

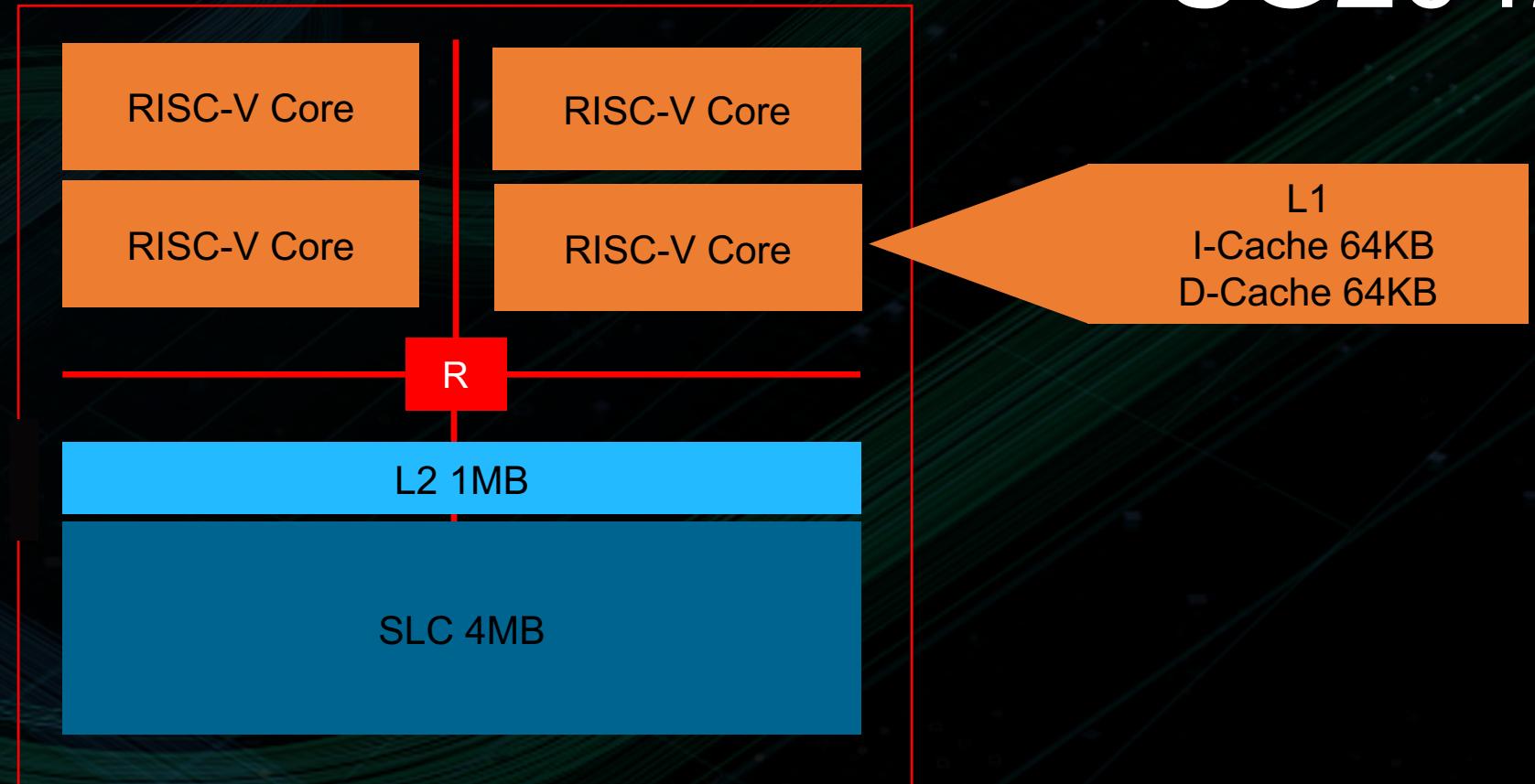


# 颠覆传统的硬件革命 RISC-V

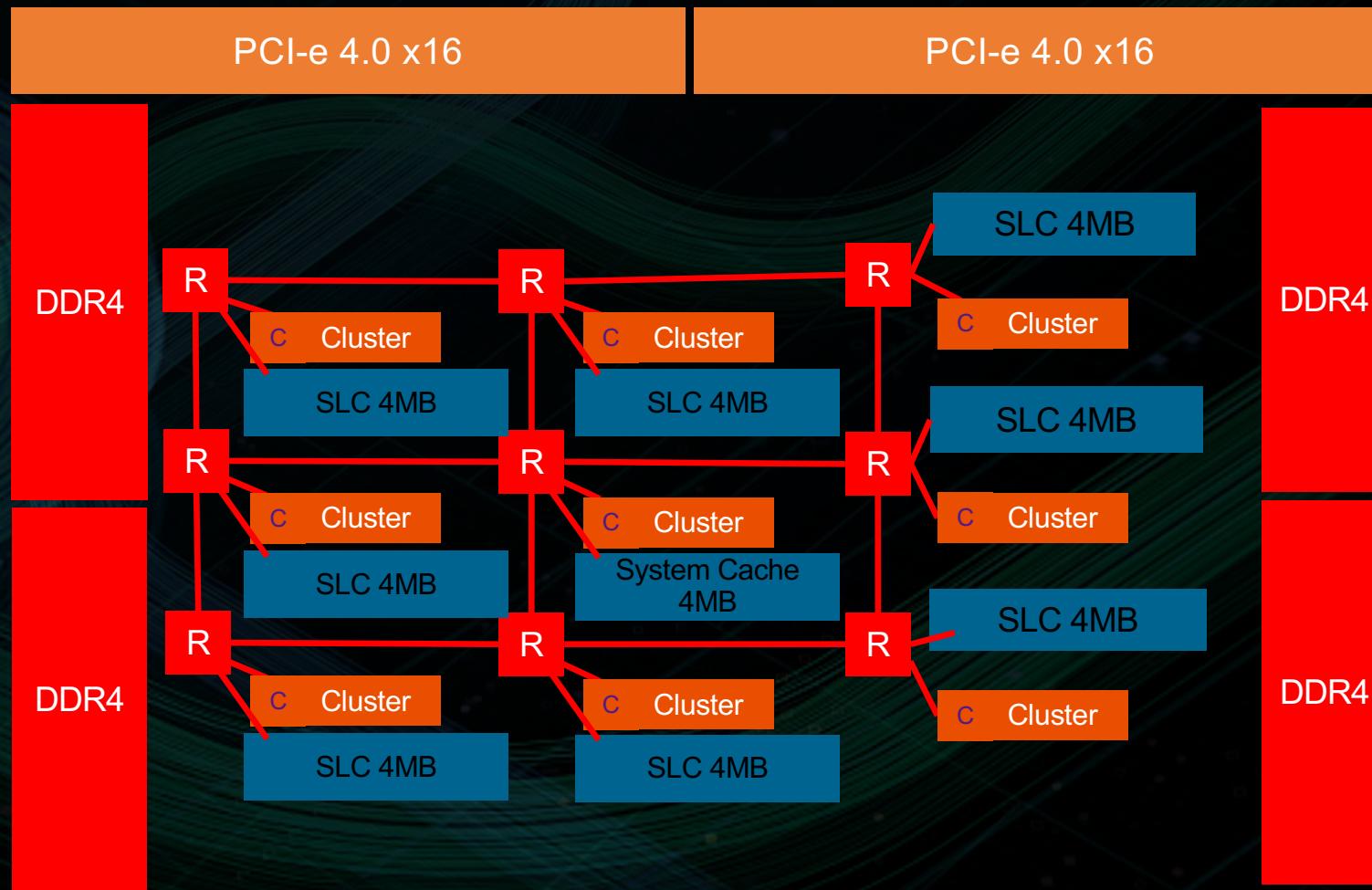
算能 陆吉年

RISC-V中国峰会 @2023.08

# SG2042



# SG2042



The diagram consists of three colored boxes arranged vertically. The top box is red and contains the white text "Router". The middle box is blue and contains the white text "CHI". The bottom box is orange and contains the white text "Cluster".

