

开源开放的RISC-V嵌入式软件平台探索

Opensource RISC-V embedded Software Platform Exploration

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芯来科技 2020.09

主要内容

- RISC-V软件生态
- NMSIS开源软件基础平台
- Nuclei SDK软件开发平台
- Nuclei RISC-V开源社区



RISC-V Open Instruction Set Architecture

RISC-V 开放指令集架构

RISC-V顺势而生，其架构具备**开放性**，**先进性**，**简洁性**，**模块化**，**扩展性**五大特点，完美契合特定领域的架构(DSA)设计对开放性和灵活性的要求。



开放性

指令集架构首次成为国际标准，任何人、组织、公司均可自由用于商业或非商业用途



先进性

架构设计上总结了历史上诸多处理器架构取其精华



简洁性

32或64位基础指令不超过60条，加上扩展指令只有一百多条



模块化

可根据不同需求配置不同的产品使产品更具差异化特色



扩展性

用户可根据产品特性扩展自定义指令增加产品差异化和竞争力

RISC-V Open Instruction Set Architecture

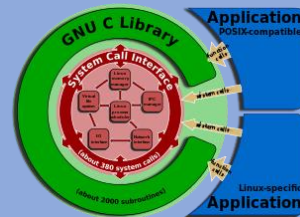
RISC-V 开放指令集架构



生态成长迅速，基金会自2015年成立不到**5年时间**已经有超过**435**家分布于**33**个国家的会员单位，包括西数，三星，Microchip, NXP, Google等国际大厂

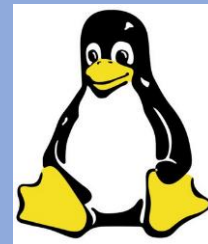
RISC-V软件生态现状

- RISC-V指令集架构成熟稳定，硬件生态蓬勃发展
 - 各种开源的RISC-V处理器实现层出不穷，Rocket Chip、蜂鸟E203等
 - 各类商业处理器例如芯来科技、平头哥、SiFive等大厂逐步推出各种RISC-V处理器IP
- RISC-V基础开发工具日趋完善
 - 开源工具链(GNU/LLVM)
 - 开源集成开发环境GNU MCU Eclipse
 - 开源RISC-V处理器仿真器QEMU，SPIKE
 - 开源调试器OpenOCD
 - 商用集成开发环境和调试器(Segger、IAR、Lauterbach等)
 - OpenSBI，Uboot 以及 Linux Kernel
- RISC-V基础软件平台薄弱且碎片化
 - 没有类似于ARM的CMSIS这样的嵌入式软件接口标准
 - 各家管好各家事，缺少统一的底层软件接口



GNU MCU Eclipse

A family of Eclipse CDT extensions and tools for GNU ARM & RISC-V development



Nuclei RISC-V Processores Can Meet the Diverse Need

芯来处理器能满足AIoT时代的各类需求

	N级别		NX级别		UX级别		可选特性
	32位架构 MCU, 边缘计算, AIoT, 安全		64位架构 存储, AR/VR, AI		64位架构 Linux, 数据中心, 网络设备, 基带		
900系列 9 Stages Dual-issue	N900	对标 ARM Cortex M7 ARM Cortex R4 ARM Cortex R5 ARM Cortex R7	NX900	NX900 多核	对标 ARM Cortex M7 ARM Cortex R5 ARM Cortex R7 ARM Cortex R8	UX900 UX900 多核	对标 ARM Cortex A35 ARM Cortex A53
600系列 6 Stages Single-issue	N600	对标 ARM Cortex M7 ARM Cortex R4 ARM Cortex R5	NX600	NX600 多核	对标 ARM Cortex M7 ARM Cortex R4 ARM Cortex R5	UX600 UX600 多核	对标 ARM Cortex A5 ARM Cortex A7
300系列 3 Stages Single-issue	N300	对标 ARM Cortex M33 ARM Cortex M4 ARM Cortex M4F					
200系列 2 Stages Single-issue	N200	对标 ARM Cortex M0 ARM Cortex M0+ ARM Cortex M3 ARM Cortex M23					
100系列 2 Stages Single-issue	N100	对标 8位/16位内核 ARM Cortex M0 ARM Cortex M0+					

安全

可靠

扩展

DSP

浮点

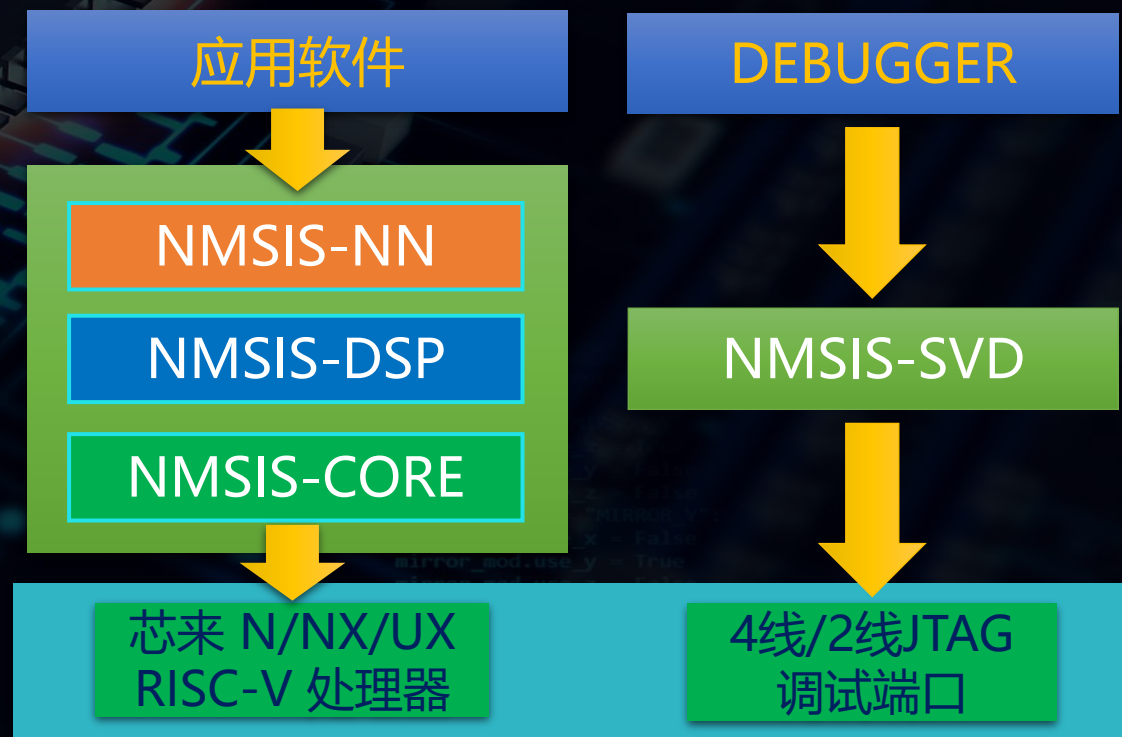
矢量

NN

芯来嵌入式软件接口标准(NMSIS)

