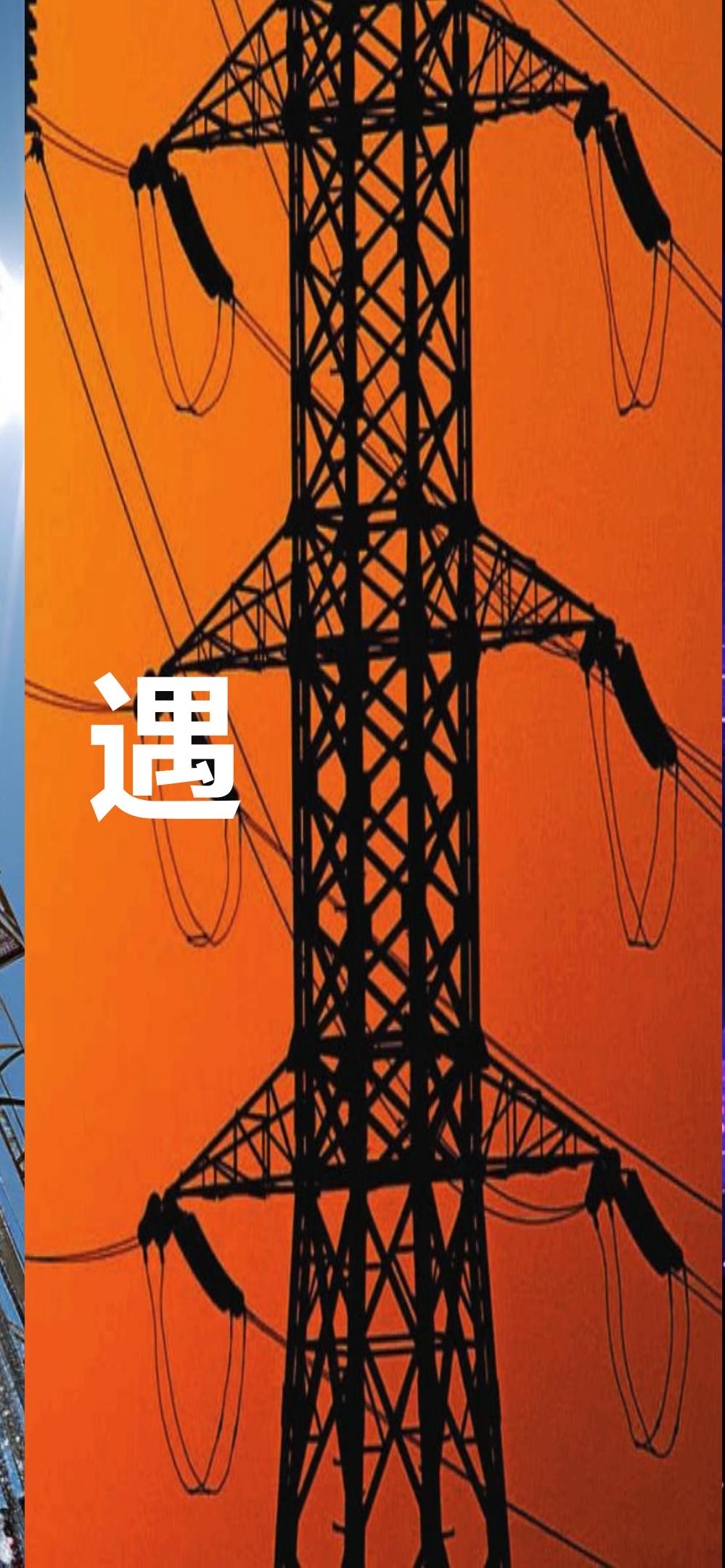


开启算力新纪元

基于RISC-V的开放算力探索和展望

算能 高级副总裁 高鹏



机遇



Intelligence
Everywhere



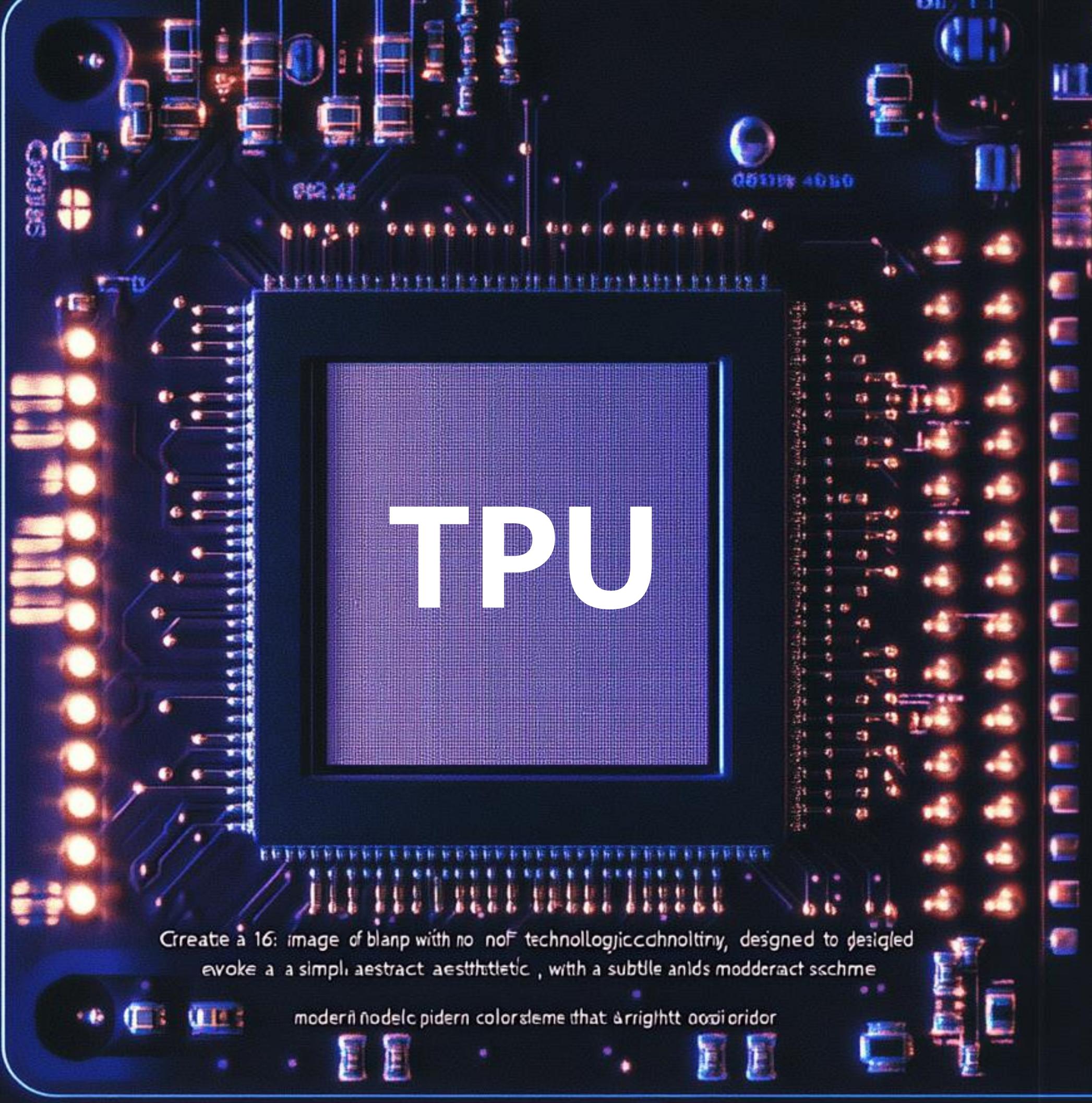
It Starts With



RISC-V



探索 算能技术路线



- More comprehensive support for Intelligent models
- Higher performance-cost ratio
- Higher performance-power ratio