首款RISC-V服务器处理器，做一台服务器吧。

The first RISC-V server processor, let's build a server.

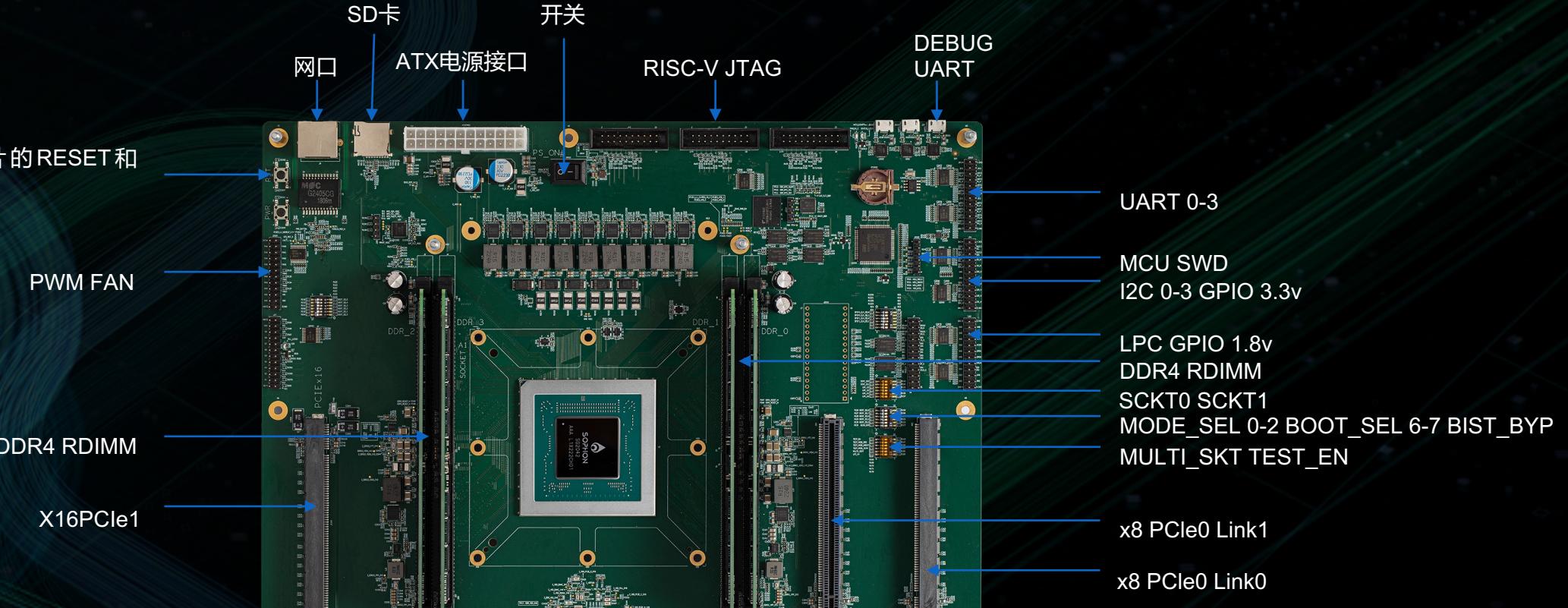
在**可爱的开源社区**的帮助下，我们开始了**全新挑战**.....

A challenge has begun

# EVB在社区捐赠了87台。

Sophgo EVB is donating 87units to the community.