NMSIS (Nuclei MCU Software Interface Standard) 为芯来RISC-V处理器提供了一套封装了处理器底层操作，DSP算法库以及神经网络NN算法库等的软件框架。该接口标准可以有效降低开发者的学习曲线，并提升了产品推向市场的速度。

- ✓ 基于开源软件ARM CMSIS-5，并针对Nuclei RISC-V处理器进行深度定制优化开发
- ✓ NMSIS定义了通用软件接口并提供持续的处理器软件支持
- ✓ NMSIS提供了简洁的处理器和外设的软件访问接口API
- ✓ NMSIS提供了兼容CMSIS-DSP和NN的软件库，并针对RISC-V DSP指令进行深度优化与测试
- ✓ 采用NMSIS框架，可以提供软件的可复用性，大大缩短RISC-V微处理器开发者的学习时间，加快RISC-V处理器产品的上市时间
- ✓ 提供完备的代码以及在线文档，并采用Apache 2.0 License进行发布



芯来嵌入式软件接口标准(NMSIS)

Nuclei-Software / NMSIS

<> Code Issues Pull requests Actions Projects Wiki Security Insights

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About

Nuclei Microcontroller Software Interface Standard Development Repo

doc.nucleisys.com/nmsis/

Releases 6

Latest

Nuclei Microcontr... 24 days ago

+ 5 releases

.ci	ci: update github page deploy script	6 months ago
Device	Device: Update cache enable policy for device t...	26 days ago
NMSIS	doc: Bump version to 1.0.1	24 days ago
.clang-format	misc: Initial commit of Nuclei Microcontroller S...	8 months ago
.editorconfig	env: update editorconfig file	8 months ago
.gitattributes	env: update editorconfig file	8 months ago
.gitignore	misc: Initial commit of Nuclei Microcontroller S...	8 months ago
.gitlab-ci.yml	ci: update ci script	last month
.travis.yml	ci: add deploy documentation script	8 months ago
LICENSE	misc: Initial commit of Nuclei Microcontroller S...	8 months ago
README.md	doc: Add Nuclei Spec reference in NMSIS	6 months ago

NMSIS

Nuclei Microcontroller Software Interface Standard

1.0.1

Search docs

CONTENTS:

Nuclei MCU Software Interface Standard(NMSIS)

NMSIS Core

Overview

Using NMSIS in Embedded Applications

Introduction

Basic NMSIS Example

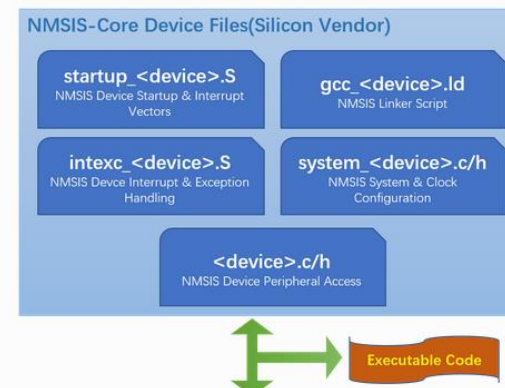
Using Interrupt and Exception/NMI

Using NMSIS with generic Nuclei Processors

Create generic Libraries with NMSIS

and functions for the **LLIC** are provided.

- **CPU Intrinsic Functions** allow to access special instructions, for example for activating sleep mode or the NOP instruction.
- **Intrinsic Functions for SIMD Instructions** provide access to the DSP-oriented instructions.
- **Systick Timer(SysTimer)** function to configure and start a periodic timer interrupt.
- **Core CSR Register Access** function to access the core csr registers.
- **Cache Functions** to access the I-CACHE and D-CACHE unit
- **FPU Functions** to access the Floating point unit.
- **PMP Functions** to access the Physical Memory Protection unit
- **Version Control** which defines NMSIS release specific macros.
- **Compiler Control** is compiler agnostic *#define* symbols for generic C/C++ source code