TPU 1.0



图片分类



目标检测



实例分割



语义分割

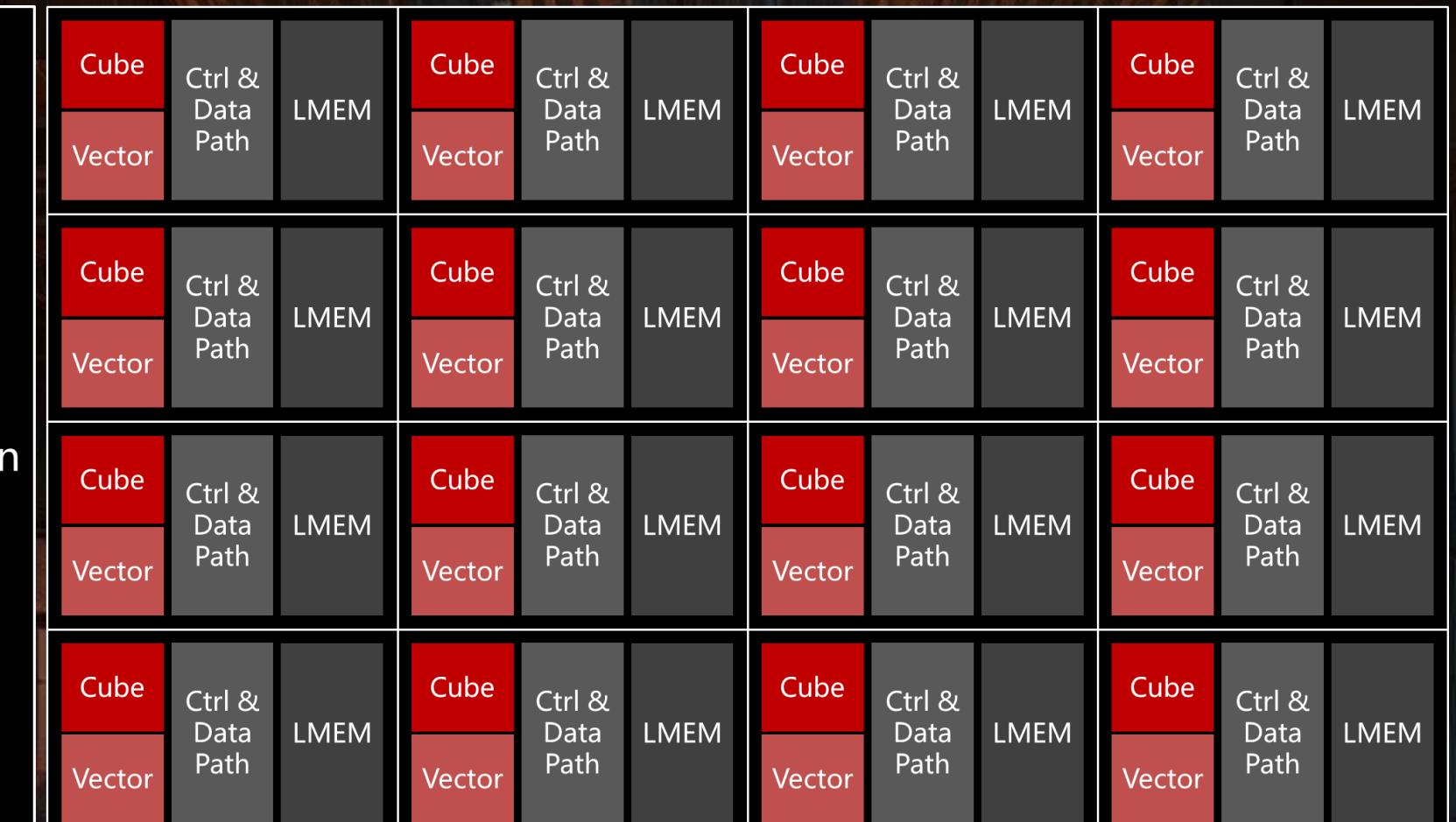


行为分析

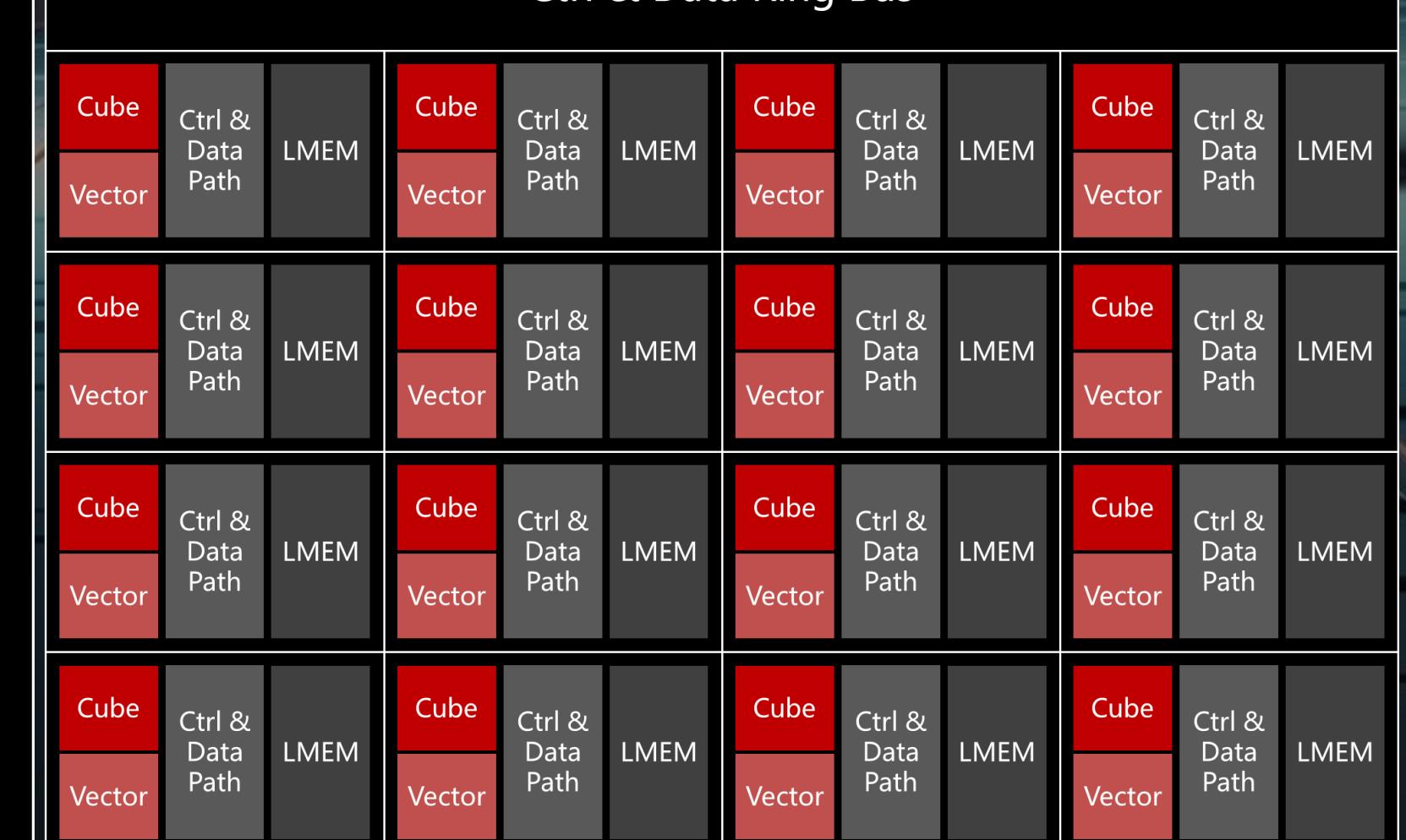


文字识别

Tensor
Instruction
Unit



Data
Access
Port



自研指令集

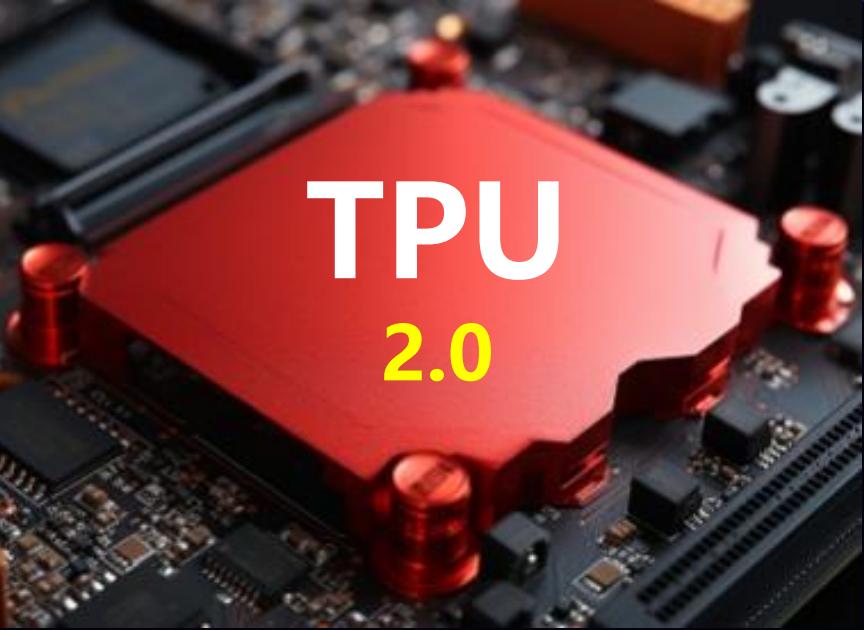
- 操作数为四维张量
- 大粒度指令：CONV、FC
- 支持 INT8、FP32 精度