复位按键，分别连接芯片的RESET和POWER pin，均可复位芯片



三种风扇接口，均可使用  
三角箭头标记的是GND  
2pin风扇接口，右侧是GND

milkV × 莎翁吉哥  
SOPHGO

莎翁吉哥  
SOPHGO

*Embracing the RISC-V Era*

# Milk-V Pioneer

The first 64-core RISC-V CPU Motherboard / Workstation

Powered by

SOPHON SG2042



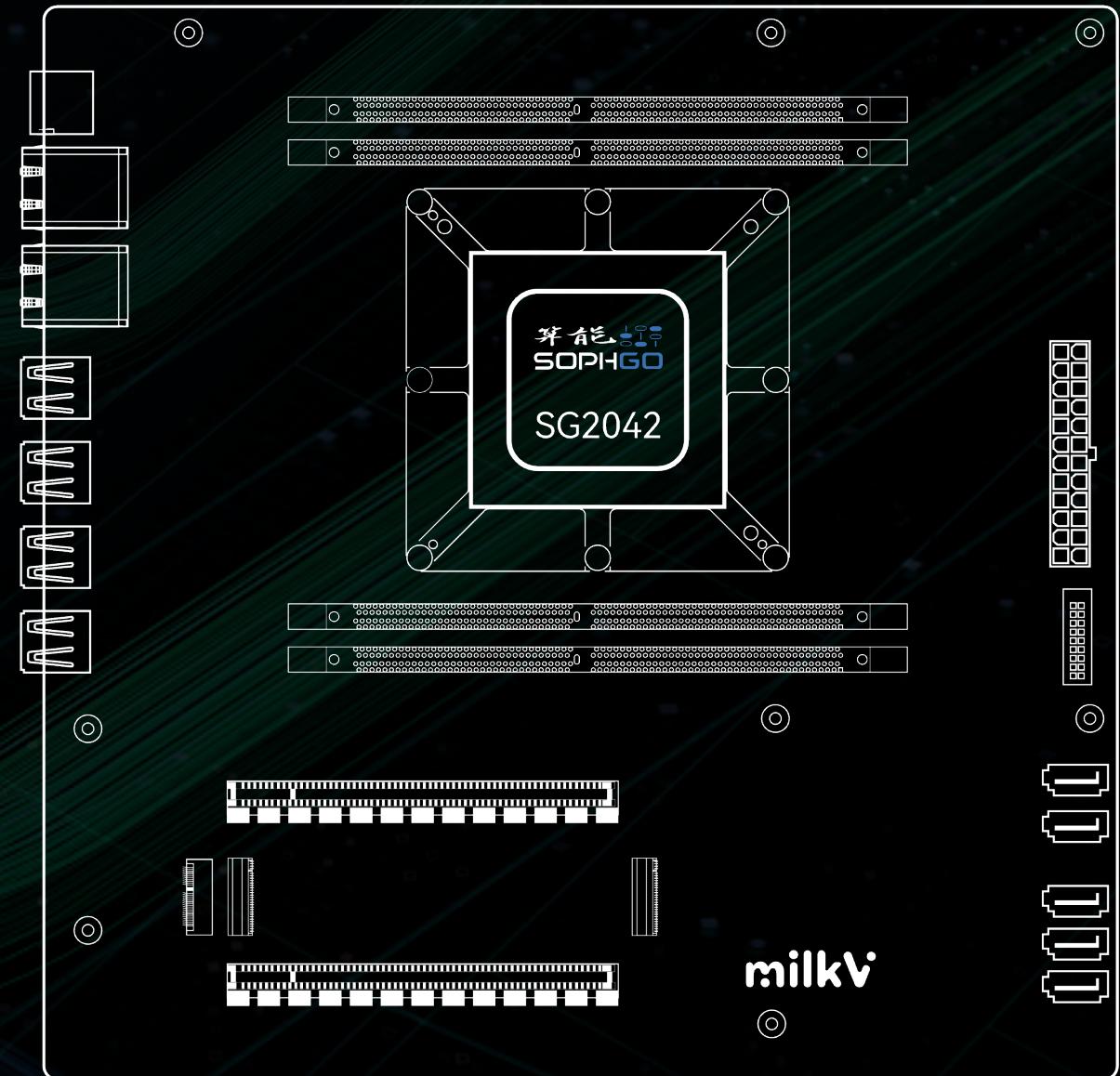
Pioneer v1.2 即将到来  
更先进、更合理的PCIe

更先进

PCIe Gen 3.0-->Gen 4.0

更合理

3x PCIe X8-->1x PCIe X16 + 1x PCIe X8



milkV

Milk-V Pioneer 是一款专门为开发者打造的于搭载64核的RISC-V处理器——SOPHON SG2042的mATX 主板/工作站，通过PC级的接口及强大的工业兼容性，Pioneer为开发者提供无缝的 RISC-V 开发环境，带来深度沉浸式的RISC-V桌面体验。无论是RISC-V的开发者，还是希望探索RISC-V技术尖端的硬件研究者，Pioneer都将成为他们的首选平台。

Milk-V Pioneer is an innovative Motherboard/Workstation designed for developers, built on the powerful SOPHON SG2042 processor and packaged in a standard mATX form factor. With its PC-like interfaces and industrial compatibility, Pioneer offers a seamless RISC-V development environment and an immersive RISC-V desktop experience. It has become the top preference for RISC-V developers and hardware pioneers seeking to explore the forefront of RISC-V technology. Embrace RISC-V and embrace a future driven by innovation.



| Pioneer Board Specification |   |
|-----------------------------|---|
| Processor                   | SOPHON SG2042(64 core C920, RVV 0.71)   |
| Memory                      | 4x DDR4 DIMM slots up to 128GB ram support  |
| PCI Express                 | 1x PCIe x16 Slot(PCie 4.0 x16)<br>1x PCIe x16 Slot(PCie 4.0 x8)   |
| Storage                     | 5x SATA<br>1x SPI Flash for BIOS<br>1x micro SD card for recovery or OS loading<br>2x M.2 M KEY(PCle 3.0 x4)  |
| Ethernet                    | 2x RJ45 2.5G  |
| Wireless                    | 1x M.2 E KEY(PCle 3.0 x1 + USB 2.0)   |
| USB                         | 8x USB3<br>1x USB Header for front panel(2x USB 3.0)  |
| Other                       | 1x misc header for front panel power, reset, etc<br>1x SPI Flash for BIOS<br>1x MicroSD card for recovery or OS loading<br>1x eMMC module connector |
| Power                       | 1x standard 24P ATX Power connector   |
| Size                        | 24.4 x 24.4cm   |
| <b>含税售价 (人民币)</b>           |   |
| <b>9999</b>                 |   |
| <b>Price (USD)</b>          |   |
| <b>1499</b>                 |   |



| Pioneer Box Specification                               |
|---|
| 1x Pioneer Board  |
| 128GB 3200MHz DDR4                                      |
| 1x 1TB PCIe 3.0 SSD                                     |
| 1x Intel X540-T2 Network Card with 2x 10Gbps RJ45 ports |
| 1x AMD R5 230 Graphic Card with HDMI, VGA and DVI       |
| 1x MSI A350 350W Power Supply                           |
| 1x Cooler with PWM Fan                                  |
| White slim PC enclosure with handle                     |
| <b>含税售价 (人民币)</b>                                       |
| <b>14999</b>  |
| <b>Price (USD)</b>                                      |
| <b>2499</b>   |



## SOPHGO Donates 50 RISC-V Motherboards – Learn More About the Pioneer Box

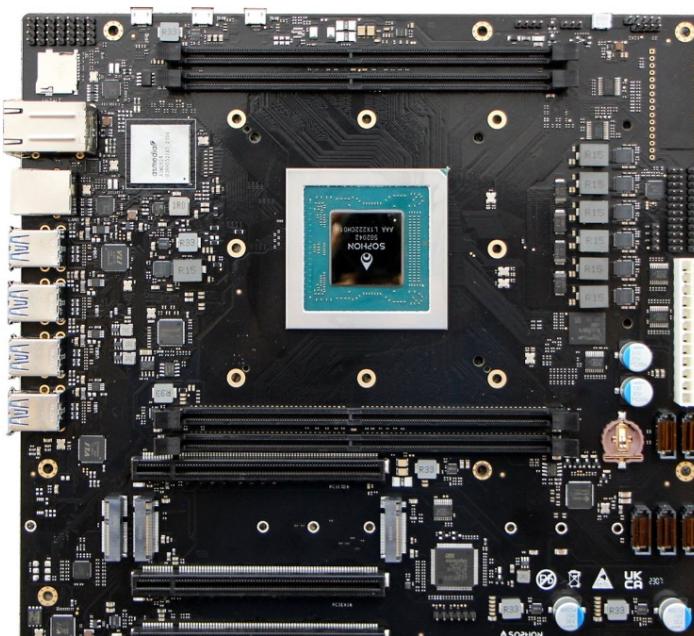
By RISC-V Community News | June 5, 2023 | No Comments

New RISC-V International member **SOPHGO** is committed to the development and promotion of AI RISC-V CPU and other computing products. RISC-V member **Milk-V** delivers high-quality RISC-V products to developers, enterprises, and consumers, to promote the development of the RISC-V hardware and software ecosystem. Together, these two members have created a must-have RISC-V motherboard.

SOPHGO's 64-core RISC-V CPU codenamed SG2042 has been implemented into a motherboard by Milk-V and assembled as a RISC-V workstation named Pioneer Box.

The Pioneer Box is a standard mATX form factor. The PC-like interface, coupled with PC industrial compatibility, delivers native RISC-V development environments and one of the industry's most premier RISC-V desktop experiences. As RISC-V developers and hardware enthusiasts look for the latest motherboard, the Pioneer Box is a go-to option.

At this week's RISC-V Summit Europe, SOPHGO is donating 50 Pioneer Boxes to be shared with the RISC-V ecosystem. The company is committed to furthering the advancement of the open standard ISA and its supporting software ecosystem.



## In the Press



### Hackster News

"With promises to make schematics and design files available soon, the 64-core Milk-V Pioneer is an absolute monster of a board."



### Tom's Hardware

"Milk-V...[is] building a new RISC-V powered line of computers... The Milk-V Duo looks like a Raspberry Pi Pico. There's also a Raspberry Pi shaped quad-core board and the current cream of the crop: a micro ATX system called the Milk-V Pioneer."