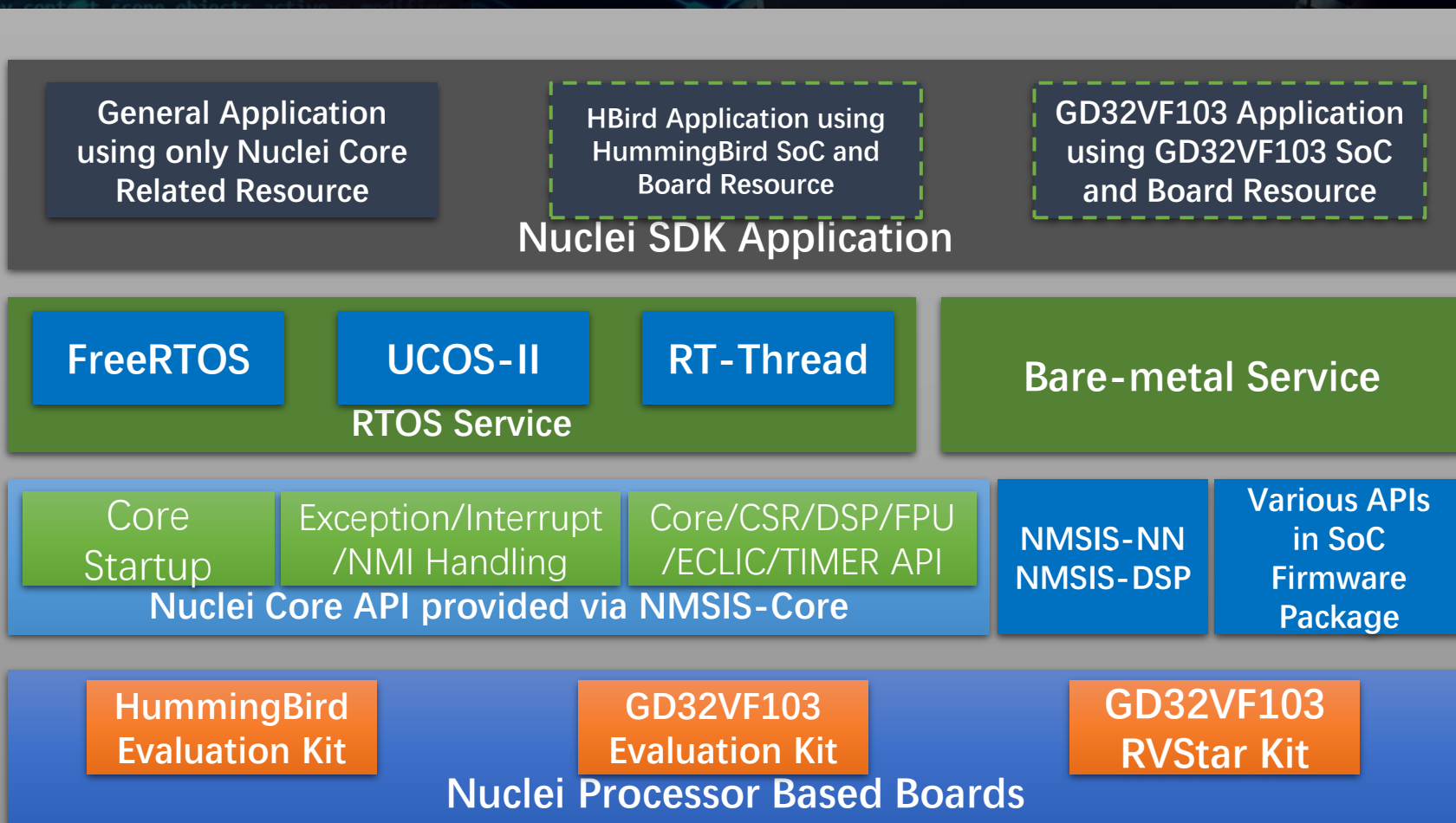


Github: <https://github.com/Nuclei-Software/NMSIS>
Gitee: <https://gitee.com/Nuclei-Software/NMSIS>

在线文档: <https://doc.nucleisys.com/nmsis>

芯来嵌入式软件开发平台(Nuclei SDK)

Nuclei SDK (Software Development Kit) 是专为基于Nuclei RISC-V处理器内核的SoC而开发的开源软件平台，能够降低RISC-V软件开发难度，加速RISC-V处理器软件开发。



- 以NMSIS为基础进行开发，提供了NMSIS上的所有功能，包括NMSIS-Core, NMSIS-NN, NMSIS-DSP
- 提供了裸机(BareMetal)或者实时操作系统(FreeRTOS、UCOS-II以及RT-Thread)应用开发环境
- 简洁明了的Makefile的编译系统，提供高效开发环境
- 支持Nuclei Studio、Segger Embedded Studio和PlatformIO IDE的集成开发环境
- 支持蜂鸟FPGA开发板以及RV-STAR开发板
- 支持Windows和Linux开发环境
- 提供完备的在线用户手册，方便开发者进行开发
- 采用Apache 2.0 License

芯来嵌入式软件开发平台(Nuclei SDK)

Nuclei-Software / nuclei-sdk

Code Issues 1 Pull requests Actions Projects 1 Wiki Security

master

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About

Nuclei RISC-V Software Development Kit

doc.nucleisys.com/nuclei_sdk

riscv risc-v embedded-hal
iot-platform nuclei
freertos rtos makefile
fpga-evaluation-board
rt-thread uc0sii
nuclei-sdk platformio sdk
embedded-systems
opensource

Readme
Apache-2.0 License

fanghuaqi	doc: Fix typo in app documentation	2 days ago	328
.ci	ci: Add --port and --baudrate option for nsdk_r...	last month	
Build	SoC: Fix build issues	last month	
NMSIS	NMSIS: update nmsis dsp library	27 days ago	
OS	OS: Replace tab to 4 spaces	last month	
SoC	SoC: Fix cache initialization in startup_hbird.S	26 days ago	
application	application: Add missing vector parse for misa	2 days ago	
doc	doc: Fix typo in app documentation	2 days ago	
test	test: No need to search ctest_begin	5 months ago	
.clang-format	misc: Initial commit of Nuclei SDK for Nuclei N/...	8 months ago	
.editorconfig	env: Fix wrong editorconfig format	8 months ago	
.gitignore	env: ignore build folder	6 months ago	

Nuclei SDK
Nuclei embedded Software Development Kit
0.2.5

Search docs

CONTENTS:

- Overview
- Quick Startup
- Developer Guide
- Contributing

Design and Architecture

- Overview
- Nuclei Processor
- SoC
- Board
- Peripheral
- RTOS

demo_timer

This demo_timer application is used to demonstrate how to use the CORE TIMER API including the Timer Interrupt and Timer Software Interrupt.

- Both interrupts are registered as non-vector interrupt.
- First the timer interrupt will run for 10 times
- Then the software timer interrupt will start to run for 10 times

How to run this application:

```
# Assume that you can set up the Tools and Nuclei SDK environment
# cd to the demo_timer directory
cd application/baremetal/demo_timer
# Clean the application first
make SOC=gd32vf103 BOARD=gd32vf103v_rvstar clean
# Build and upload the application
make SOC=gd32vf103 BOARD=gd32vf103v_rvstar upload
```

Expected output as below:

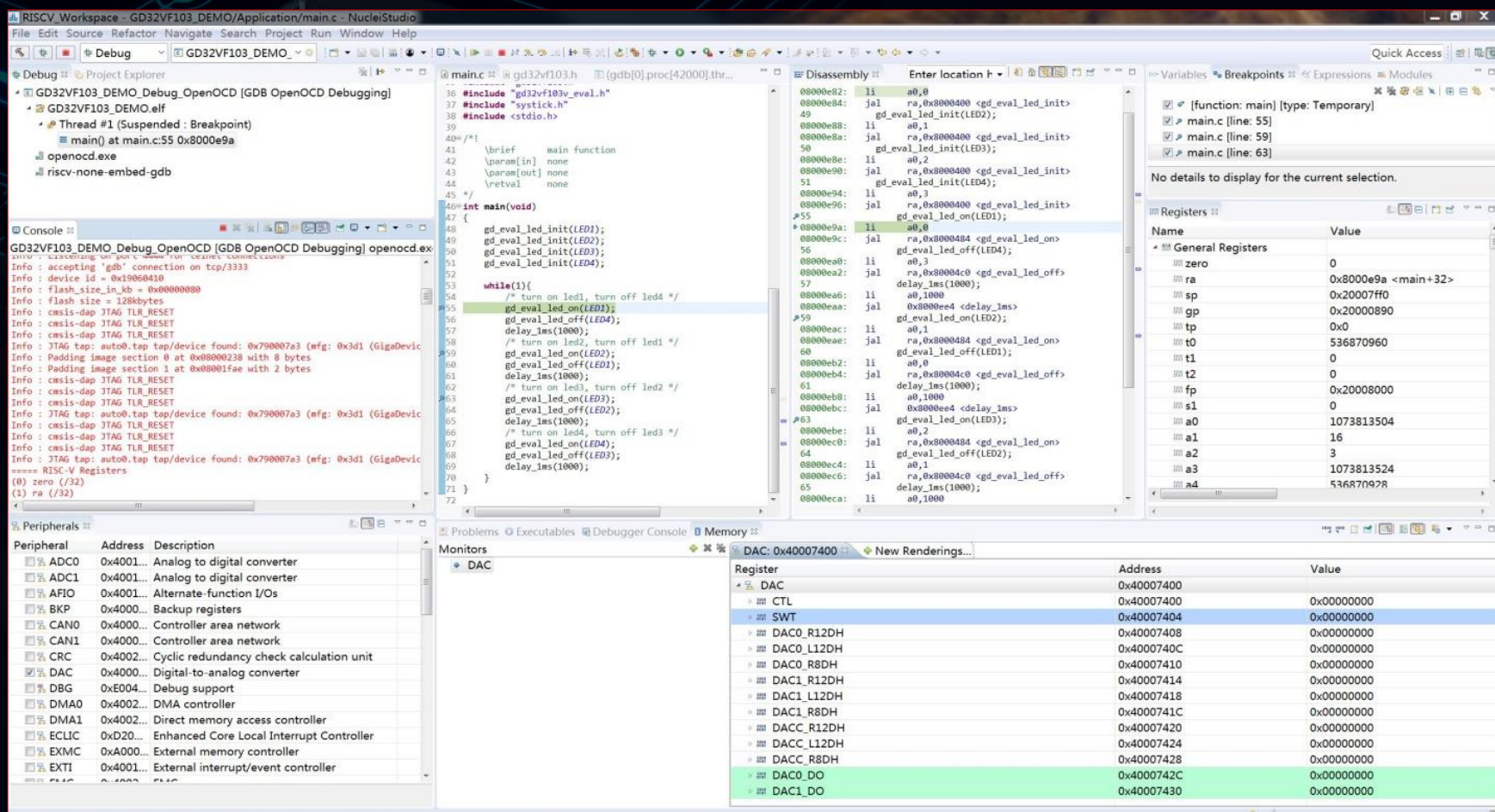
```
Nuclei SDK Build Time: Feb 21 2020, 12:52:37
Download Mode: FLASHXIP
CPU Frequency 108794117 Hz
init timer and start
MTimer IRQ handler 1
MTimer IRQ handler 2
MTimer IRQ handler 3
```

Github: <https://github.com/Nuclei-Software/nuclei-sdk>
Gitee: <https://gitee.com/Nuclei-Software/nuclei-sdk>

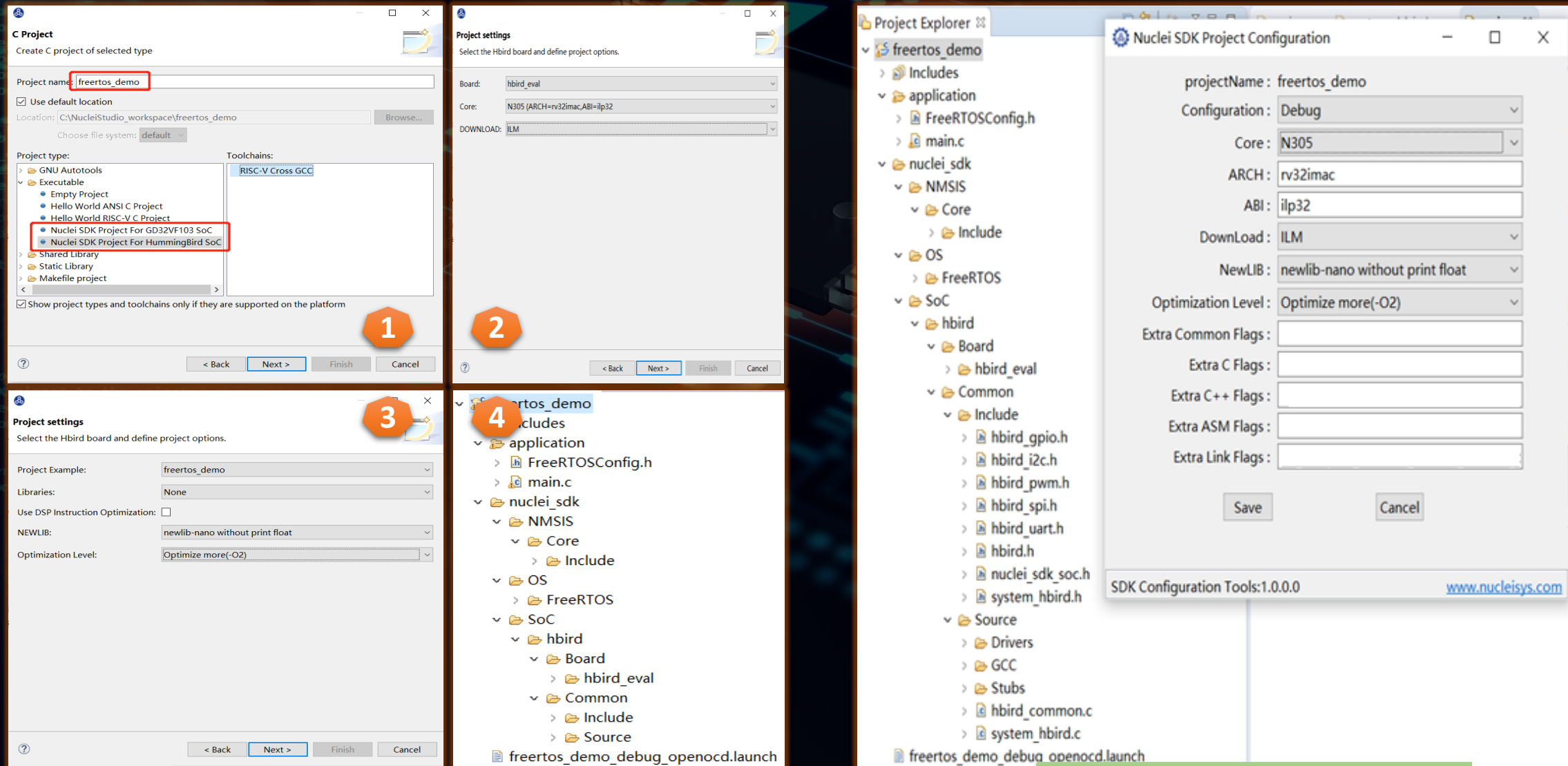
在线文档: https://doc.nucleisys.com/nuclei_sdk/