自研架构

- 单一指令核心、多个计算核心
- 基于 SRAM 的近存计算

自研总线

- 简单高效
- 支持广播



TPU

2.0

+



语言处理



语音识别



语音合成



搜索推荐

更多

- ✓ 新增支持 **FP16、BF16、INT32、INT16**
- ✓ 新增支持 **可编程重量量化、反量化**
- ✓ 新增支持 **DeformConv、ROI Pooling**
- ✓ 新增 **适配Transformer的矩阵乘法指令**
- ✓ 新增支持 **Scatter、Gather、Mask select**
- ✓ 新增支持多种前后处理算法：**全库 TopK、分库 TopK、Embedding、NMS**

更强

- ✓ 卷积和矩阵乘峰值算力达到 **100%**
- ✓ Transformer 类模型性能比前代提升 **50倍**
- ✓ TopK、NMS 性能比前代提升 **10倍**

TPU

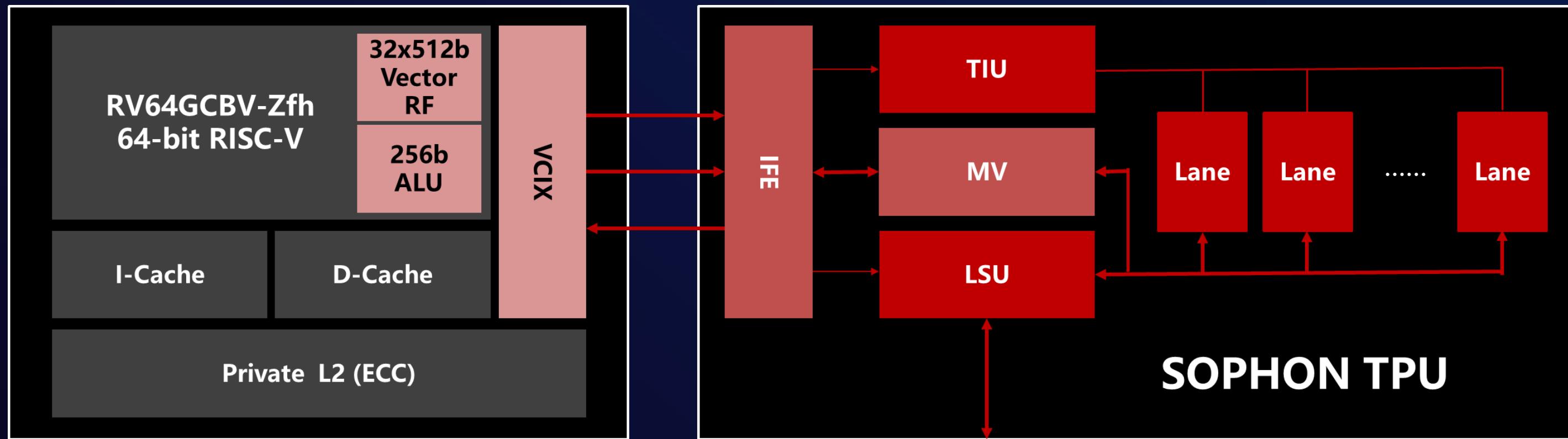
3.0



RISC-V

Tensor

扩展指令



面向智能计算的指令定义

- 图像、语言、语音模型全支持
- 完备、正交、高效
- 支持多核心协作

面向智能计算的寄存器

- 操作数据为四维张量
- 超大长度，最大可达 256KB
- 灵活的物理存储布局支持

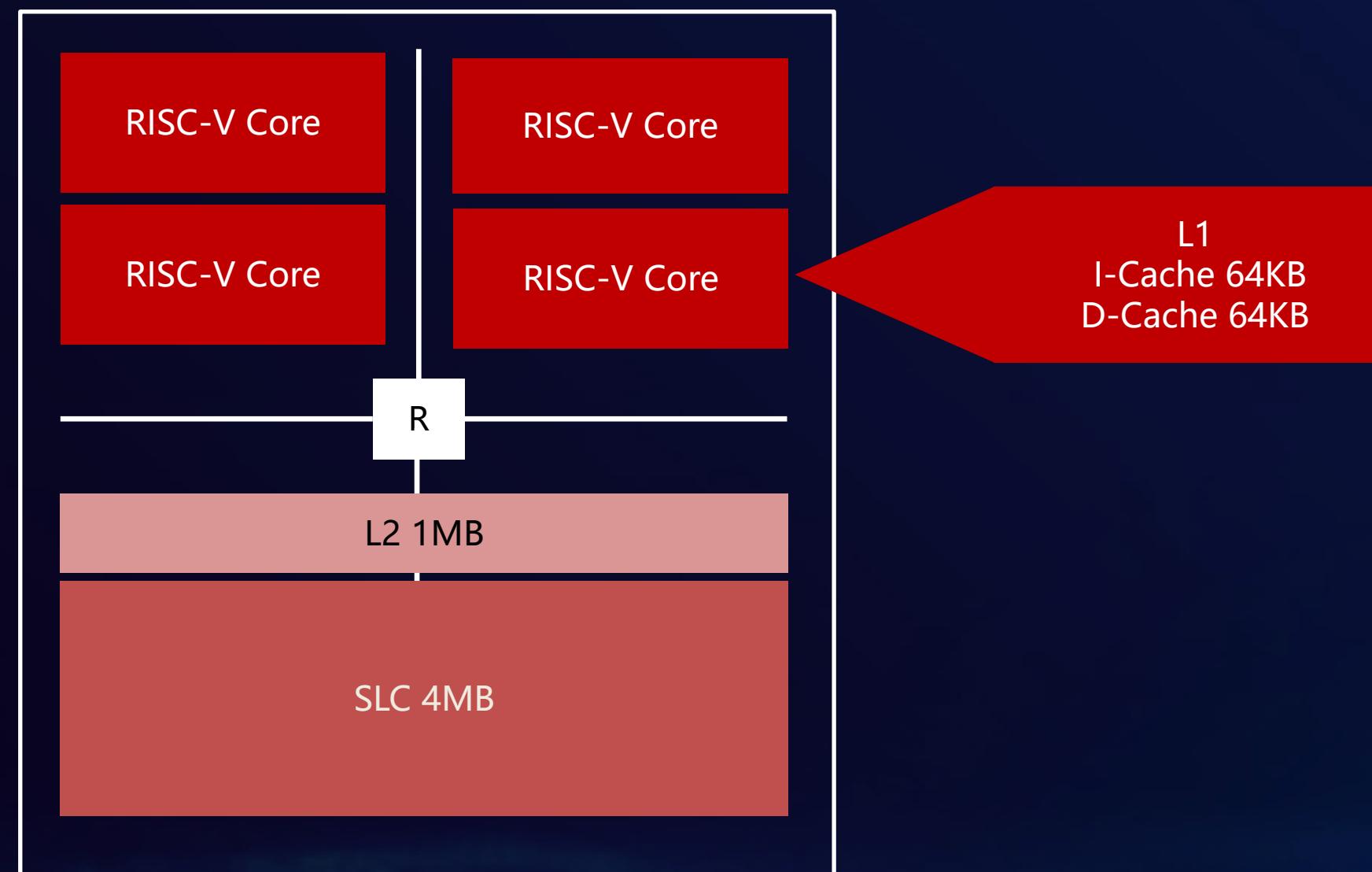
Processor

Create a 16: image of blap with no noF technologyahnoltiny, designed to designed
evoke a a simpl abstract aesthetic , with a subtle and modern scheme

