

AI超节点基石组件的创新：高速互连系统方案实践与思考

Innovation in AI Supernode Foundation Components: Practices,
and Insights in High-Speed Interconnect Systems

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AI超节点生态演进

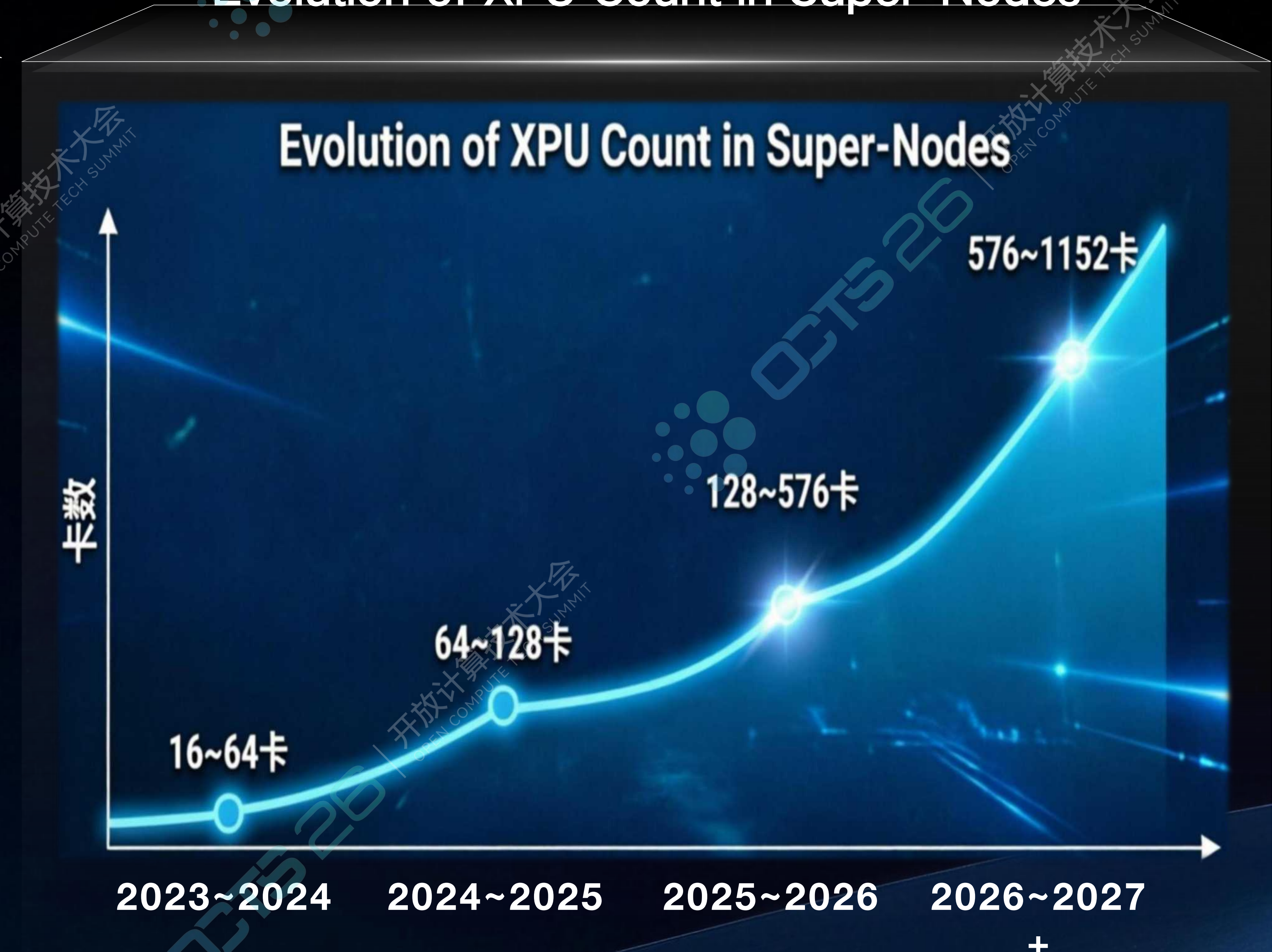
Evolution of the AI Super-Node Ecosystem