### Tech Powerup

"Chinese RISC-V developers Milk-V Technology and SOPHGO recently announced their collaborative open source Milk-V Pioneer developer motherboard and workstation based on the SOPHON SG2042 RISC-V server SoC."



算能向RISC-V基金会捐赠50台Pioneer box.  
**Sophgo** is donating 50 Pioneer boxes to the **RISC-V foundation**.

Kernel 6.1.42



openKylin



支持DIMM，根据SPD自动适配支持的DIMM型号

Supports DIMM and automatically adapts to DIMM based on SPD

移植Linux boot V0.9，解决了硬盘启动问题

Port Linux boot to solve the hard disk booting issue.

维护到最新的Kernel版本 6.1.42

The latest Kernel version is 6.1.42

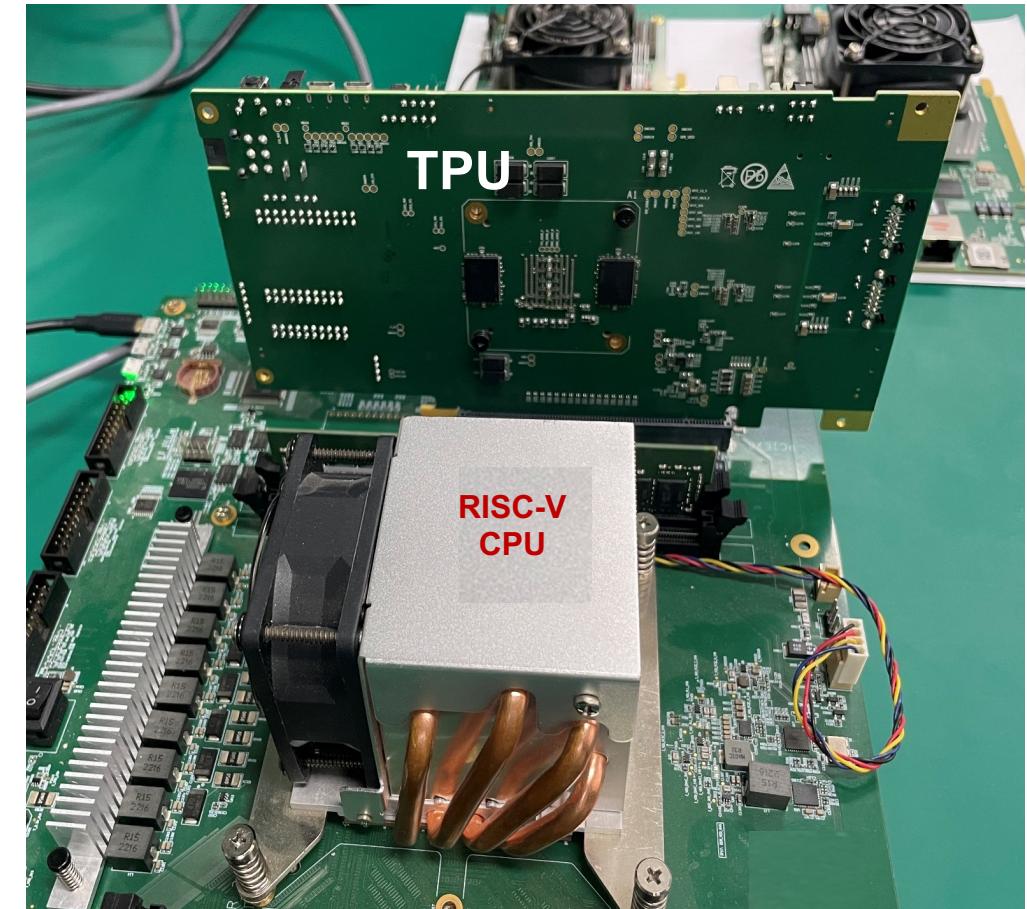
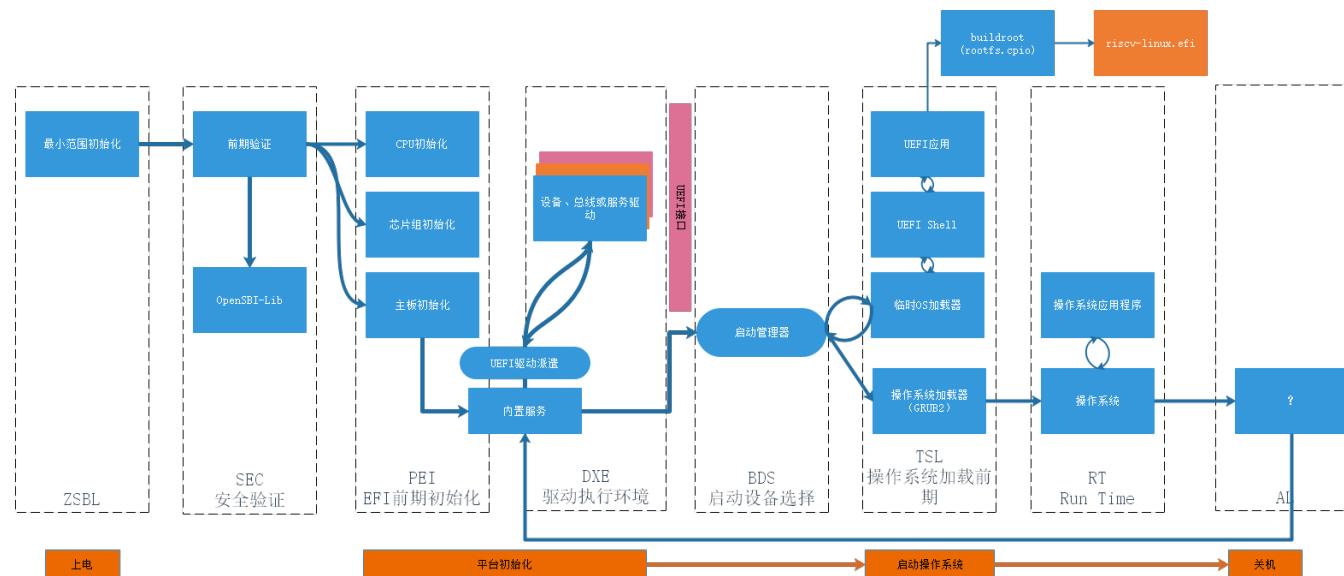
适配了基于AST2600和openBMC的BMC子系统

Adapt the BMC subsystem based on AST2600 and openBMC



# 面向SG2042移植了UEFI开源版本EDK II

Ported the open-source UEFI version EDK II for SG2042.



SG2042平台 SEPCInt2006性能提升**20.1%**

参数: -O3 -flto -dlo

The SEPCInt2006 performance test on the SG2042 platform has improved by **20.1%**.