modern colorscheme that arright oodiorid

Embracing RISC-V
Focusing on High Performance

Processor 1.0



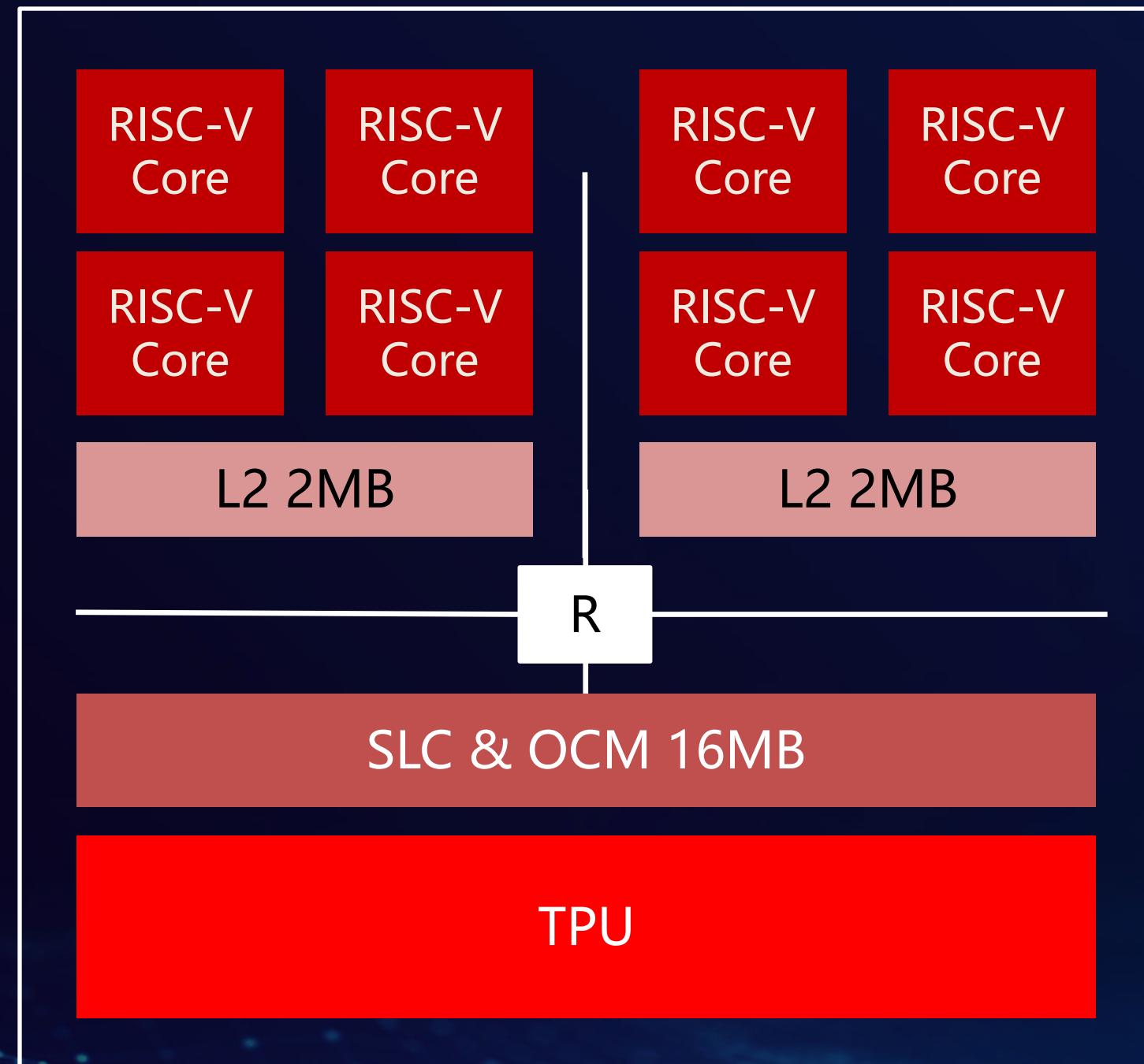
RISC-V Core

- RV64GC
- Vector 0.7
- SV39

Cache

- 64 KB L1 I\$ & D\$
- 1 MB L2 \$
- 64 MB SLC

Processor 2.0



RISC-V Core

- Vector 1.0
- SV48

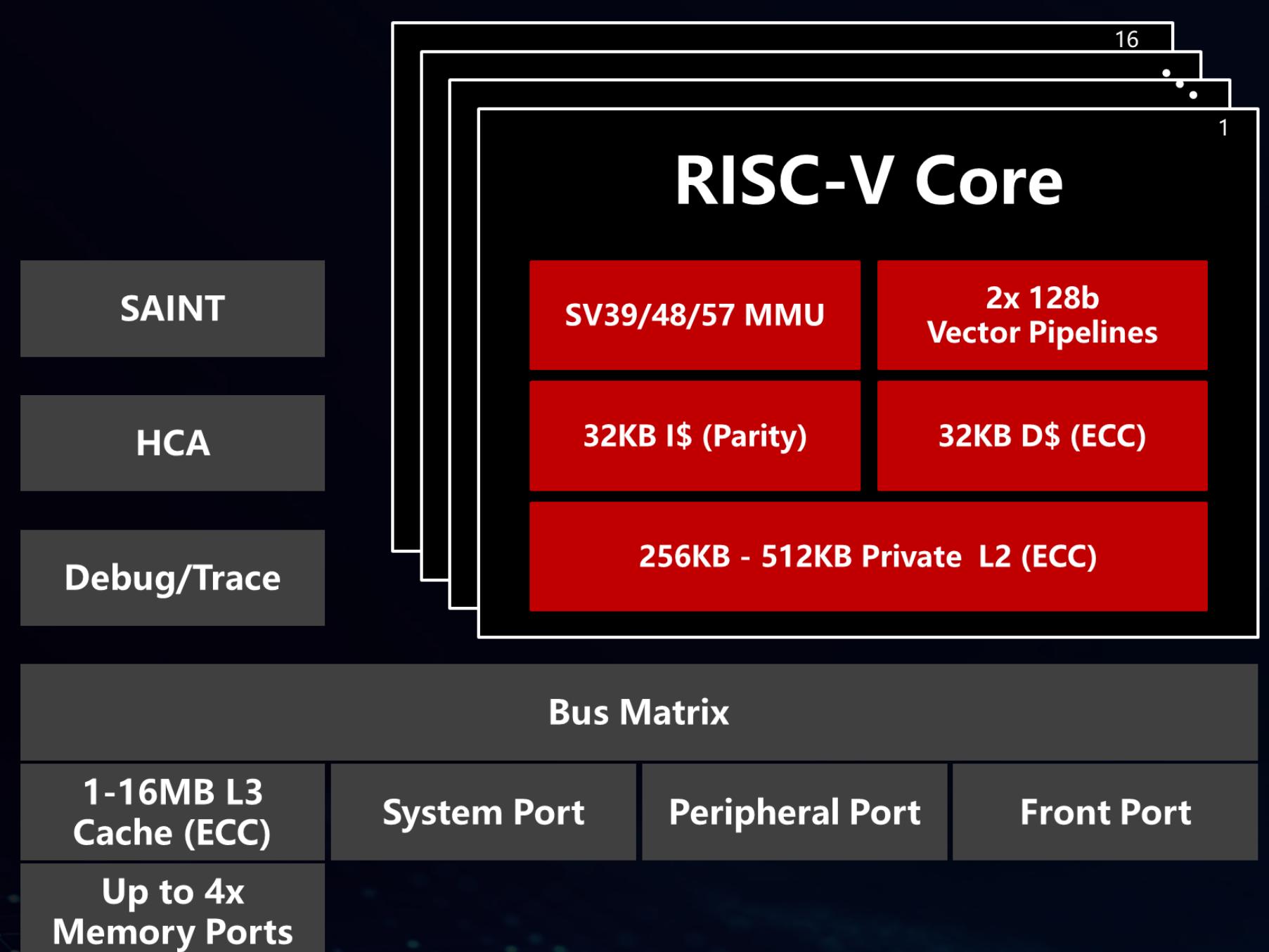
Cache

- 2 MB L2 \$ 100% ↑
- 128 MB SLC 100% ↑
- Support ECC

System

- MSI-X
- Open OCD

Processor 3.0



12+ SPECInt2k6 / GHz
RVA22

64-bit RISC-V 指令集
Hypervisor 扩展
MSI 中断处理器

Vector 扩展
2x 128b 向量计算单元

16 核一致性子系统
一致性总线支持多子系统一致性

先进的安全功能
加密加速指令扩展

完备的 跟踪和调试
能力



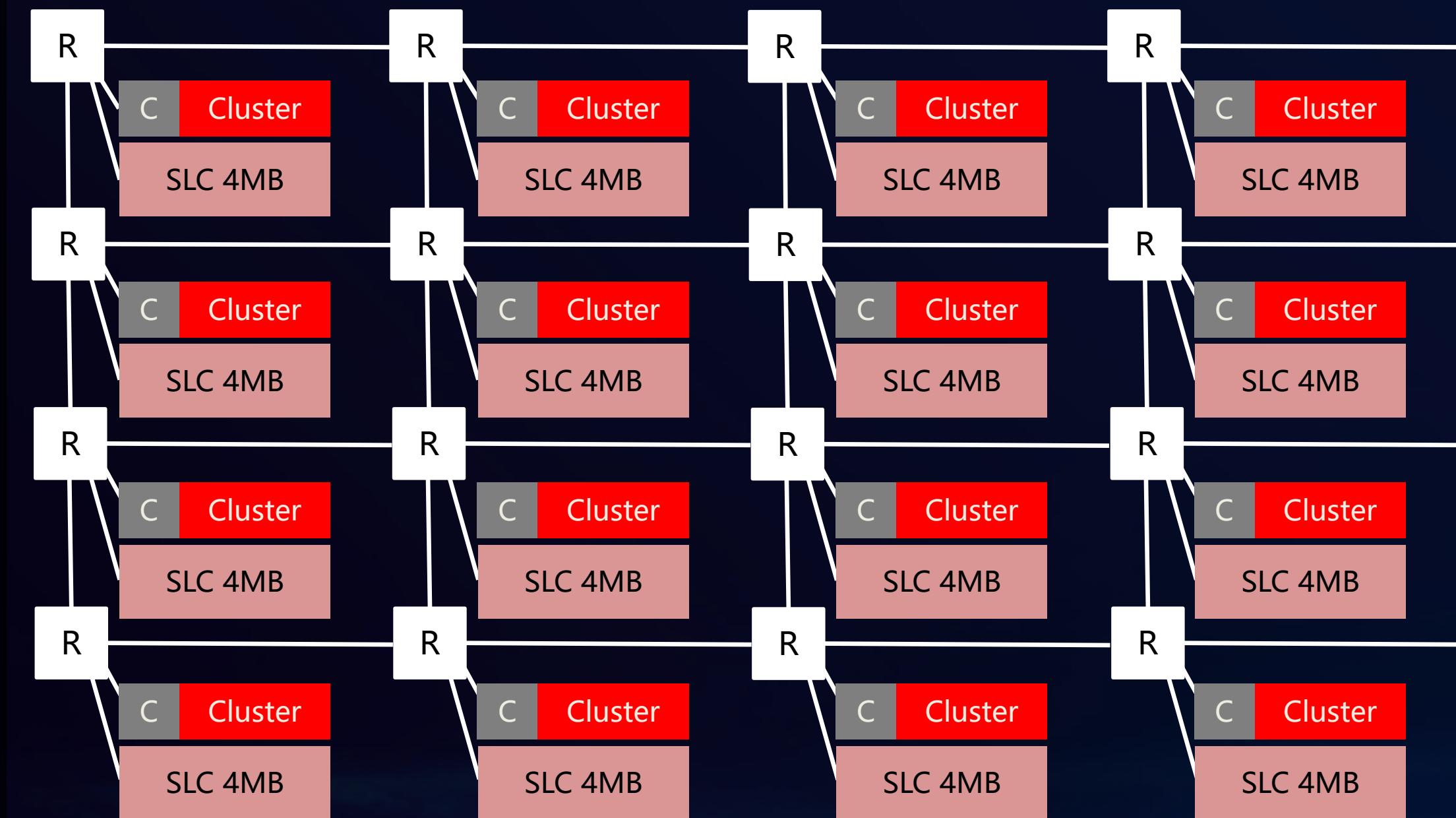
NOC

Create a 16: image of blap with no noF technologychnology, designed to designed
evoke a a simple abstract aesthetic , with a subtle and modern scheme