整机柜 - AI超节点生态

Rack-Scale - AI Super-Node Ecosystem

超节点XPU数量演进

Evolution of XPU Count in Super-Nodes



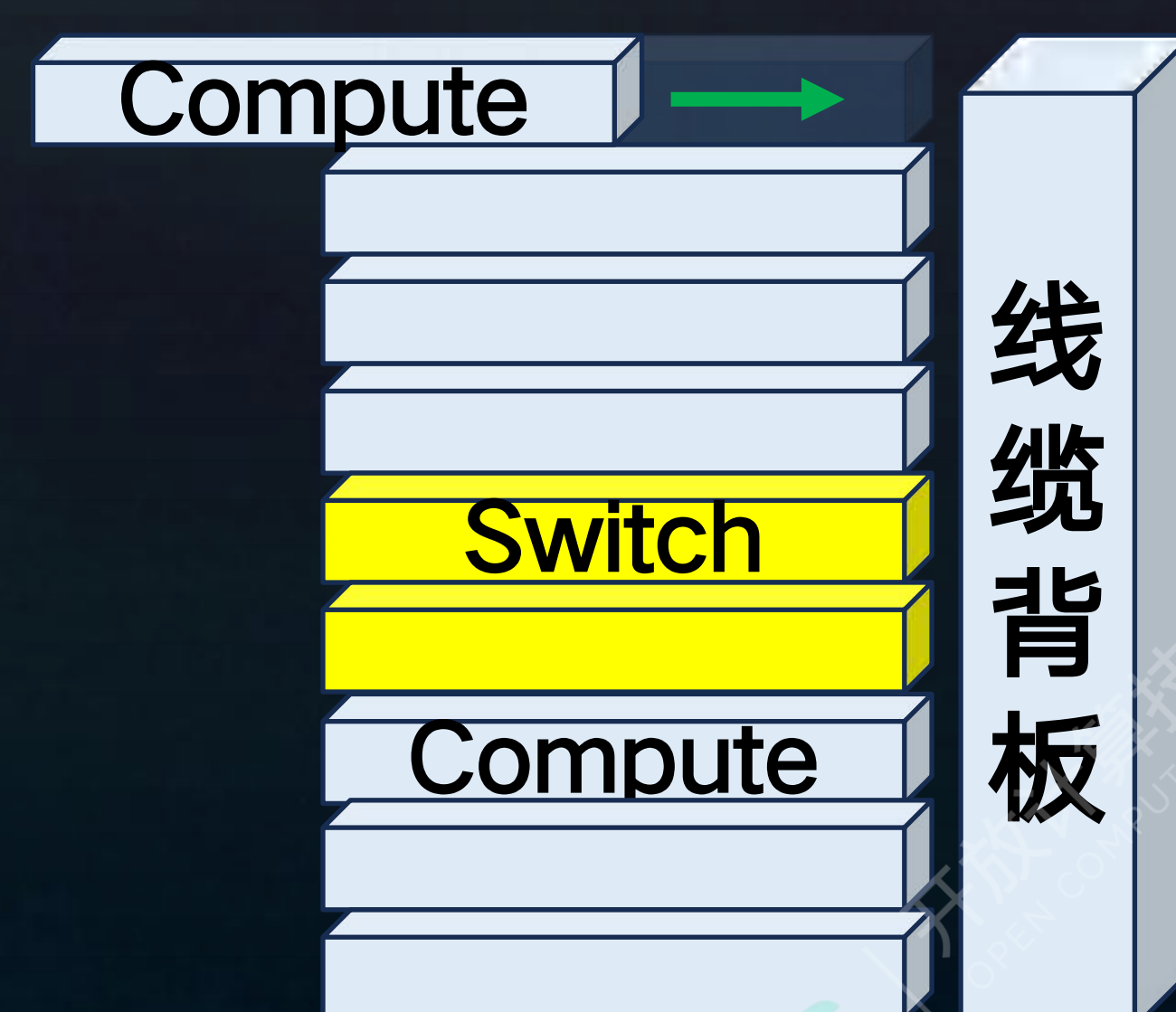
(引用- NVIDIA网站 / ODCC网站 / OCTC网站 / 百度网站 / 浪潮信息网站 / 超聚变网站 / ZTE网站 / 阿里云网站 / 新华三网站)