## 科学计算典型应用

- MonoSAT
- PerfXPy
- Octave

## AI计算典型应用

- Llama

## 轻量级应用服务器

- WEB Server
- MC Game
- SaaS

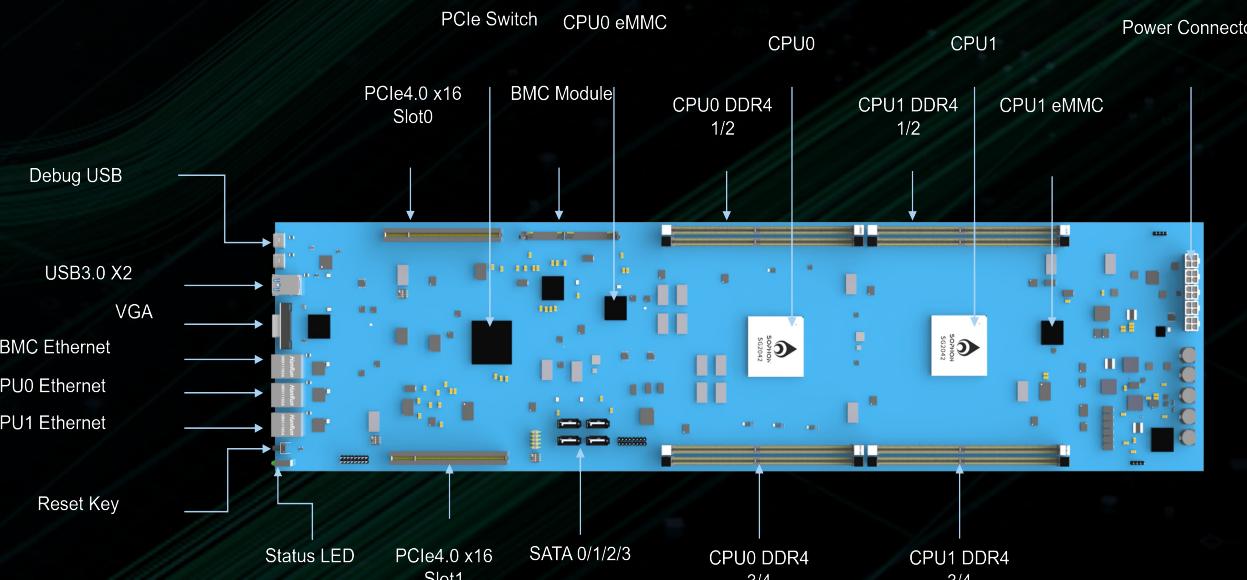
中间件适配：六大常用数据库适配，Nginx, Kubernetes等

基准测试：正在完成第一版“RISC-V性能基准测试白皮书”  
SpecCPU, Stream, 7zip, Coremark, unixbench, Linpack

计算库建设：OpenMPL 已支持OpenBLAS, MathVML, FFTW

并行计算组件：OpenMP, OpenMPI, OpenCL  
工具链建设：GCC（已支持RVV0.7.1），Fortran, Python

打通典型场景建立基础体系



基于RISC-V 128Core  
衡山-1 1U服务器进入量产  
HS-1 Mass Production



# 基于SG2042运行的我的世界

Running Minecraft on SG2042.



<http://mc.rvv.top:8233>

LLM



# 王贺 He Wang

开源爱好者，一切为了好玩的极客。他从小就喜欢计算机，高三就自己做了一个 Linux 发行版，手撸过完整的CPU，向数十个开源项目贡献过代码，大学期间成为分布式开源数据库TiDB的重要Committer，DDL SIG。

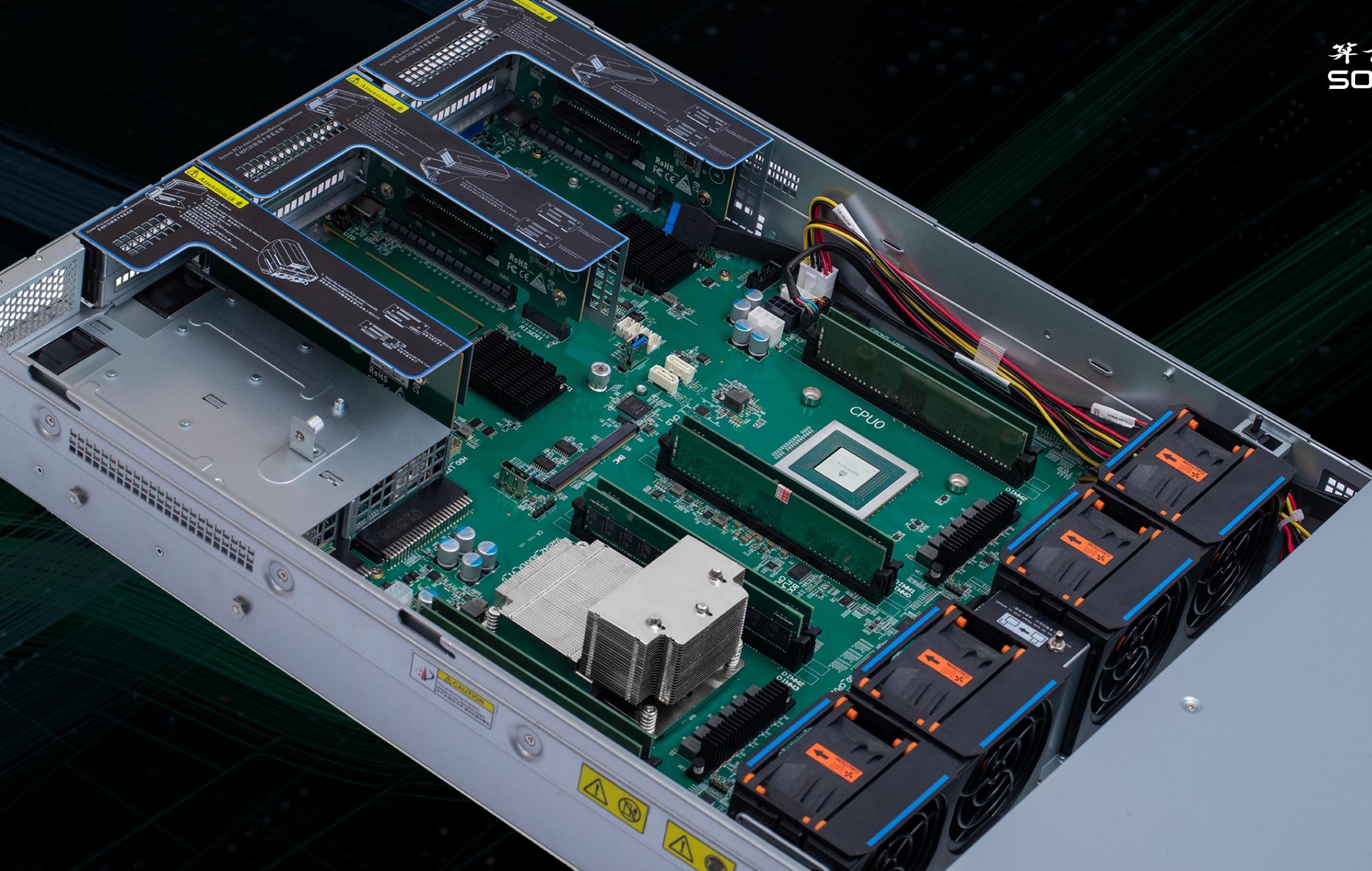
An open-source enthusiast and a geek driven by the pursuit of fun. He developed a passion for computers from a young age, creating his own Linux distribution in his senior year of high school, handcrafting complete CPUs, contributing code to dozens of open-source projects. During college, he became a significant Committer and DDL SIG member for the distributed open-source database TiDB.