modern colorscheme that bright colors

- Support heterogeneous fusion computing
- Higher performance

NOC 1.0



R Router

C CHI

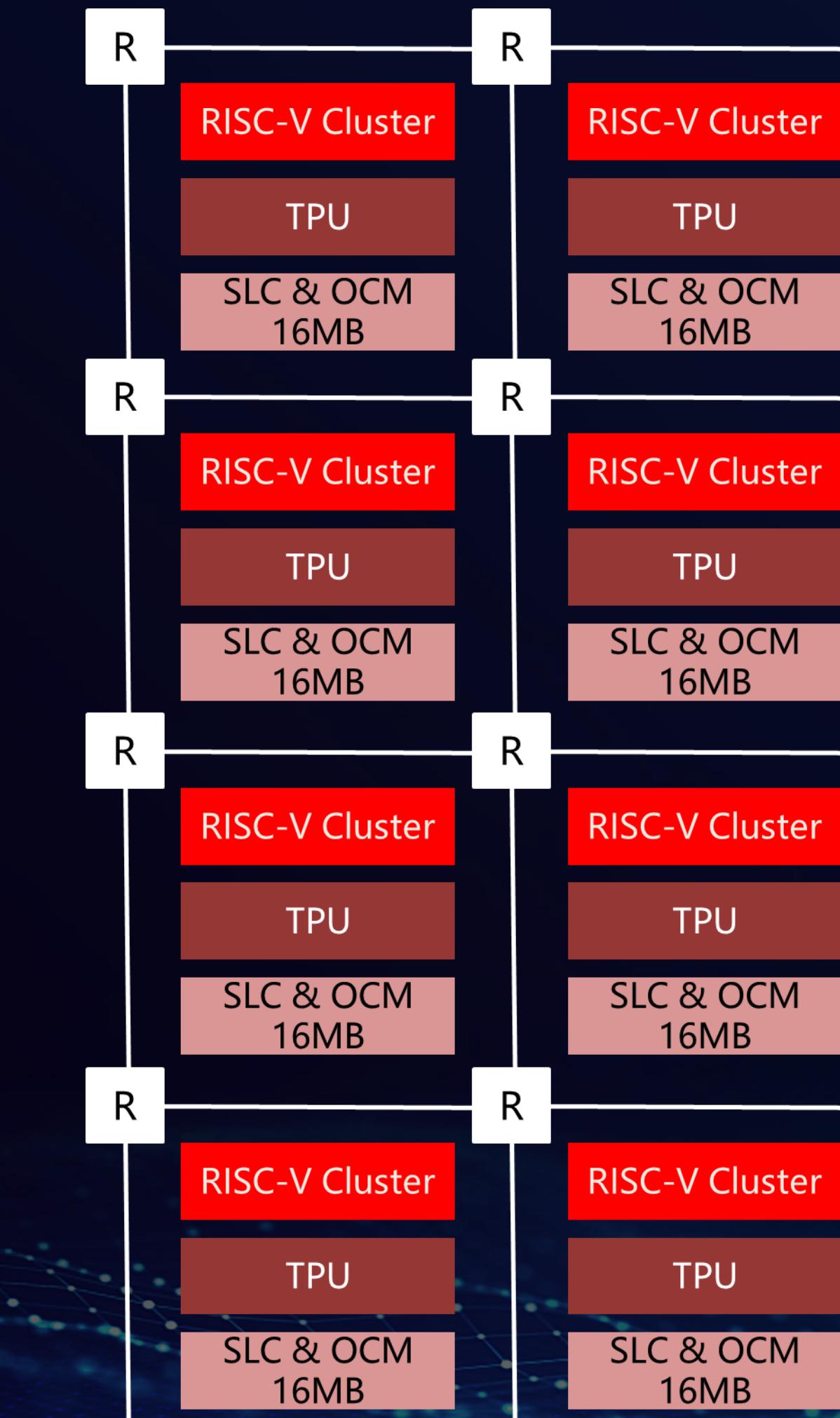
RISC-V Cluster

SLC

256bit @1GHz

Support 16
clusters

Support 2 site
system



1024bit @2GHz

Support **DVM**

Support **IO Coherence**

Support configurable **DDR**
Interleave

ISP+CV

Create a 16: image of blap with no nof technollogicahnoltiny, designed to designed
evoke a a simpli abstract aesthetic , with a subtle ands modderact sscheme

moder nodelc pidern colorlame that arright oxi oridor

Enable Machines to See
More Clearly

ISP+CV

1.0

- High Dynamic Range
- 3D Noise Reduction
- Lens distortion correction
- Auto Exposure
- Auto White Balance
- Auto Focus
- Dehaze