芯来Nuclei Studio开源集成开发环境

- 基于Eclipse CDT开发环境
- 集成Nuclei RISC-V GCC和Nuclei OpenOCD
- 深度集成Nuclei SDK
- 功能完善
- 自由免费
- 绿色免安装
- 一键项目模板
- 一键项目配置
- 代码编写
- 在线调试
- 程序烧写
- 集成串口显示
- 实时显示寄存器
- 支持Linux和Windows



芯来Nuclei Studio开源集成开发环境



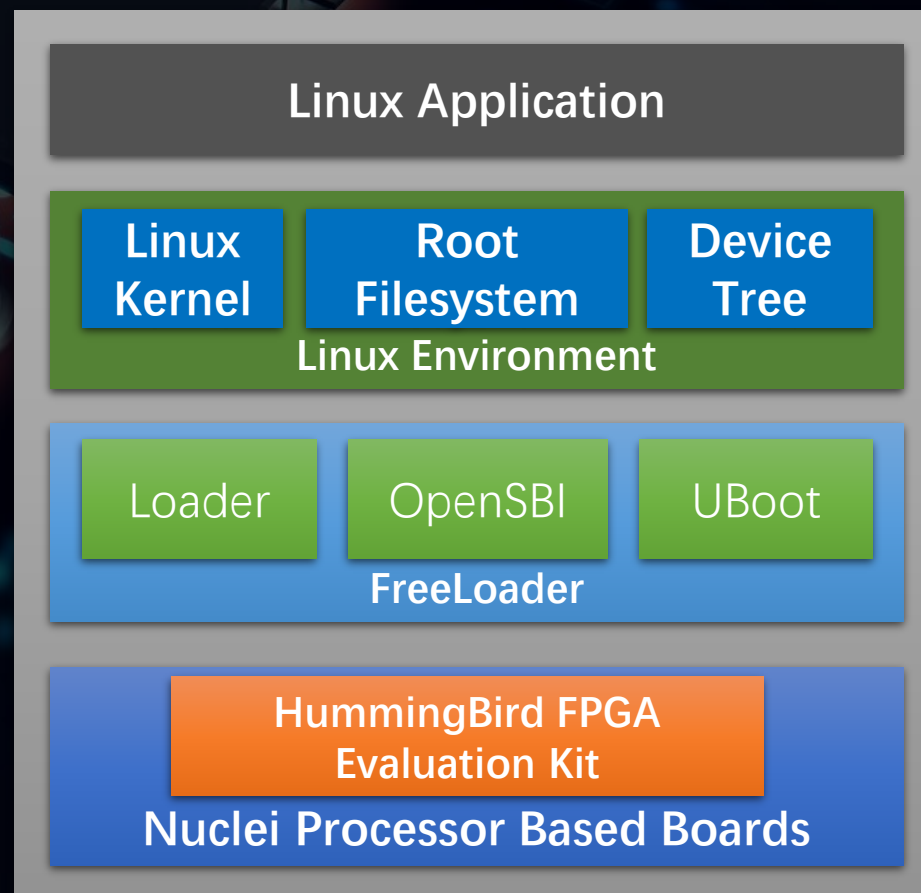
一键Nuclei SDK项目模板

一键Nuclei SDK项目配置

芯来嵌入式Linux软件开发平台(Nuclei Linux SDK)

Nuclei Linux SDK (Software Development Kit) 是专为基于Nuclei RISC-V处理器开发Linux应用而推出的快速上手平台，加快RISC-V Linux处理器的Linux内核快速Bringup。

- ❑ 支持Nuclei RISC-V UX600系列64位处理器
- ❑ 支持Nuclei 蜂鸟FPGA评估开发板
- ❑ 基于Makefile编译系统，支持快速构建启动镜像文件以及用于烧写的启动固件(Freeloader)
- ❑ Freeloader中集成简易Loader，OpenSBI以及Uboot启动软件
- ❑ 启动镜像文件中包含Linux内核镜像，基于Busybox的根文件系统以及设备树二进制文件
- ❑ 支持Linux Kernel 5.7版本
- ❑ 采用Apache 2.0 License
- ❑ 代码托管
 - ❑ <https://github.com/Nuclei-Software/nuclei-linux-sdk>
 - ❑ <https://gitee.com/Nuclei-Software/nuclei-linux-sdk>