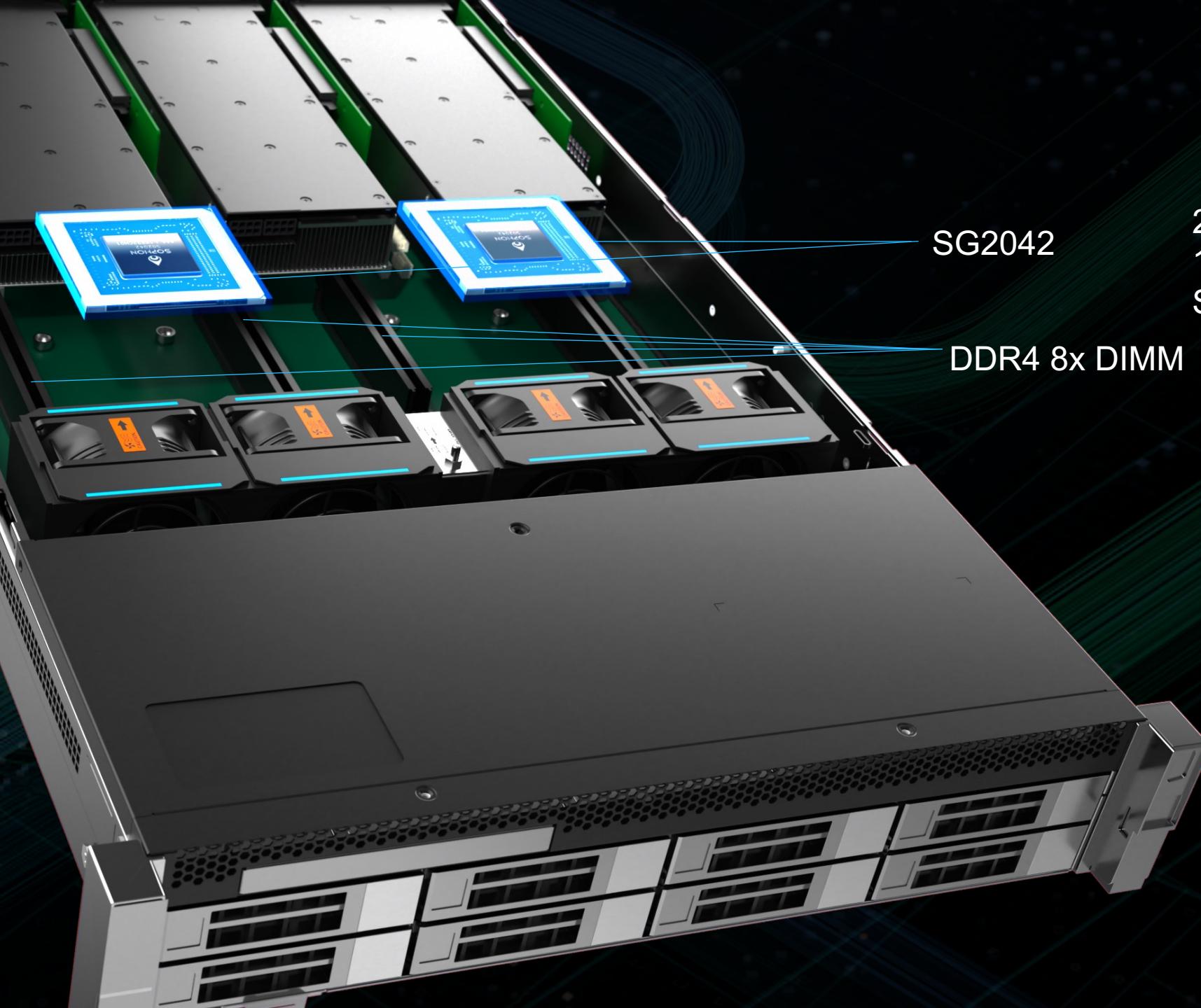
为高性能大模型推理框架inferllm添加了RISC-V平台的支持，让SG2042可以流畅地运行ChatGLM2、Llama2、Alpaca、baichuan等大模型。他认为参与任何项目“一定要 get hands dirty，观望不如动手，实践出真知。”

He added support for the RISC-V platform to the high-performance large model inference framework 'inferllm', enabling smooth operation of models like ChatGLM2, Llama2, Alpaca, and Baichuan on the SG2042. He believes in getting hands dirty when involved in any project, valuing action over observation and emphasizing that real understanding comes from practical experience.



我们来了  
Server and Cluster





SG2042

DDR4 8x DIMM

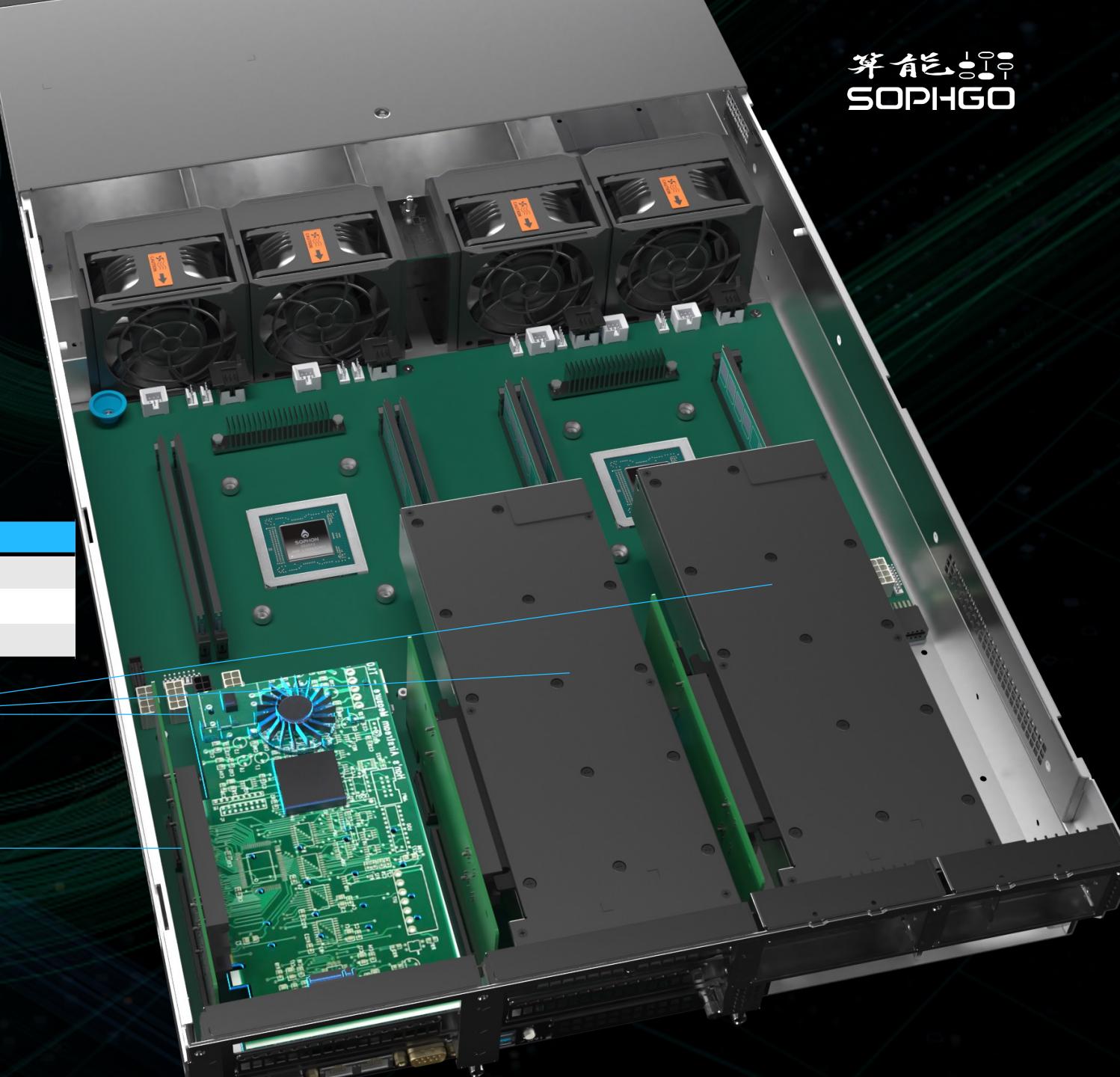
2-ways SG2042  
128-Core RISC-V  
Supports up to 256GB of memory