ISP + CV

2.0



- Fish Eye Spread Out
- Binocular Depth
- Multi-image Stitch



Professional ISP



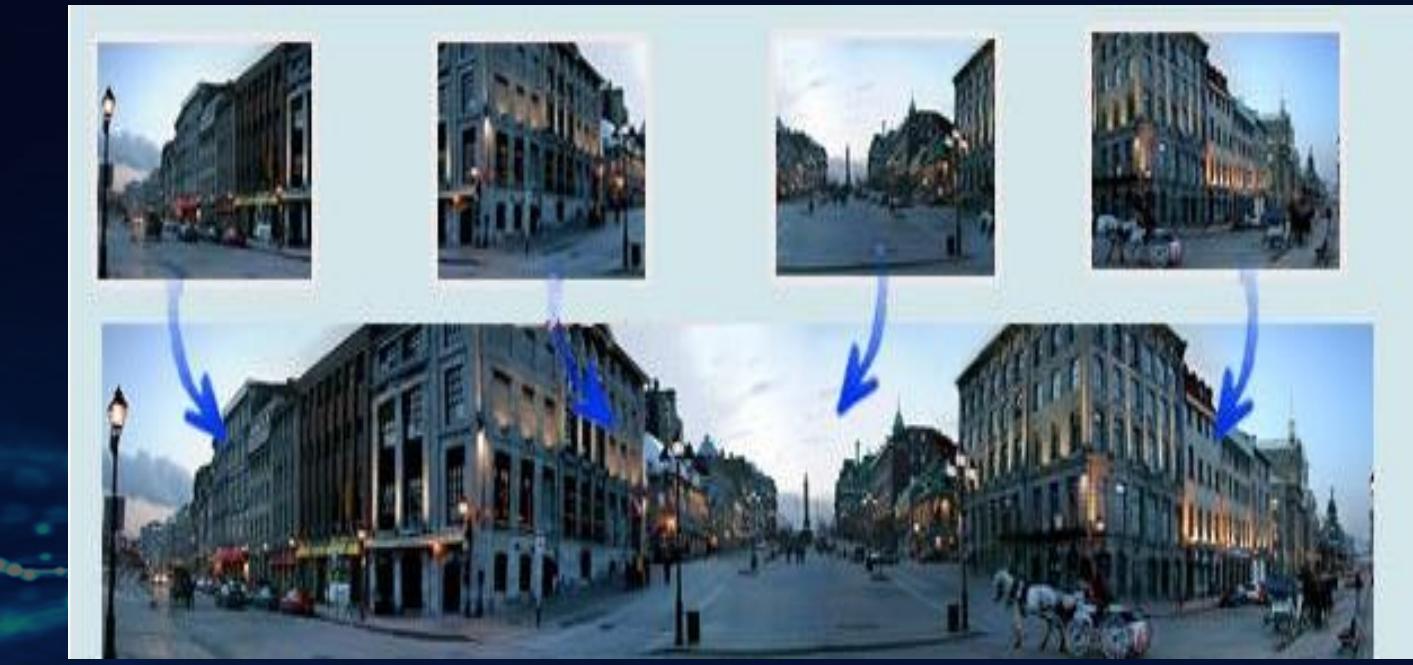
Binocular depth



Fish eye spread out



Multi-image stitch



ISP+CV 3.0



Intelligent ISP

- Noise Reduction
- Dynamic Range Compression



NR

- 细节更清晰
- 噪声更少
- 拖影更少

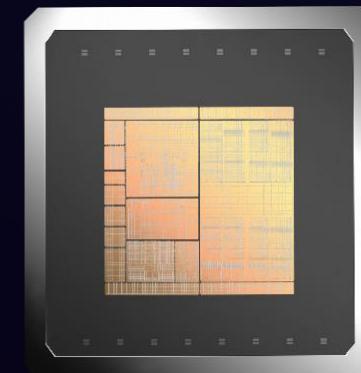
DRC

- 色彩饱和度改善
- 对比度提高
- 暗区细节增强



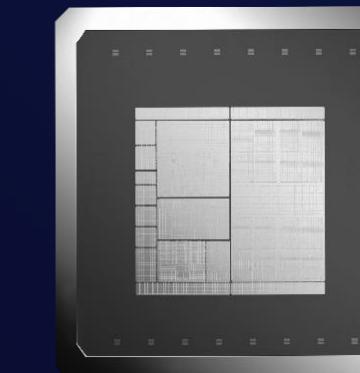
成 果

Cloud



SG2042
Processor1.0+NOC1.0

Server-grade RISC-V
Processor

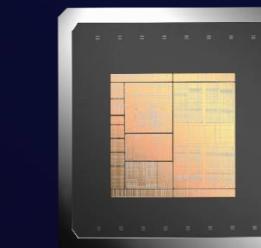


Coming

SG****
Processor2.0+NOC2.0+TPU2.0

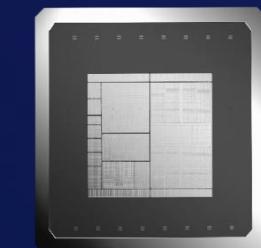
2nd Generation Server-grade
RISC-V Processor

Edge



SG2300
TPU2.0

Edge Processor for
Large Intelligent Model

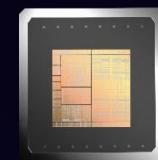


Coming

SG****
Processor3.0+TPU3.0+ISP3.0

Fusion Computing Processor
for Intelligent PC and Edge
Server

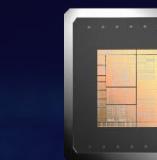
Terminal



SG200X
TPU1.0+ISP1.0

Terminal Intelligent
Computing Processor

1.0

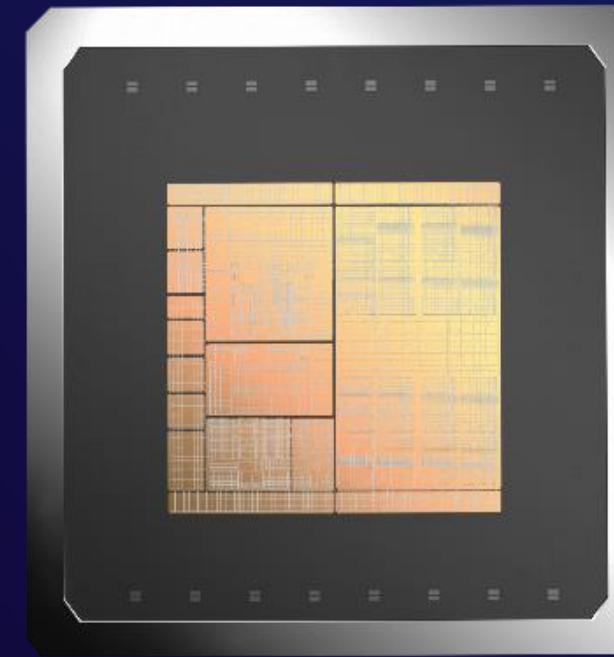


CV186
TPU2.0+ISP2.0

Terminal High-end Intelligent
Computing Processor

2.0

3.0



SG2042

The first server-level RISC-V processor

64 core RISC-V
2GHz

64 MB
System level cache

Support **2** site
System

256 GB DDR4
102.4 GB/s

2* X16 Gen4
PCIe

This Processor is FREE! Milk-V Pioneer with RISC-V



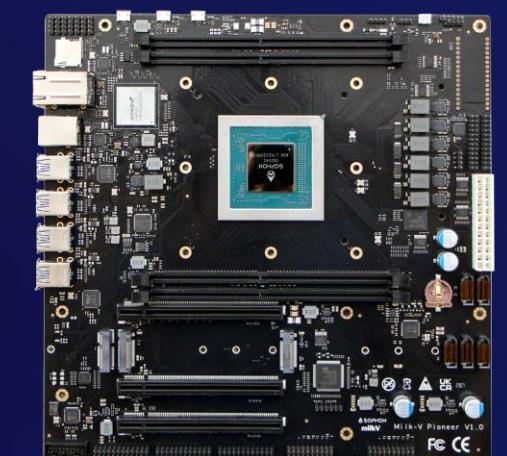
Linus Tech Tips
1580万 位订阅者
126万 次观看
5万 点赞

You Tube



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

New RISC-V International member SOPHGO is committed to the development and promotion of RISC-V Processor 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.



RISC-V Cloud Computing is Coming

First commercial RISC-V-based cluster (48 nodes) delivered to Shandong University in late September 2023



