具产品线

RISC-V® arm

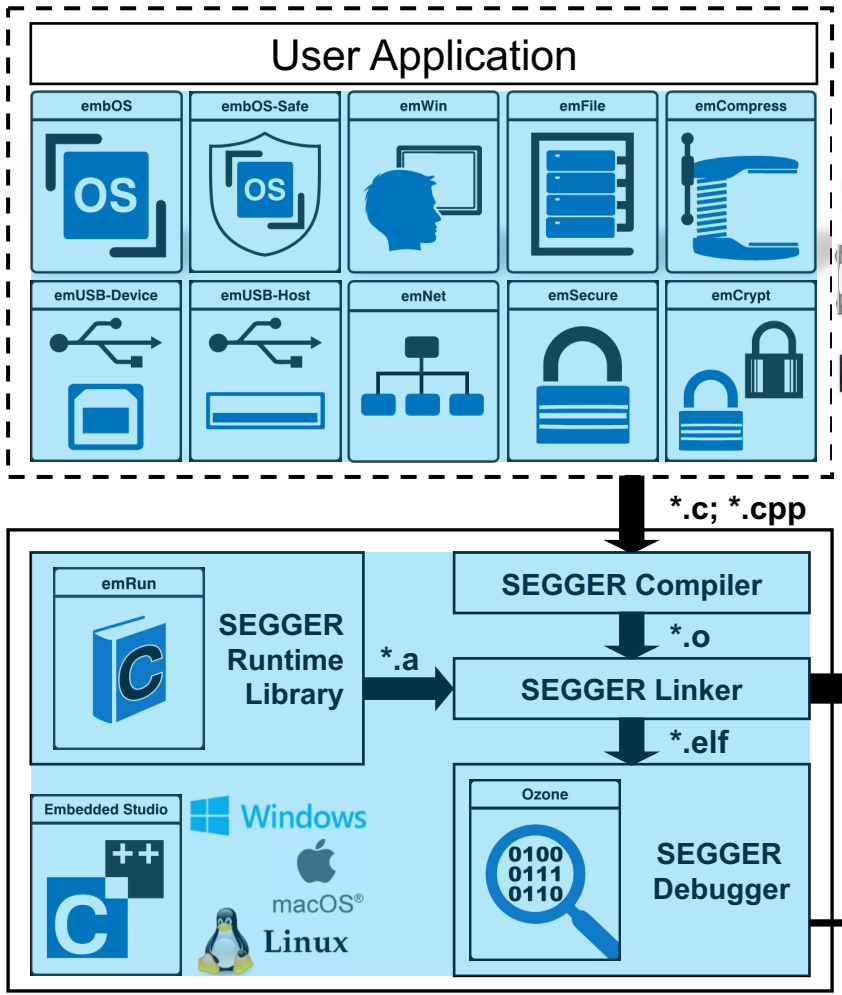
SEGGER

The Embedded Experts

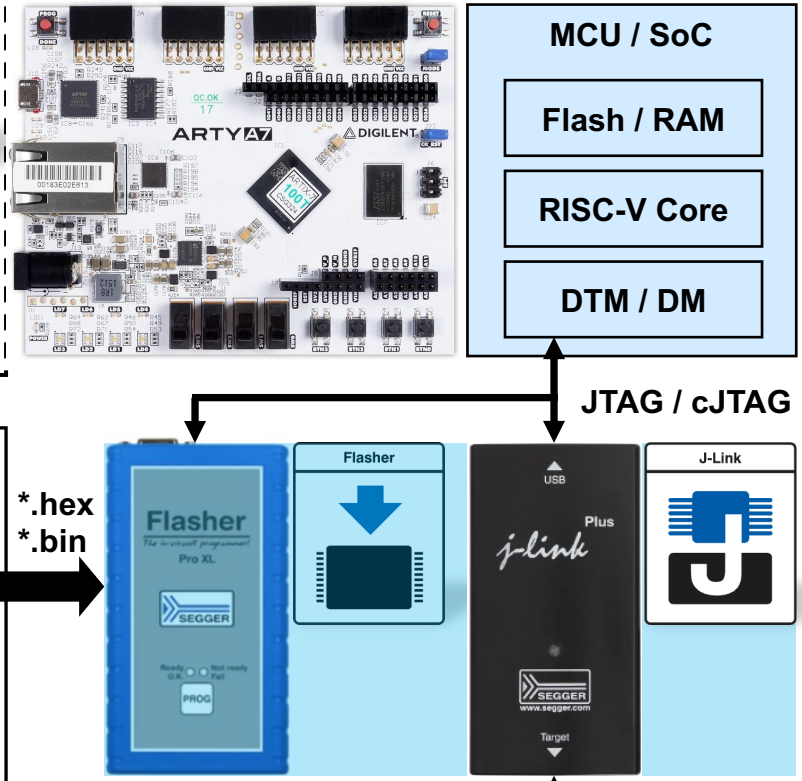
从研发到量产：SEGGER一站式RISC-V软件与工具解决方案

RTOS和
嵌入式软件

嵌入式软件
开发工具



目标硬件系统



调试和烧录工具

面对快速发展的RISC-V芯片市场，软件开发者需要怎样的工具？

专业IDE + 调试下载工具、芯片支持、编译效率、技术支持、灵活授权

	Ideal Tools	Tricky Tools
易用性	开箱即用，用户可专注于自身应用程序的开发，不必在准备工作上花费过多时间。	自行编写和修改各种脚本与配置文件来建立开发环境，精力消耗在不创造价值的环节。
完整性	覆盖从研发到量产的完整流程，工具链的适配和整合已经完成，没有兼容性问题。	从多个vendor处获取并整合各种功能的软件与工具，适配度没有保证，存在兼容性问题。
开发环境	专业的图形化IDE，功能完备、界面简洁、用户友好。	复杂的命令行环境，或是体积庞大、运行缓慢、界面复杂的Eclipse IDE。
芯片支持	除了内核（指令集）之外，还包含芯片级支持，如SFR、存储空间、Linker文件、Flash下载等。	只提供对内核（指令集）的支持，用户需要自行配置和扩展对芯片级资源的支持。
编译效率	商业级的编译器、链接器和运行时库，显著缩小代码尺寸，提升程序性能。	基于开源GCC/LLVM编译工具，优化程度不理想，在RISC-V架构上的代码尺寸尤为不理想。