| AI算力 | INT8/FP16/FP32 | 256 TOPS/128 TFLOPS/16 TFLOPS |
|------|----------------|-------------------------------|
| 内存   | 标准配置           | 128GB LPDDR4x 1024bit 546GB/s |
| PCIe | 数据链路           | PCIe Gen4 X16                 |
| 功耗   | 最大功耗           | 300W                          |

7x PCIe x16 Slot (PCIe 3.0x8)  
support

RAID Card





RISC-V ISA

Server-grade Processor

RISC-V Core: 1024 Core@2G

Floating-point computing power: 16T

Vector 0.71

在集群的建设中感谢



RedHat 傅伟



软件所PLCT 吴伟团队



山东大学智能创新研究院 戴鸿君团队

8 x 2U server  
1 x KVM  
1 x Switch



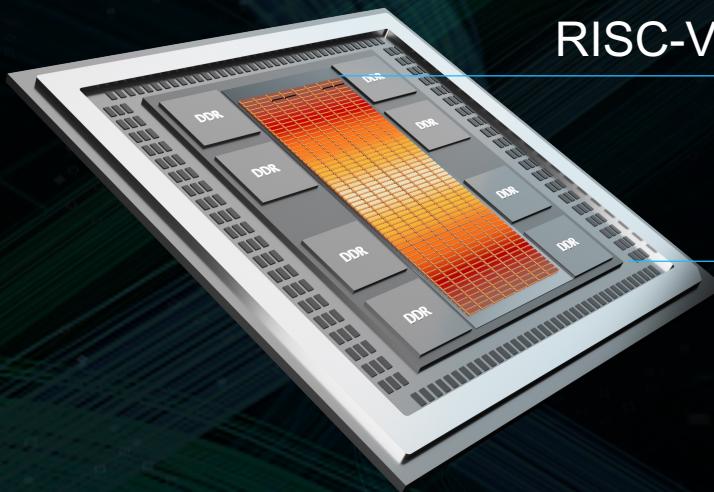


与山东大学共同研发，2023年9月底完成交付给山东大学智能创新研究院，第一台基于RISC-V的商业集群落地（48节点）  
First commercial RISC-V-based cluster (48 nodes) delivered to Shandong University in late September 2023

团队在思考：  
**我们还应该做什么？**  
We were thinking : what else should  
we be doing?

SG2044 in 2024  
Vector1.0

# SG2044



RISC-V 64core and Vector 1.0

8x DDR Control

RISC-V Core  
**64core**

Vector  
**1.0**

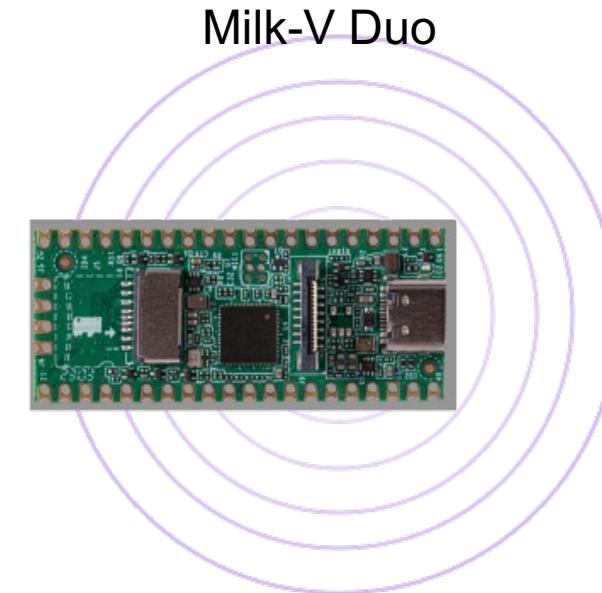
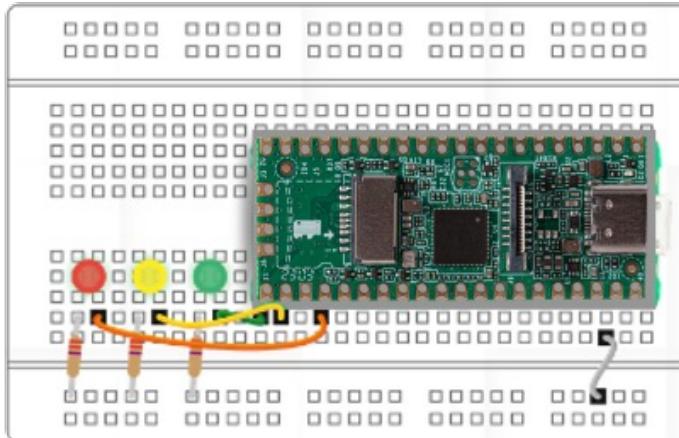
DDR Bandwidth  
**3X**