Distros



Emulators

SPIKE



Cloud Language

=GO



node
JS



Cloud Infrastructure



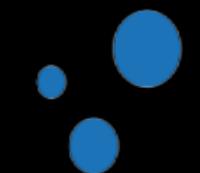
redis



NGINX



JBoss



VARNISH CACHE



SQUID



ACTIVEMQ

Cluster Management



Prometheus

DASHBOARD

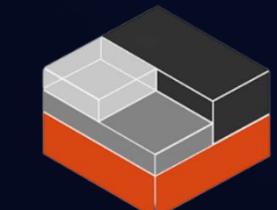
Containers



kubernetes



podman



LXD



docker

Storage and Data



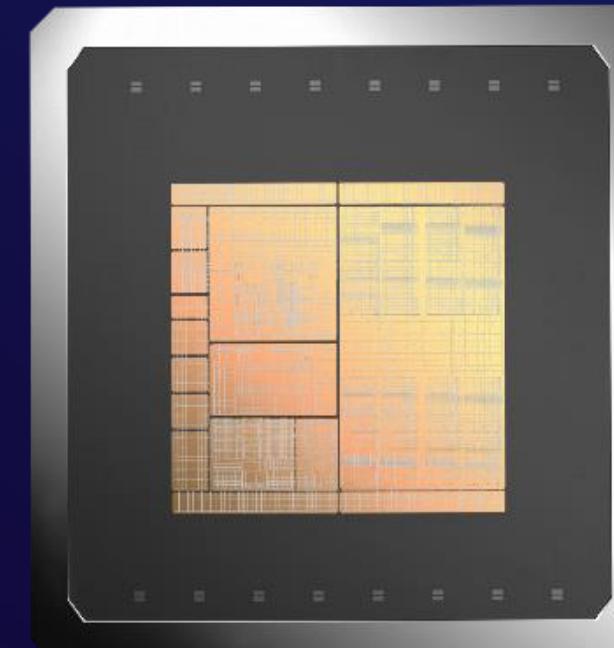
PostgreSQL



MariaDB



ceph



SG2300

Leadership generative intelligent accelerator at edge

32 TOPS INT8

16 TFLOPS FP16

8 core A53

2.3 GHz

32* 1080P @25FPS

Video decode

12* 1080P @25FPS

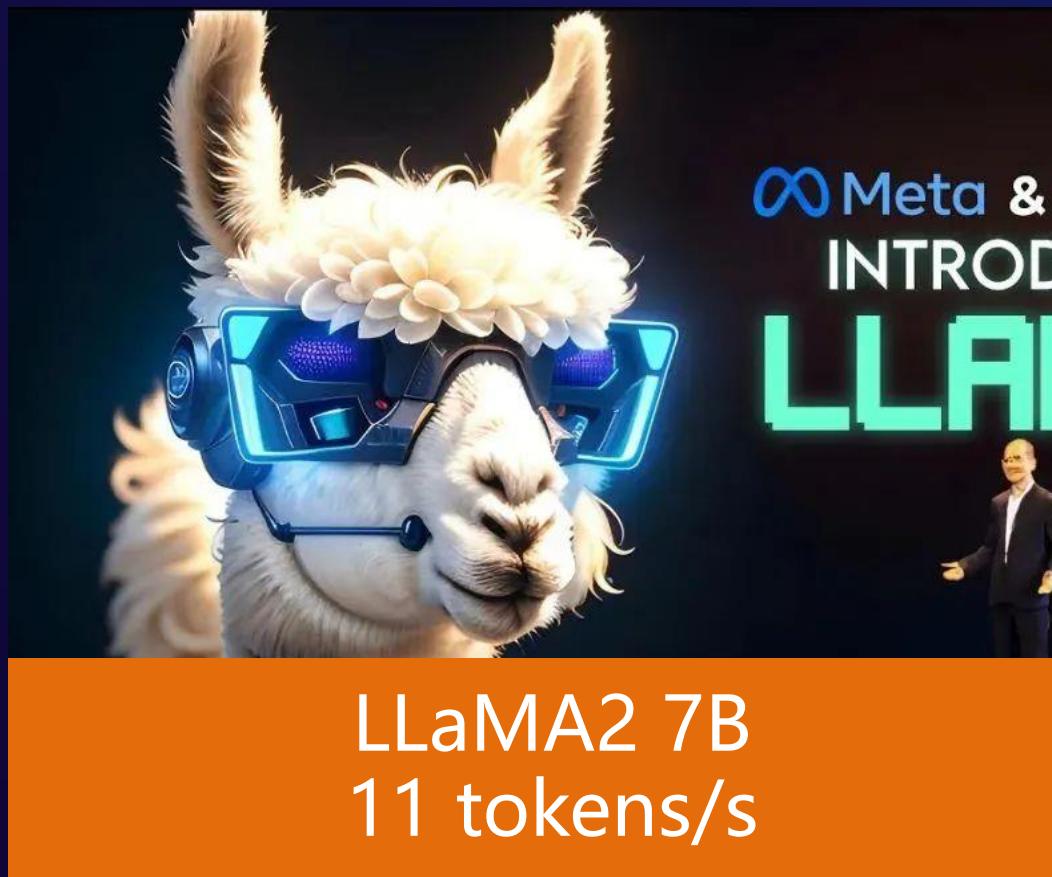
Video encode

128b LPDDR4X &

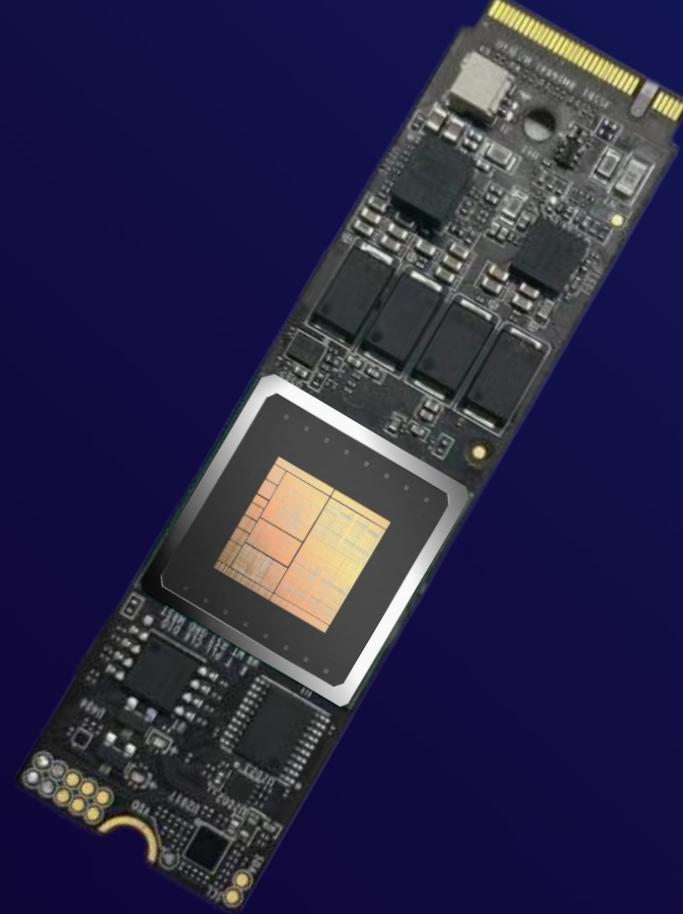
Up to **16** GB

PCIe **Gen3**

X8 EP + X8 RC



SG2300 边缘大模型的最佳算力平台





SG200X

Terminal Fusion Computing Processors for the
Development of the Ecosystem

C906	1GHz	Up to 512MB DRAM	Up to 2* 2 lane MIPI CSI	4M pixels Advanced ISP	5M@30fps Video encode
C906	700MHz				
ARM A53	1GHz				
TPU	0.5~1 TOPS				
8051					

全开源

芯片资料

SDK

工具链

模型



手势识别

人体关键点检测

人体检测

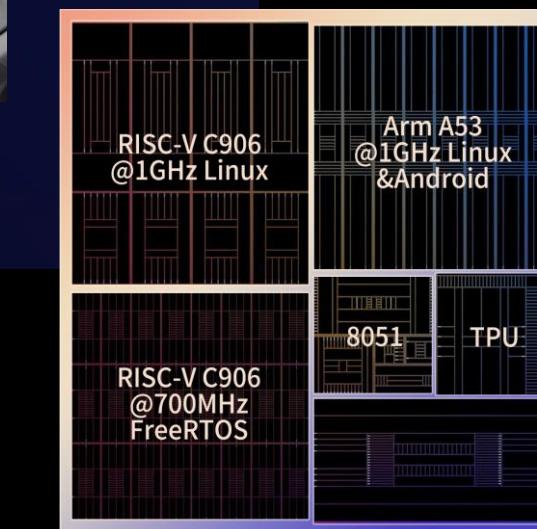


红外人体检测

车牌识别

交通工具识别

10



>8万
开发者用户

>5,000
贡献者

100+ 外设



显示屏

手势传感器

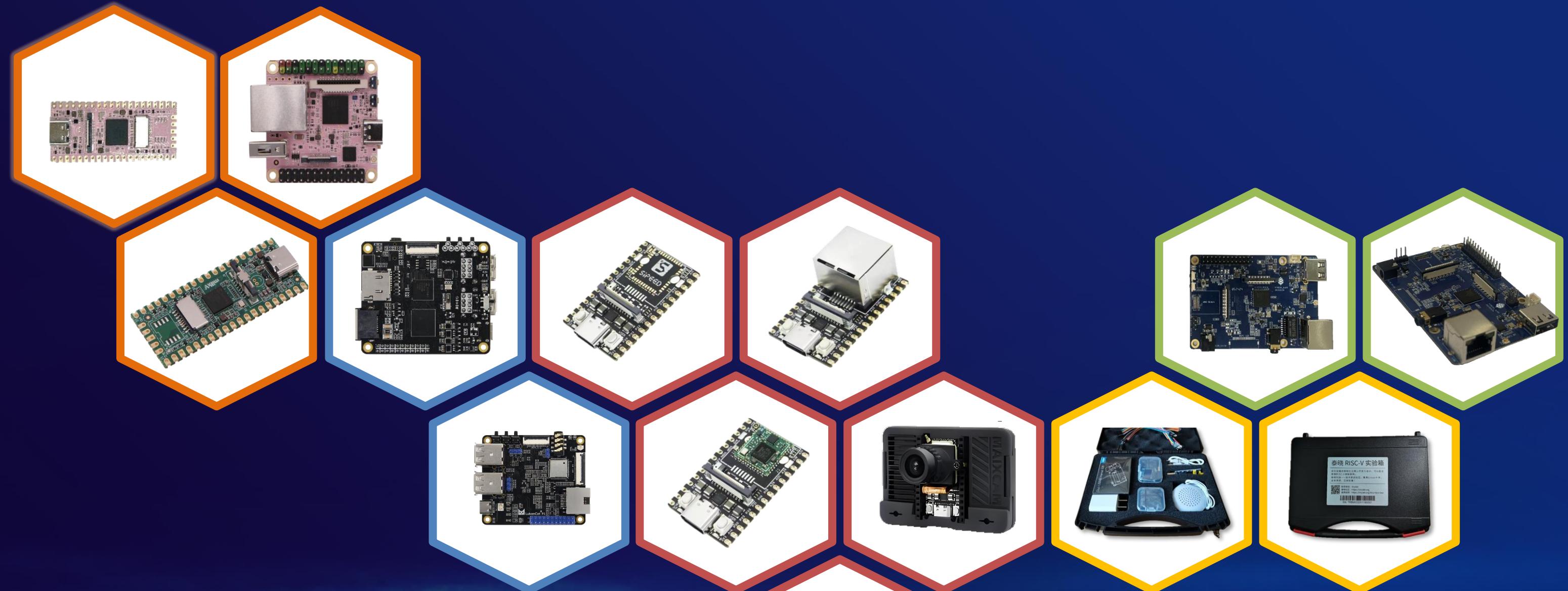
红外传感器

超声波测距
传感器



基于 SG200x 小核 C906 全面适配 Arduino
代码全部开源

共创 RISC-V 硬件生态!