下载与调试	专业调试工具，支持高速下载和Flash烧录，调试功能丰富，如Trace、Profiling、Coverage等。	基于类似UART接口和GDB协议的简易调试器，下载速度缓慢，只支持基本调试功能，往往需要配合第三方Flash烧录工具。
升级与服务	定期版本更新，专业技术支持团队，响应时间有保证。	通过论坛、社区等渠道获取支持，版本更新和响应时间无保证。
授权模式	授权模式灵活，支持企业授权和第三方Buyout授权，有效降低最终用户的使用成本。	固定按照使用者人数授权，通过加密狗和License管理机制进行限制，使用成本不易控制。

RISC-V MCU用户遇到的常见问题 — 从工具的角度

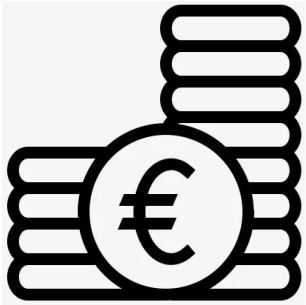
SEGGER助力芯片企业，共建RISC-V生态系统，解决用户痛点

新的MCU层出不穷，现有的开发工具来不及支持，各种连接和下载问题……

****** Error: Timeout while waiting for core to halt after reset
Specific core setup failed.
Cannot connect to target.

免费工具倒是容易获得，但是Eclipse IDE又大又慢，代码效率也不理想。

商业版本工具好是好，只是对于中小企业来说，采购成本是个问题。



Partnership with MCU vendors — 开箱即用的芯片支持

Official RISC-V device support by J-Link & Embedded Studio

J-Link Prime

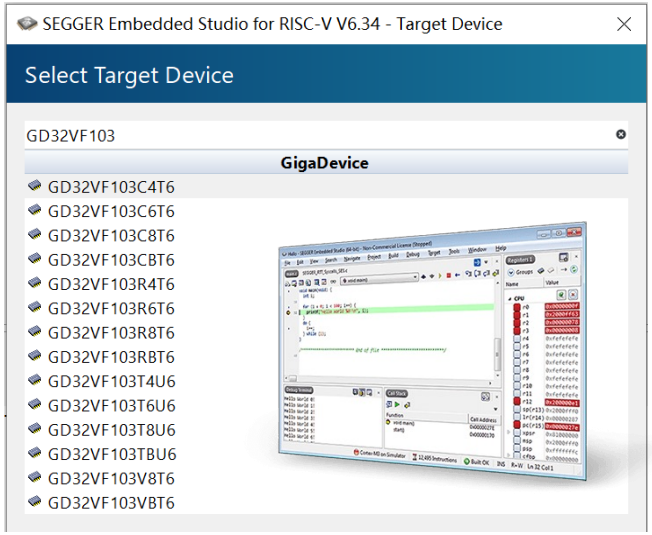
SEGGER J-Link V7.70a - Target device settings