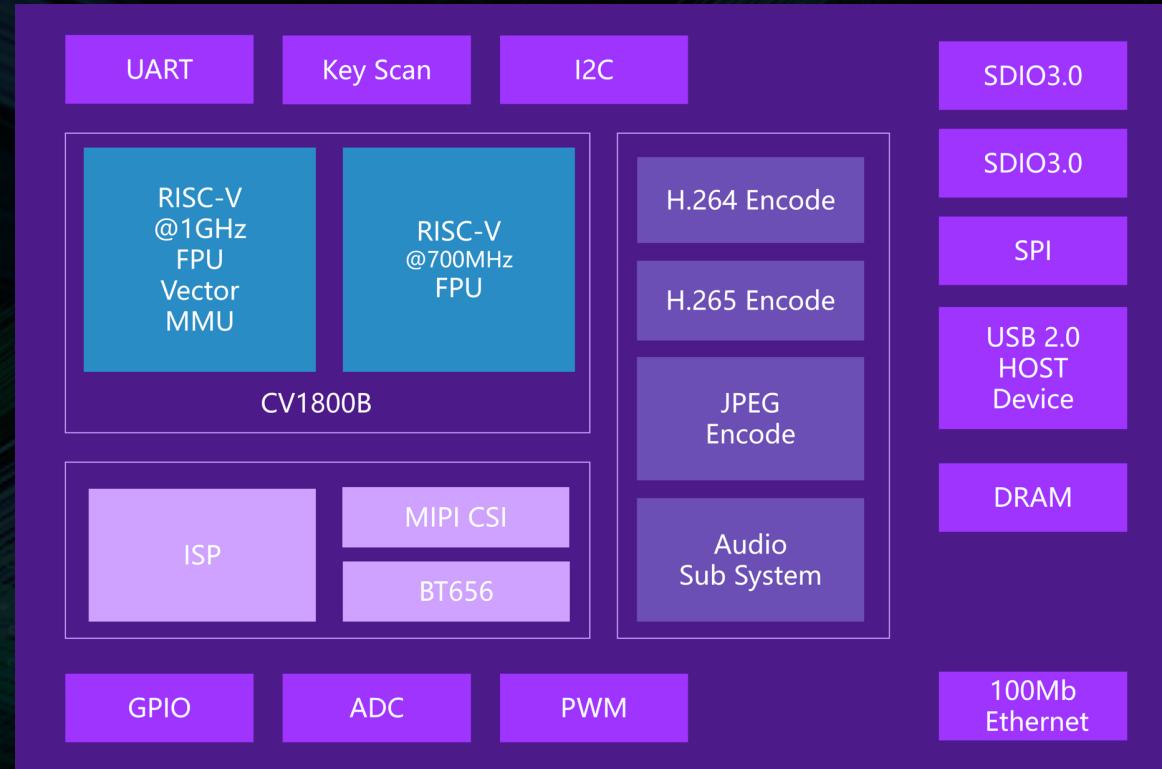
PCI-e  
**2X**

团队在思考：  
**我们还能为生态做什么？  
易获得是关键**  
We were thinking : what else should  
we be doing?

# 可以跑Linux全球最便宜的RISC-V开发板

¥ 35 \$5





|              |                             |
|--------------|-----------------------------|
| 封装           | QFN 7X7mm 0.35Pitch         |
| 主频           | RISC-V@1Ghz; RISC-V@700Mhz  |
| L1 Cache     | I:32KB and D:64KB           |
| DRAM         | DDR2 512Mb SIP              |
| 典型功耗         | 1080P+Video Codec +AI 500mW |
| Linux Kernel | 5.10                        |



“The compact board is very clearly inspired by the Raspberry Pi Pico, borrowing the same overall layout and handy castellated pins which make it suitable for breadboard use and surface mounting as as module. Rather than an RP2040 microcontroller with its two Arm Cortex-M0+ cores running at up to 133MHz, though, the SOPHGO CV1800B at its heart offers two RISC-V cores running at up to 1GHz, alongside 64MB of RAM.”

## Y Hacker News

Roughly twice the cost an identically-sized RP2040 Pico (both 51mm x 21mm), but 6x clock, with 250x the RAM, miniSD slot, USB-C and optional ethernet connect. Freaking awesome.

## tom'sHARDWARE

With a 40 pin GPIO that looks like a drop-in replacement for the Raspberry Pi Pico, the Duo could turbo-charge your microcontroller projects with a full Linux or RTOS based operating system.

WeChat Group



[Matrix]



Official Website



Forum



WeChat Public





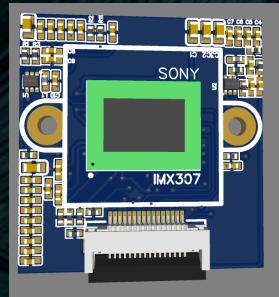
Milk-V Duo 多功能扩展板



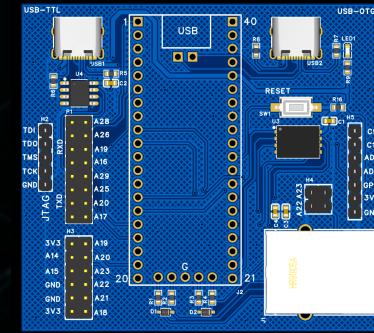
Milk-V Duo USB&RJ45 扩展板



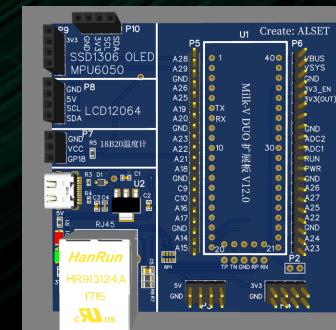
Milk-V Duo JTAG 扩展板



Milk-V Duo 摄像头模块 (社区自制)



Milk-V Duo 多功能基础底板 (社区自制)



Milk-V Duo 多传感器支持底板 (社区自制)

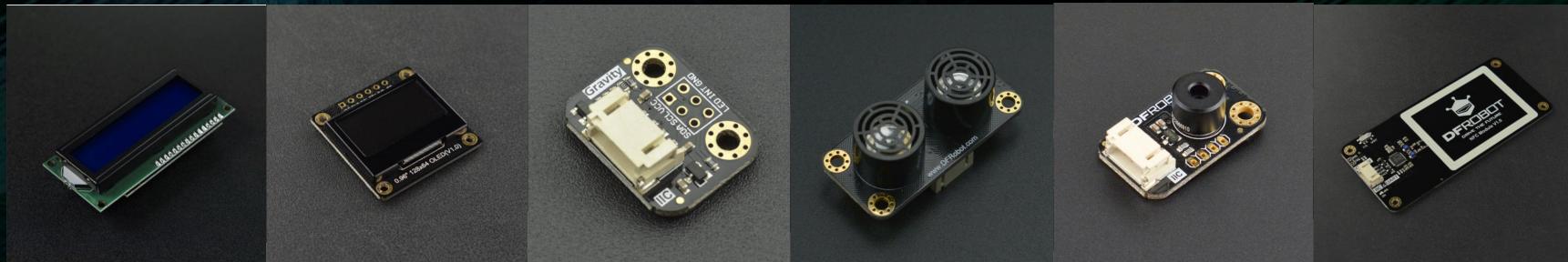


Milk-V Duo SC200AI 摄像头



# 支持PinPong库

- 部分支持硬件 约50种：
- Gravity系列数字传感器
- Gravity系列模拟传感器
- Gravity系列I2C传感器



DFR0063  
1602显示器

DFR0650  
12864显示器

SEN0212  
Tcs34725  
颜色传感器

SEN0304  
超声波  
传感器

SEN0206  
红外测温  
传感器

DFR0231  
NFC近场通讯

# 全球捐赠计划

## Global donation Program

捐赠数量 10K

Donation quantity: 10,000 units.

国内: 算能生态部& 软件所PLCT实验室吴伟团队

海外: RISC-V基金会



# 启动RUYI SDK计划 开源重构SDK-业内首次

Launch the RUYI SDK initiative. Open-source SDK reconstruction - the first in the industry.



# 向这个时代这样一批伟大的开发者致敬

## Salute to the great developers of this era.

感谢开芯院包老师团队

感谢软件所PLCT实验室 吴伟老师团队

感谢山东大学智能创新研究院戴鸿君教授团队

感谢Milk-V

感谢澎峰科技

感谢兆松科技

感谢算能魏超、乔德浩团队

王贺

苏业钦

.....  
感谢所有的开源社区的贡献和支持