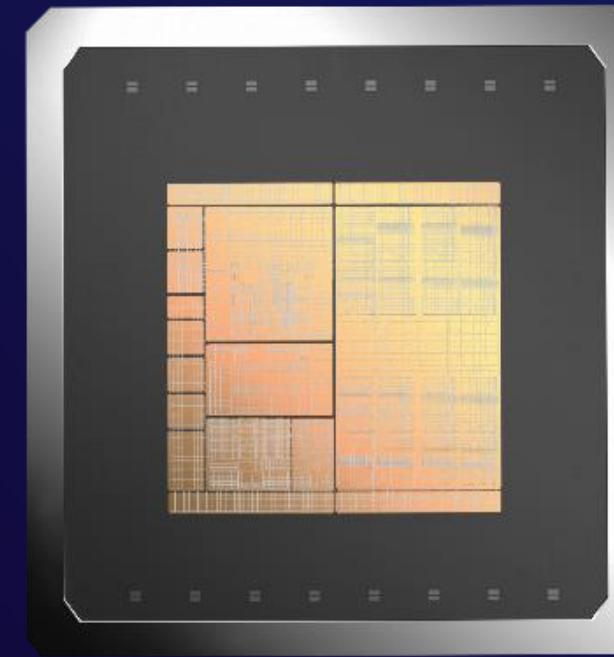


展望

Bringing RISC-V to the Intelligent PC and Edge Server Market

More economical
More intelligent





OASIS

Fusion computing processor based on SOPHGO
3.0 technology platform

16 core P670	Up to 32 TOPS INT8	Desktop Level Graphic	4K 60fps Intelligent ISP	256 bit LPDDR5
12 SPECInt2K6 / GHz	16 TFLOPS FP16	Imagination AXT-16-512	4K 60fps video decode	Up to 128 GB
Hypervisor extension	Intelligent computing	Vulkan, OpenGL, OpenGL ES	4K 30fps video encoder	

OASIS 助力个人电脑大模型性能倍增

OASIS Enhances Performance of PC LLM

350% Faster
LLaMA2 7B W4A16

Only 40%
Price

8X
Performance-price
Ratio

OASIS 使边缘服务器通用算力性价比倍增

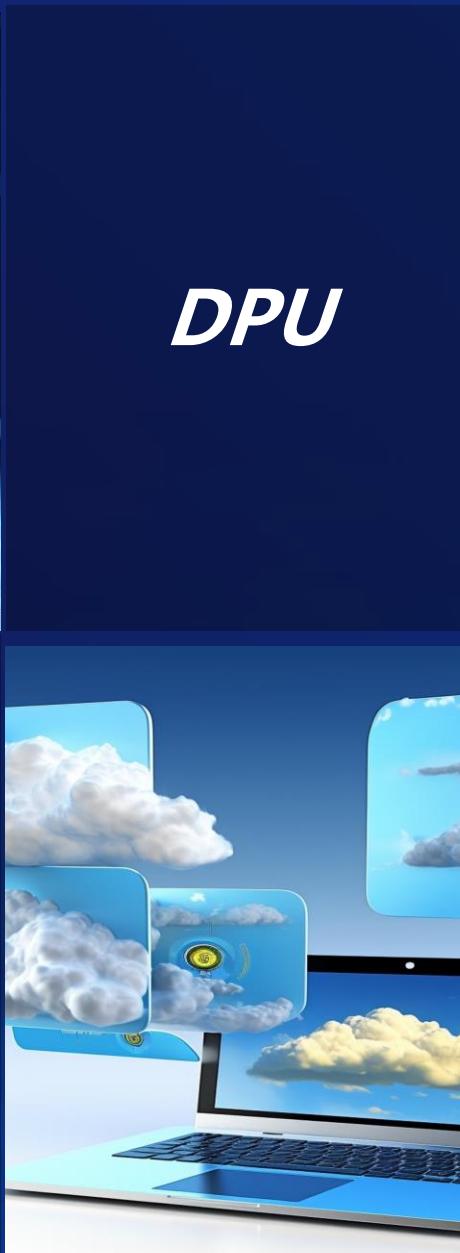
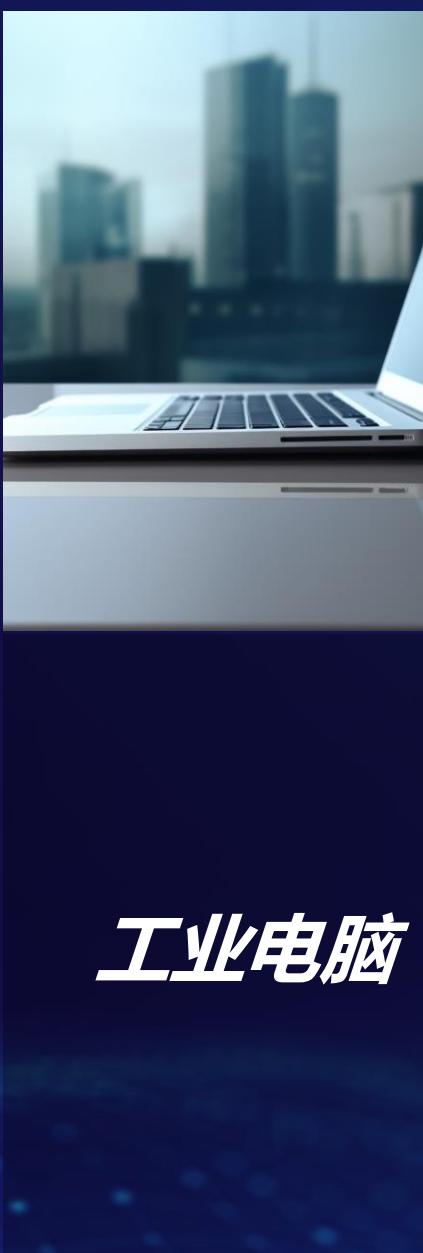
OASIS Enhances the Cost-Effectiveness of Edge Server General Computing Power

80% Performance
Mainstream X86 8-core
16-thread Server
Processors

Only 40%
Price

2X
Performance-price
Ratio

探索 RISC-V 的无限可能



软件吞噬世界，开源软件吞噬软件

已经没有任何公司或主权可以独立维护所有的软件栈

开源软件已经成为存储全人类知识的基础设施





甲辰计划

ASE PLCT

算有巨
SOPHGO

愿景使命：

在下一个丙辰年（2036龙年）之前，基于 RISC-V 实现从数据中心到桌面办公、从移动穿戴到智能物联网全信息产业覆盖的开放标准体系及开源系统软件栈，使 RISC-V 软硬件生态达到或超过其它主流架构的生态成熟度。

目标：

- 联合100家以上芯片及方案厂商、500家以上软件企业，在18个以上基础关键行业领域完成面向RISC-V的适配与优化，合作完成超过 1000 款重要行业及商业软件的移植与部署。
- 围绕SG2380、香山等高性能RISC-V芯片及IP，帮助业界完成基于RISC-V的、可以商业交付落地的行业解决方案，包括并且不限于智能加速、边缘计算、存储、机器人、工业仿真、医疗辅助等领域。
- 建立RISC-V人才识别体系，连接超过1万名具备RISC-V芯片设计、软件开发、社区运营、教育培训专业人才，实现RISC-V人才领域的互认合作。

项目网址：<https://rv2036.org>



ASE

PLCT

算 舟
SOPHGO



openKylin

milkV

SPACEMIT
进迭时空

山东大学 智能创新研究院
ACADEMY OF INTELLIGENT INNOVATION, SHANDONG UNIVERSITY

inchi
英麒智能

苦芽

芯来科技
NUCLEI

兆松科技
Tera Pines

deepin

NCC 微纳核心
NANO-CORE CHIP

LeapFive

orange pi

PerfXLab
澎 峰 科 技

TRANSCHIP
传 智 芯 科 技

朗科智算
NETAC
SMART COMPUTING

SiFive

radxa

SiPEED

MetaStone
元石智算

秦派软件
Pulsarware Technologies

SCOFD

中科微澜
VULAB.COM.CN



HiHope

RT-Thread

华秋



TiMESINTELLI
时擎科技

WCH 沁恒

sansec
三未信安

芯昇科技
XinSheng Tech

苏州龙谷

微核心
vcore

感谢聆听！

智算赋能未来