Selected Device: ARM7 | Little Endian | Core #0

Manufacturer	Device	Core	NumCores	Flash Size
	GD32VF103		Filter	Filter
GigaDevice	GD32VF103T4U6	RISC-V	1	16 KB
GigaDevice	GD32VF103T6U6	RISC-V	1	32 KB
GigaDevice	GD32VF103T8U6	RISC-V	1	64 KB
GigaDevice	GD32VF103TBU6	RISC-V	1	128 KB
GigaDevice	GD32VF103C4T6	RISC-V	1	16 KB
GigaDevice	GD32VF103C6T6	RISC-V	1	32 KB
GigaDevice	GD32VF103C8T6	RISC-V	1	64 KB
GigaDevice	GD32VF103CBT6	RISC-V	1	128 KB
GigaDevice	GD32VF103R4T6	RISC-V	1	16 KB
GigaDevice	GD32VF103R6T6	RISC-V	1	32 KB
GigaDevice	GD32VF103R8T6	RISC-V	1	64 KB
GigaDevice	GD32VF103RBT6	RISC-V	1	128 KB
GigaDevice	GD32VF103V8T6	RISC-V	1	64 KB
GigaDevice	GD32VF103VBT6	RISC-V	1	128 KB

- 芯片型号加入J-Link支持列表
- SEGGER官网可见
- JTAG/cJTAG调试
- Flash快速下载
- J-Link Certified Logo

Embedded Studio Prime



- 芯片型号加入Embedded Studio支持列表
- SEGGER官网可见
- CPU support package
  - 启动代码/寄存器文件/链接脚本/…
  - 基础例程

SEGGER J-Link & Flasher — 全面支持RISC-V MCU

Telink GigaDevice AUCU 奥库科技 HPMicro 先楫半导体

Manufacturer	Device	Core	NumCores	Flash Size
AUCU	Filter	RISC-V	Filter	Filter
AUCU	AU301LDF51	RISC-V	1	152 KB + ⋯
AUCU	AU302NDF51	RISC-V	1	152 KB + ⋯
AUCU	AU302PDF51	RISC-V	1	152 KB + ⋯
Telink	TLSR9513C	RISC-V	1	128 MB
Telink	TLSR9513B	RISC-V	1	128 MB
Telink	TLSR9218A	RISC-V	1	128 MB
Telink	TLSR9215A	RISC-V	1	128 MB
Telink	TLSR9213A	RISC-V	1	128 MB
GigaDevice	GD32VF103R4T6	RISC-V	1	16 KB
GigaDevice	GD32VF103R6T6	RISC-V	1	32 KB
GigaDevice	GD32VF103R8T6	RISC-V	1	64 KB
GigaDevice	GD32VF103RBT6	RISC-V	1	128 KB
GigaDevice	GD32VF103V8T6	RISC-V	1	64 KB
GigaDevice	GD32VF103VBT6	RISC-V	1	128 KB
HPMicro	HPM6280xPAx	RISC-V	1	16 MB
HPMicro	HPM6280xPAx_CPU1	RISC-V	1	16 MB
HPMicro	HPM6284xEPx	RISC-V	1	4096 KB
HPMicro	HPM6284xEPx_CPU1	RISC-V	1	4096 KB
HPMicro	HPM6284xPAx	RISC-V	1	4096 KB
HPMicro	HPM6284xPAx_CPU1	RISC-V	1	4096 KB
HPMicro	HPM6320xEPx	RISC-V	1	16 MB
HPMicro	HPM6320xPAx	RISC-V	1	16 MB
HPMicro	HPM6340xEPx	RISC-V	1	16 MB
HPMicro	HPM6340xPAx	RISC-V	1	16 MB

Long-term partnership with silicon vendors

- 最新添加国产RISC-V芯片支持
  - HPMicro
  - GigaDevice
  - AUCU
  - Telink
  - ESWIN

程序调试

代码跟踪

产线编程

便携烧录

J-Link DSK — 自行添加J-Link芯片支持的便捷方案

- J-Link DSK: Device Support Kit
  - SEGGER Flash Loader
  - J-Link script file
  - Optional: Installer for Microsoft Windows
- 允许芯片公司或最终用户，自行开发和分发（非SEGGER官方的）J-Link芯片支持包
- 快速灵活地支持新型号MCU（Arm or RISC-V）
- 充分利用J-Link和Flasher的丰富功能
  - J-Link Commander, J-Flash, Ozone, …
  - 通过J-Link GDB Server实现第三方IDE支持