支持多种主流嵌入式操作系统和云连接



Linux



TencentOS
Tiny

腾讯TencentOS
腾讯云连接



小而美的物联网操作系统

睿赛德RT-Thread

μC/OSTM
RTOS and Stacks

μC/OS II



FreeRTOS



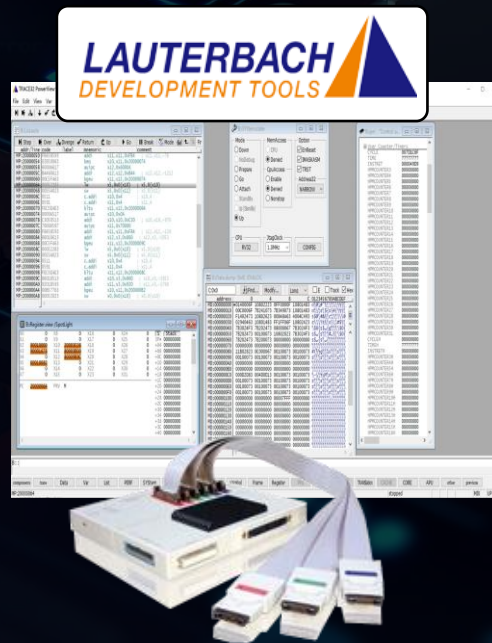
HUAWEI LiteOS

华为LiteOS
华为云连接

完善的第三方商业工具链支持



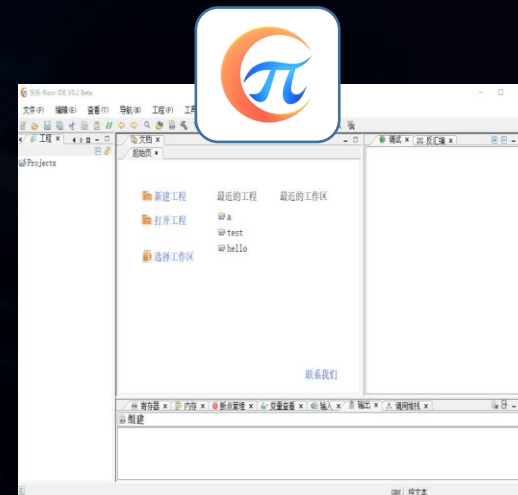
SEGGER



劳特巴赫



IAR



卡姆派乐

联合生态伙伴提供完整的领域软硬件解决方案

工具链



安全



操作系统



IP和设计服务



应用和算法



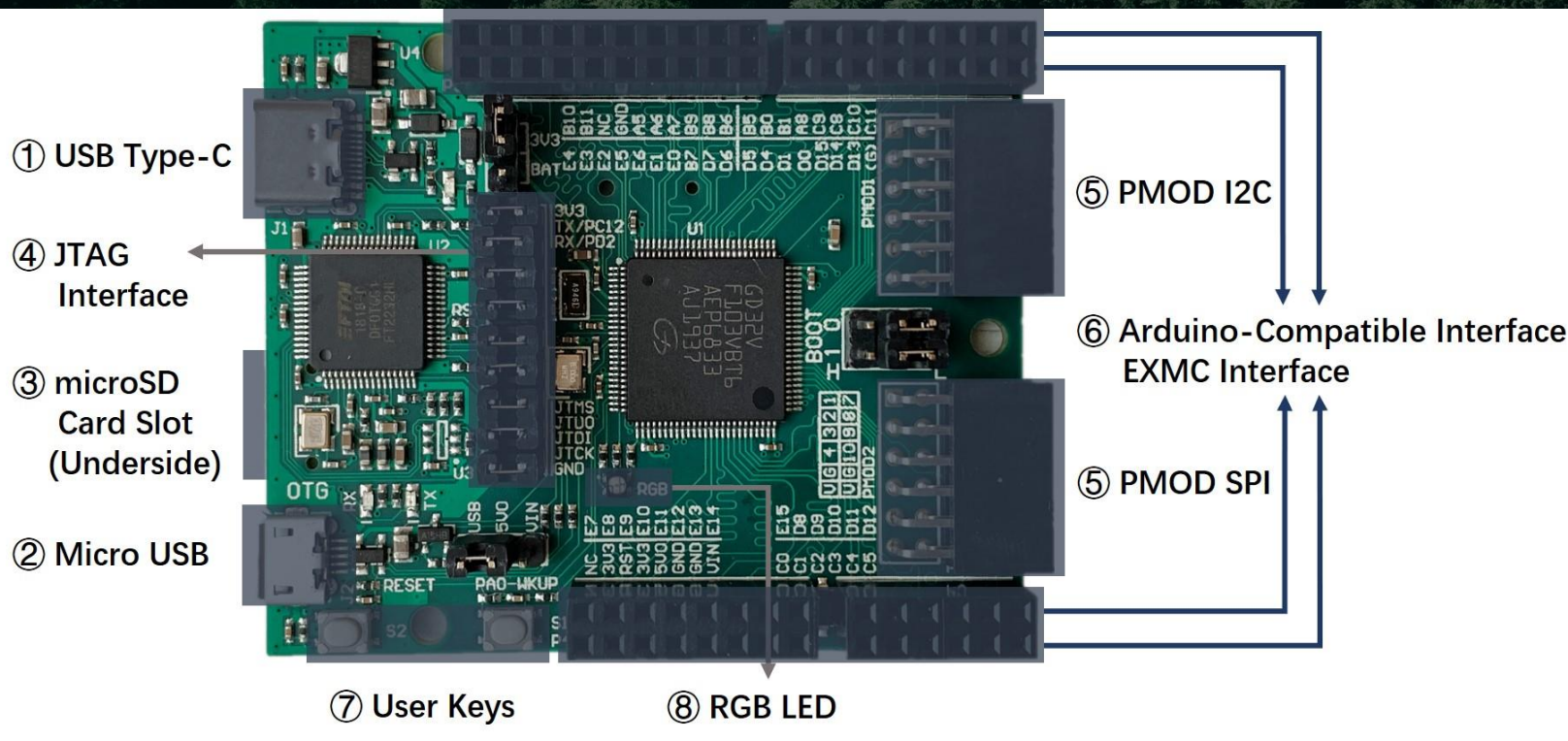
公共服务平台



协会和联盟



Nuclei RISC-V生态社区

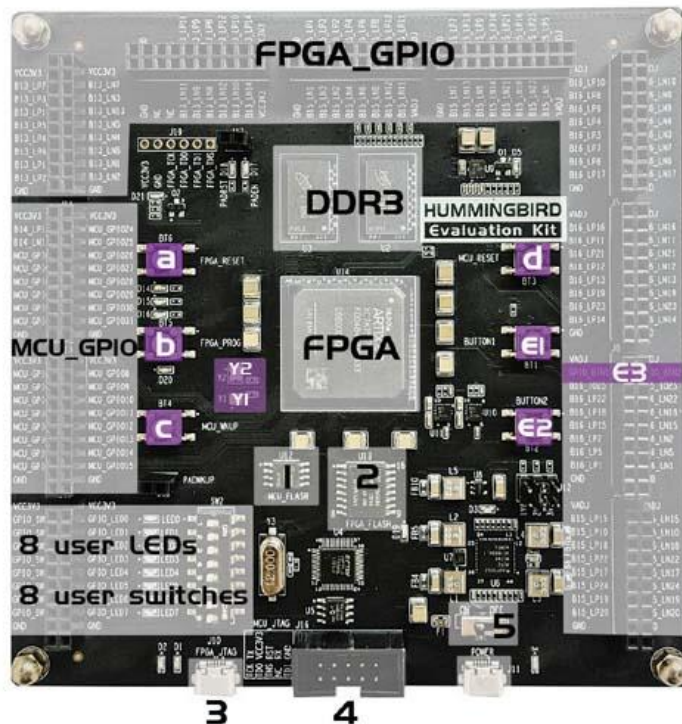


芯来科技RV-STAR开发板

- ❑ 卡片大小GD32VF103 MCU 的 RISC-V开发板
- ❑ 处理器内核为Nuclei Bumblebee内核, 支持RV32IMAC
- ❑ 提供USB-Type-C板载调试器
- ❑ Arduino兼容外设接口
- ❑ PMOD兼容外设接口
- ❑ 复位, 唤醒按键以及RGB LED
- ❑ 提供Micro SD卡接口, USB接口
- ❑ 支持Nuclei SDK开发环境
- ❑ 支持Nuclei Studio, Segger Embedded Studio, PlatformIO 集成开发环境
- ❑ 支持RT-Thread开发环境
- ❑ 完整在线开发文档
- ❑ 内容丰富的社区平台

Nuclei RISC-V生态社区

- a: FPGA_RESET
- b: FPGA_PROG
- c: MCU_WKUP
- d: MCU_RESET
- e1: User button 1
- e2: User button 2
- e3: User button header
- Y1: GCLK
- Y2: RTC_CLK
- 1: MCU_FLASH
- 2: FPGA_FLASH
- 3: FPGA_JTAG
- 4: MCU_JTAG
- 5: Power switch



芯来科技蜂鸟FPGA评估板

- ❑ 专为芯来科技RISC-V处理器内核IP的SoC原型评估而设计
- ❑ 支持开源的蜂鸟E203 RISC-V处理器
- ❑ 主芯片FPGA型号为Xilinx XC7A100T, 另有200T版本即将推出
- ❑ 配备多达126个引出的FPGA GPIO, 用于用户自定义使用
- ❑ 备独立的MCU FLASH芯片, 此Flash用于存储RISC-V内核运行的程序文件
- ❑ 配备独立的FPGA Flash芯片, 此Flash用于存储mcs格式的比特流文件
- ❑ 配备用户LEDs、按键及拨码开关
- ❑ 配备蜂鸟调试器接口 (2线N-LINK及4线JTAG协议支持)
- ❑ 支持Nuclei SDK开发环境
- ❑ 支持Nuclei Studio, Segger Embedded Studio, PlatformIO集成开发环境
- ❑ 完整开发文档
- ❑ 内容丰富的社区平台

Nuclei RISC-V生态社区

The screenshot shows the Nuclei RISC-V ecosystem website. The top navigation bar includes links for 首页 (Home), 新闻资讯 (News), 快速入门 (Quick Start), 论坛讨论 (Forum), and 大学计划 (University Plan). A search bar is located on the right. The main content area is divided into several sections:

- MCU芯片 (MCU Chips):** Lists products like GD32VF103, GD32VF103C-START, and Sipeed Longan Nano, each with links to data sheets, user manuals, and purchase options.
- MCU开发板 (MCU Development Boards):** Lists boards like RV-STAR and Sipeed Longan Nano, with links to introductions, circuit diagrams, and user manuals.
- IDE开发工具 (IDE Development Tools):** Lists tools like Embedded Studio and RV-STAR, with links to quick starts.
- RISC-V系列课程 (RISC-V Series Courses):** Promotes a "处理器设计" (Processor Design) course with a "火速围观" (Watch Quickly) button.
- 论坛热帖 (Forum Hot Posts):** Displays a list of recent forum posts with titles and brief descriptions.
- 资讯·推荐 (News & Recommendations):** Displays a list of recommended news articles with titles and brief descriptions.
- 关注我们 (Follow Us):** Includes a QR code and a link to the Nuclei RISC-V community.

- 丰富的设计资源，涵盖RISC-V MCU社区软硬件资料，开放RISC-V指令集文档，Nuclei处理器中文指令集手册
- 随时随地获取最新最全的RISC-V在线资讯信息
- 提供各类RISC-V软硬件开发工具在线教程
- 举办各类RISC-V社区活动，例如答题获奖，RISC-V开发大赛
- 完善的开源蜂鸟E203 RISC-V处理器讨论社区
- 开源RISC-V处理器软硬件社区论坛，与技术大牛热烈交流
- 完善的RISC-V大学计划在线文档与教学视频

RISC-V MCU开放社区
<https://www.rvmcu.com/>

Nuclei RISC-V生态社区

配套教学资源


RISC-V
处理器设计

课
程
资
源

[CPU基础知识](#)

[RISC-V架构基础](#)

[蜂鸟 E203设计概况](#)

[蜂鸟 E203指令流水线设计](#)

[蜂鸟 E203存储器架构](#)

[蜂鸟 E203异常和中断](#)

[蜂鸟 E203低功耗机制和可扩展协处理器](#)

[蜂鸟 E203开发实战](#)

[CPU基础知识](#)

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RISC-V
硬件平台

配套书籍



[手把手教你设计CPU——RISC-V处理器篇](#)



[RISC-V架构与嵌入式开发快速入门](#)


RISC-V
嵌入式开发



[蜂鸟E203处理器源码包](#)
[蜂鸟E203配套软件开发平台](#)

RISC-V 大学计划

Nuclei RISC-V生态社区

**Nuclei Software**
Open Source Software for Nuclei System Technology, A Professional RISC-V Processor IP Company
📍 China 🌐 <https://nucleisys.com/> ✉ contact@nucleisys.com