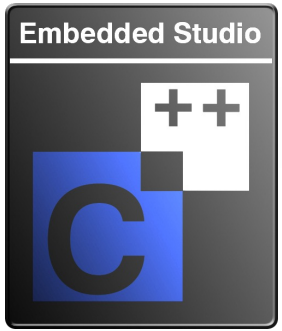
J-Link Device XML File :

```
<Database>
  <Device>
    <ChipInfo Vendor="SEGGER" Name="SEGGER_Device0" Core="JLINK_CORE_CORTEX_M4" JLinkScriptFile="SEGGER/Example.jlinkscript"/>
    <!-- 512 KB internal code flash bank with 1 loader -->
    <FlashBankInfo Name="Internal code flash" BaseAddr="0x08000000" AlwaysPresent="1" >
      <LoaderInfo Name="Default" MaxSize="0x80000" Loader="Flashloader_Device0_InternalCodeFlash.elf" LoaderType="FLASH_ALGO_TYPE_OPEN" />
    </FlashBankInfo>
  </Device>
</Database>
```

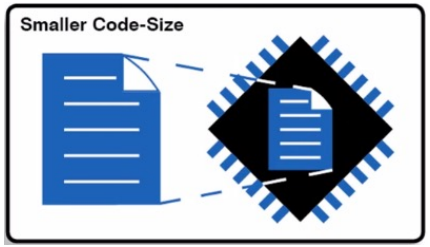
J-Link script file

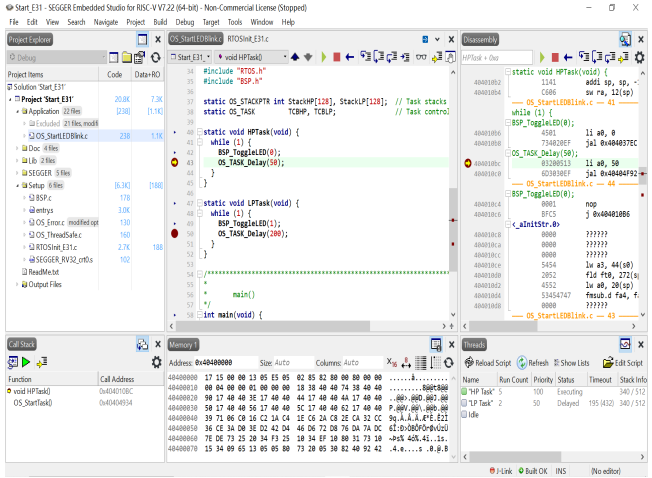
SEGGER Flash Loader

SEGGER嵌入式软件开发工具 — Embedded Studio



C/C++集成编译调试环境



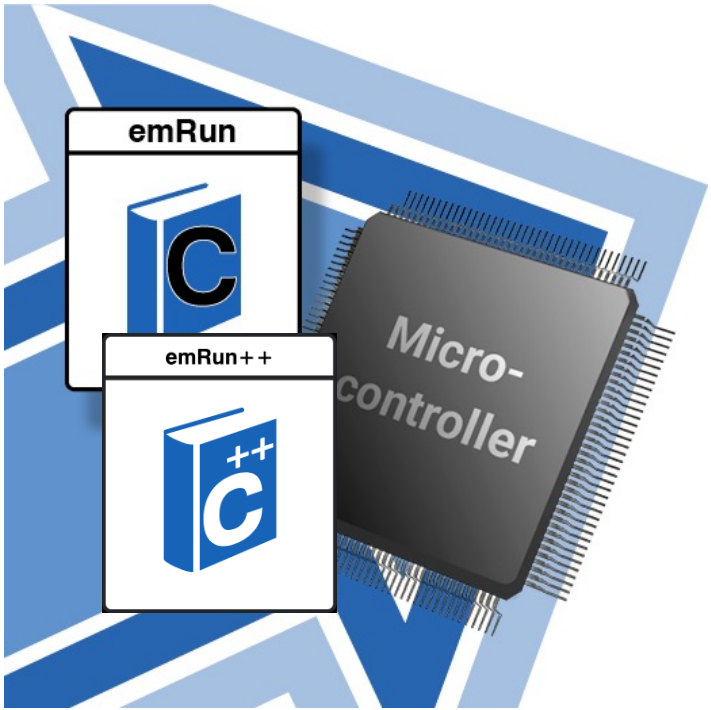


- Professional IDE for Arm & RISC-V targets
- Supports RV32/RV64 and M, A, C, F, D, B, V extensions
- Runs on Windows, macOS or Linux host
- Not Eclipse, very fast and efficient
- Extensive CPU support packages
- GCC & SEGGER optimized C/C++ compiler
- SEGGER Linker can further reduce the code size
- Highly optimized SEGGER C/C++ runtime library
- Seamless J-Link integration in the debugger
- FREE for non-commercial usage, without any limitation

Embedded Studio for RISC-V — SEGGER Runtime Library

emRun / emRun++ 运行时库

- 100% developed by SEGGER to be used with GCC/LLVM based toolchains
- Significant **code size** reduction (comparing with *newlib*, *libstdc++, etc.*)
- **Configurable** for size, speed or balanced
- Available in generic C code for any processor, and hand-coded assembly-optimized variants for 32-bit Arm and **RISC-V** architecture
- Includes the **Floating-Point** Library
  - IEEE-754 compliant
  - Very fast and small
  - Boosts the performance for arithmetic and mathematical functions
- * Available for 3rd-party toolchains (object library redistributable)



Partnership with MCU vendors — 软件开发工具和运行时库

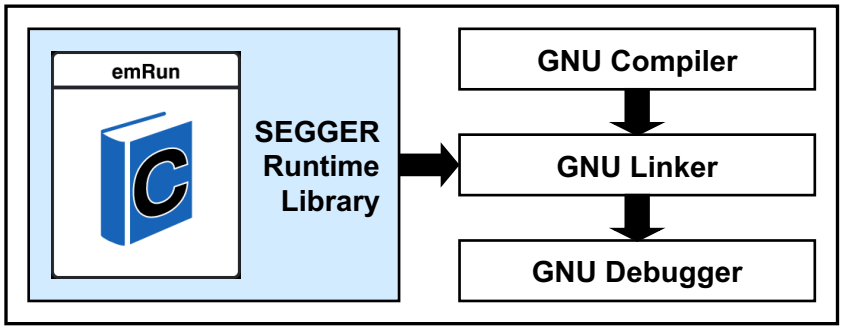
芯片公司自研IDE：SEGGER提供运行时库授权，改善代码体积和性能

芯片公司没有IDE：SEGGER提供开发工具授权，推进使用正版，减少用户开支

emRun / emRun++ Buyout

- Silicon vendor拥有并维护自己的IDE
- SEGGER提供Runtime Library的源代码
- 授权Silicon vendor将二进制库文件集成在自己的IDE中，并分发给最终用户
- 与newlib, libstdc++等开源运行时库相比，可显著缩小大多数应用程序的代码尺寸
- 显著提升浮点运算性能

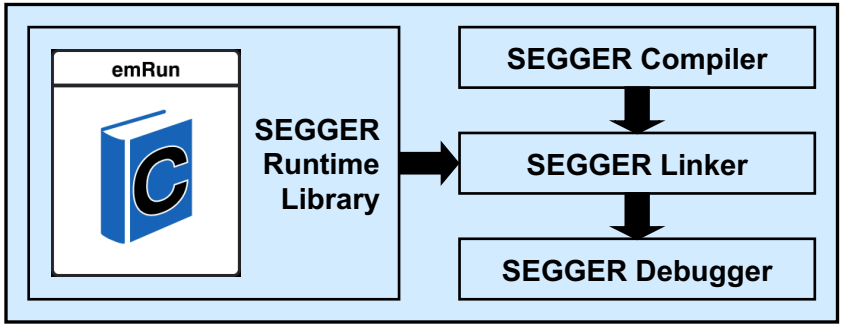
Silicon vendor's IDE



Embedded Studio Buyout

- Silicon vendor免于开发和维护IDE
- 针对特定范围的MCU，Silicon vendor买断Embedded Studio的使用权
- 上述MCU的所有最终用户都可**免费**使用Embedded Studio，包含商业用途
- 上述MCU需要被J-Link所正式支持

SEGGER Embedded Studio



SEGGER软件开发工具和运行时库合作伙伴（RISC-V industry）

SiFive

SEGGER licenses C++ runtime library to SiFive for code size and performance efficiency

SEGGER, a leading supplier of **RTOS and software libraries, debug and trace probes, in-system flash programmers**, and **software development tools**, is proud to announce that SiFive, Inc., the founder and leader of RISC-V computing, has licensed SEGGER's cutting-edge **emRun++** C++ library for RISC-V.

emRun++ is a complete C++ standard library specifically designed and optimized for GCC/LLVM-based toolchains and embedded systems. It is based on SEGGER's efficient **emRun** and **emFloat** runtime and floating-point libraries.