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Pinned repositories

Customize pinned repositories

**NMSIS**
Nuclei Microcontroller Software Interface Standard Development Repo
🌟 5 🍴 1

**nuclei-sdk**
Nuclei RISC-V Software Development Kit
🌟 14 🍴 5

**nuclei-linux-sdk**
Nuclei RISC-V Linux Software Development Kit
🌟 1

Type: All Language: All New

NMSIS
Nuclei Microcontroller Software Interface Standard Development Repo
[iot](#) [embedded](#) [dsp](#) [nn](#) [iot-platform](#) [riscv](#) [nuclei](#)
🌟 5 🍴 1 📅 0 🔄 0 Updated 3 minutes ago

nuclei-sdk
Nuclei RISC-V Software Development Kit
[opensource](#) [sdk](#) [makefile](#) [platformio](#) [embedded-systems](#) [iot-platform](#) [riscv](#)
🌟 14 🍴 5 📅 1 🔄 0 Updated 5 minutes ago

nuclei-board-labs
Nuclei Board Labs
🌟 2 🍴 0 📅 0 Updated 3 days ago

Top languages

● C ● Makefile ● Python ● Assembly

Most used topics

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Nuclei Software Open Source Organization In **Github**
<https://github.com/Nuclei-Software>

**Nuclei-Software**
Open Source Software for Nuclei System Technology, A Professional RISC-V Processor IP Company
📍 武汉 🌐 https://nucleisys.com ✉ contact@nucleisys.com

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热门

自定义

nuclei-board-labs
Nuclei Board Labs
🌟 1 🍴 0

nuclei-sdk
Nuclei RISC-V Processor Software Development Kit
🌟 2 🍴 2

platform-nuclei
Nuclei: development platform for PlatformIO
Python
🌟 2 🍴 2

Linux Kernel
Forked from 腾讯云极速下载 / Linux Kernel
Linux kernel source tree
🌟 1 🍴 0

nuclei-linux-sdk
Nuclei RISC-V Linux Software Development Kit
🌟 1 🍴 0

NMSIS
Nuclei RISC-V Microcontroller Software Interface Standard Development
🌟 1 🍴 0

📄 组织介绍

📄 成就

关于芯来科技

- 中国大陆第一家专业RISC-V IP公司
- 本土RISC-V生态引领者
- 全自主研发RISC-V全系列IP产品线
- 首家实现多款RISC-V芯片量产的本土IP企业
- 联合兆易创新推出全球首款基于RISC-V的量产通用MCU

关于本组织

本组织是 <https://github.com/nuclei-software/> 的镜像，一天同步四次。

本组织主要提供芯来科技基础软件平台相关的代码：

- 芯来科技RISC-V处理器嵌入式软件SDK平台 Nuclei SDK
- 芯来科技RISC-V处理器Linux 软件平台 Nuclei Linux SDK
- PlatformIO for Nuclei SDK
- Nuclei Board Labs

访问 <https://gitee.com/riscv-mcu> 获取更多RISC-V开源软件

联系

网站: <https://nucleisys.com/>
邮箱: contact@nucleisys.com

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仓库

0
PR

5
Star

40
Fork

仓库语言

C 75%

Python 25%

成员 (1)


华仔

Nuclei Software Open Source Organization In **Gitee**
<https://gitee.com/Nuclei-Software>

 芯来科技
NUCLEI

Nuclei RISC-V生态社区



RISC-V Microcontroller

Open Source Software for RISC-V Microcontroller

<https://www.riscv-mcu.com/> contact@nucleisys.com

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**riscv-openocd**
Forked from riscv/riscv-openocd
Fork of OpenOCD that has RISC-V microcontroller support
● C ☆ 11 🍴 8

**riscv-gnu-toolchain**
Forked from riscv/riscv-gnu-toolchain
GNU toolchain for RISC-V, including GCC. Tweaked for microcontrollers.
● C ☆ 12 🍴 4

**riscv-gcc**
Forked from riscv/riscv-gcc
● C ☆ 4 🍴 3

**riscv-binutils-gdb**
Forked from riscv/riscv-binutils-gdb
RISC-V backports for binutils-gdb. Development is done upstream at the FSF. Including Nuclei's extension instructions.
● C ☆ 1 🍴 1

**riscv-newlib**
Forked from riscv/riscv-newlib
RISC-V port of newlib
● C ☆ 1 🍴 1

**ses_nuclei_sdk_projects**
SEGGER Embedded Studio Projects For Nuclei SDK
● C ☆ 4 🍴 3

Find a repository...

Type: All

Language: All

New

hbird-sdk
OpenSource HummingBird RISC-V Software Development Kit
● C 📄 Apache-2.0 🍴 1 ☆ 2 ⌚ 0 🍴 0 Updated 3 days ago

e203_hbirdv2
The Ultra-Low Power RISC-V Core
cpu fpga core riscv verilog china hummingbird
● Verilog 📄 Apache-2.0 🍴 1 ☆ 0 ⌚ 0 🍴 0 Updated 3 days ago

Top languages
● C ● Python ● Verilog ● Assembly ● TeX

Most used topics
nuclei risc-v riscv segger-embedded-studio

RISC-V MCU Open Source Organization In **Github**
<https://github.com/riscv-mcu/>



RISCV-MCU

Open Source Software for RISC-V Microcontroller

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精选

自定义

**GD32VF103_Firmware_Library**
Original GD32VF103 Firmware Library
👁 1 ☆ 0 🍴 0

**e203_hbirdv2**
The Ultra-Low Power RISC-V Core
C 👁 7 ☆ 6 🍴 5

**hbird-sdk**
HummingBird RISC-V Software Development Kit
C 👁 4 ☆ 5 🍴 1

**riscv-gnu-toolchain**
GNU toolchain for RISC-V, including GCC. Tweaked for microcontrollers.
👁 1 ☆ 0 🍴 0

**ses_nuclei_sdk_projects**
SEGGER Embedded Studio Prebuilt Projects For Nuclei Processor Core
C 👁 1 ☆ 0 🍴 0

**riscv-openocd**
Fork of OpenOCD that has RISC-V microcontroller support
👁 1 ☆ 0 🍴 0

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组织介绍
RISC-V MCU 社区开源项目维护仓库镜像, 一天四次同步 <https://github.com/riscv-mcu>
主要维护以下代码:
● 开源蜂鸟E203二代处理器代码及其SDK项目
● 开源RISC-V GCC工具链
● SES、Nuclei Studio开源IDE工程项目
● GD32VF103 处理器MCU项目教程
如果想了解更多商用版本的RISC-V处理器信息, 请点击:
● 芯来科技官网
● 芯来科技开源基础软件组织

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仓库语言
C 100%

成员 (2)
华仔 Jayden

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www.nucleisys.com

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