"After licensing and integrating SEGGEI
Freedom Tools packages in 2021, and e
open-source alternatives, the next step
emRun++ once it became available for I
SiFive. "As a modern programming lang
offering developers more and more opti
to our customers. emRun++ is perfectly

Nuclei
芯来科技

Nuclei Studio IDE now with SEGGER's emRun runtime library for RISC-V

SEGGER and Nuclei System Technology, a China-based RISC-V processor IP and solution company, announce that the Nuclei Studio IDE now comes integrated with SEGGER's emRun runtime library. As a result of this cooperation, executables produced by the Nuclei toolchain using emRun are both smaller and faster.

emRun is a complete C runtime library for use with any toolchain. Written from the ground up specifically for embedded devices, it is designed to provide high chip performance with the smallest possible memory footprint. In many cases, the reduced code size makes it possible to use smaller microcontrollers and less on-chip memory, which can lead to significant cost savings.

Included in emRun is **emFloat**, a complete, fully optimized and verified floating-point library for embedded systems. emFloat's arithmetic routines are hand-coded in assembly language and optimized for small code size and high execution speed.

Haawking
中科昊芯

Haawking licenses SEGGER's emRun for RISC-V

SEGGER Microcontroller announces that Beijing Haawking Technology, a specialist provider of RISC-V-based DSPs, has licensed SEGGER's emRun for RISC-V Runtime Library for distribution with its compiler tools for HX2000 series chips.

emRun is a complete C runtime library for use with any toolchain. Written from the ground up specifically for embedded devices, emRun is designed to provide high chip performance with the smallest possible footprint. emRun for RISC-V is assembly optimized for RISC-V, resulting in unrivaled performance and code size on RISC-V devices.

In many cases, the reduced code size makes it possible to use smaller microcor
This can result in significant cost savings, especially for devices built in large qu
increase in performance leads to better products with faster reaction times and l

emRun's value and performance has been widely proven as part of SEGGER's
also be used to easily evaluate emRun.

HPMicro
先楫半导体

SEGGER collaborates with HPMicro making Embedded Studio for RISC-V available at no cost

SEGGER today announces its partnership with HPMicro Semiconductor Inc. (HPMicro), a leading supplier of high-performance MCUs and embedded solutions. The partnership focuses on making SEGGER's top-rated, multi-platform IDE Embedded Studio available, free of charge, to all HPMicro's customers using HPM6000 series RISC-V microcontrollers, boosting the RISC-V ecosystem.

Embedded Studio includes all the tools and features expected for streamlined, professional embedded development in C and C++. It comes with a powerful project manager and build system, a source code editor with code completion and folding, and a package system to install board and device support. It also includes SEGGER's highly optimized **emRun** runtime and **emFloat** floating point libraries, as well as SEGGER's smart linker, all of which have been developed from the ground up specifically for resource-constrained embedded systems. The built-in debugger leaves nothing to be desired. Fully integrated with **J-Link**, it delivers great performance and stability.

"I am extremely happy to see that our customers can develop their solutions with HPMicro MCUs using SEGGER's professional IDE at no cost. Our goal is to provide the best possible development solution for our RISC-V devices. Following an in-depth analysis of the market, we found that SEGGER's Embedded Studio delivers the best results in terms of firmware size, performance and user experience," says Jintao Zeng, CEO at HPMicro. "The collaboration with Segger will definitely help HPMicro grow our customer base."

Why SEGGER ?

RISC-V arm

+ 三十多年的嵌入式行业经验
+ 为用户提供一站式嵌入式软件与工具解决方案
+ 所有产品均为SEGGER自研，并经过市场和用户的充分检验
+ 支持Arm、RISC-V等多种主流CPU体系架构
+ 800,000+ J-Link出货量
+ 软件产品无版税，授权模式灵活，免费评估试用
+ 专为资源受限的嵌入式系统设计，高性能+低存储器占用
+ 作为完全独立的供应商，不受第三方制约，不使用美国技术
+ 与芯片厂商和合作伙伴携手发展，共建RISC-V生态系统

+ It simply works !