超节点架构形态划分与选择

Classification and Selection of Super-Node Architectures

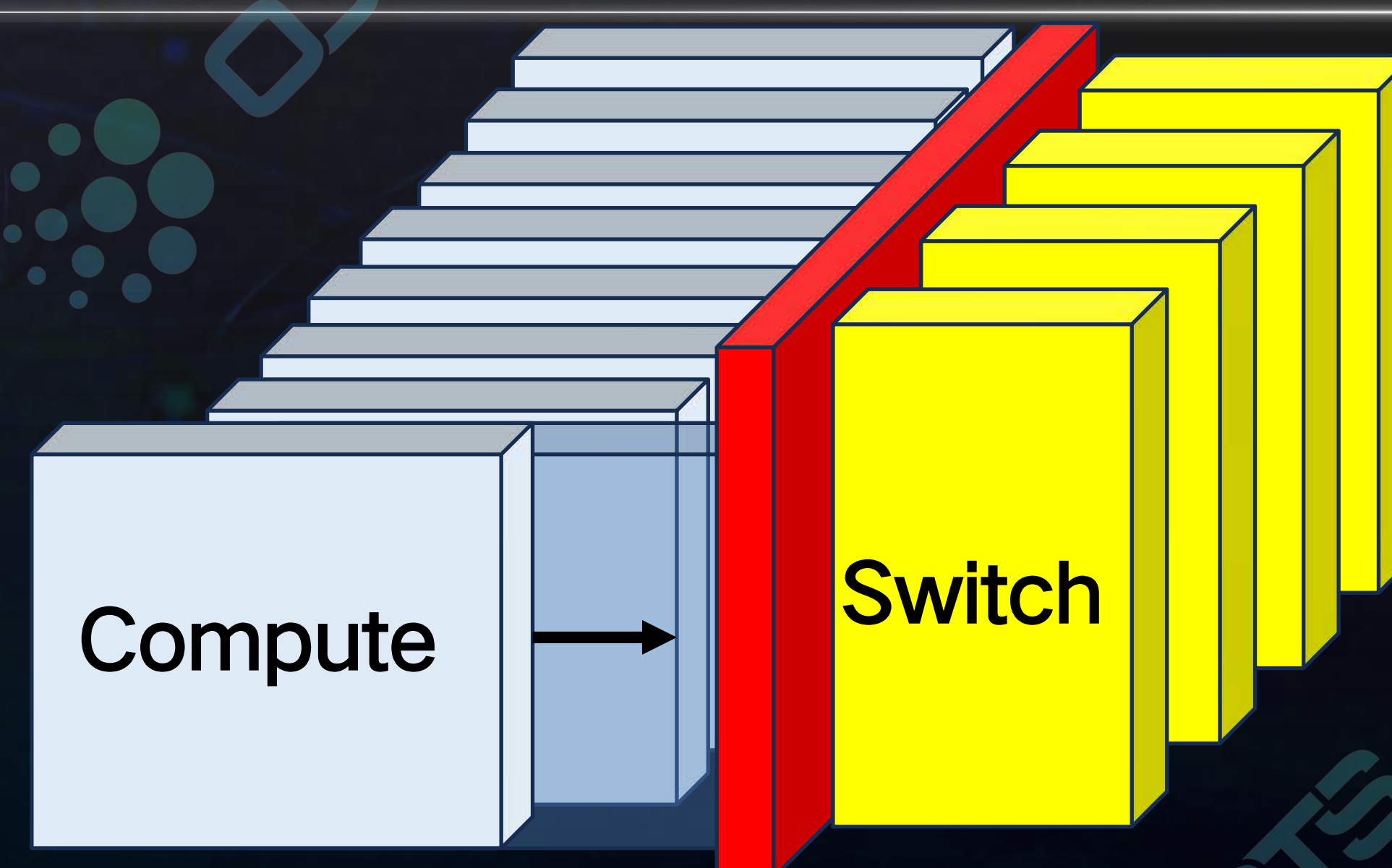
线缆背板互连 (单面横插)

Cable Tray



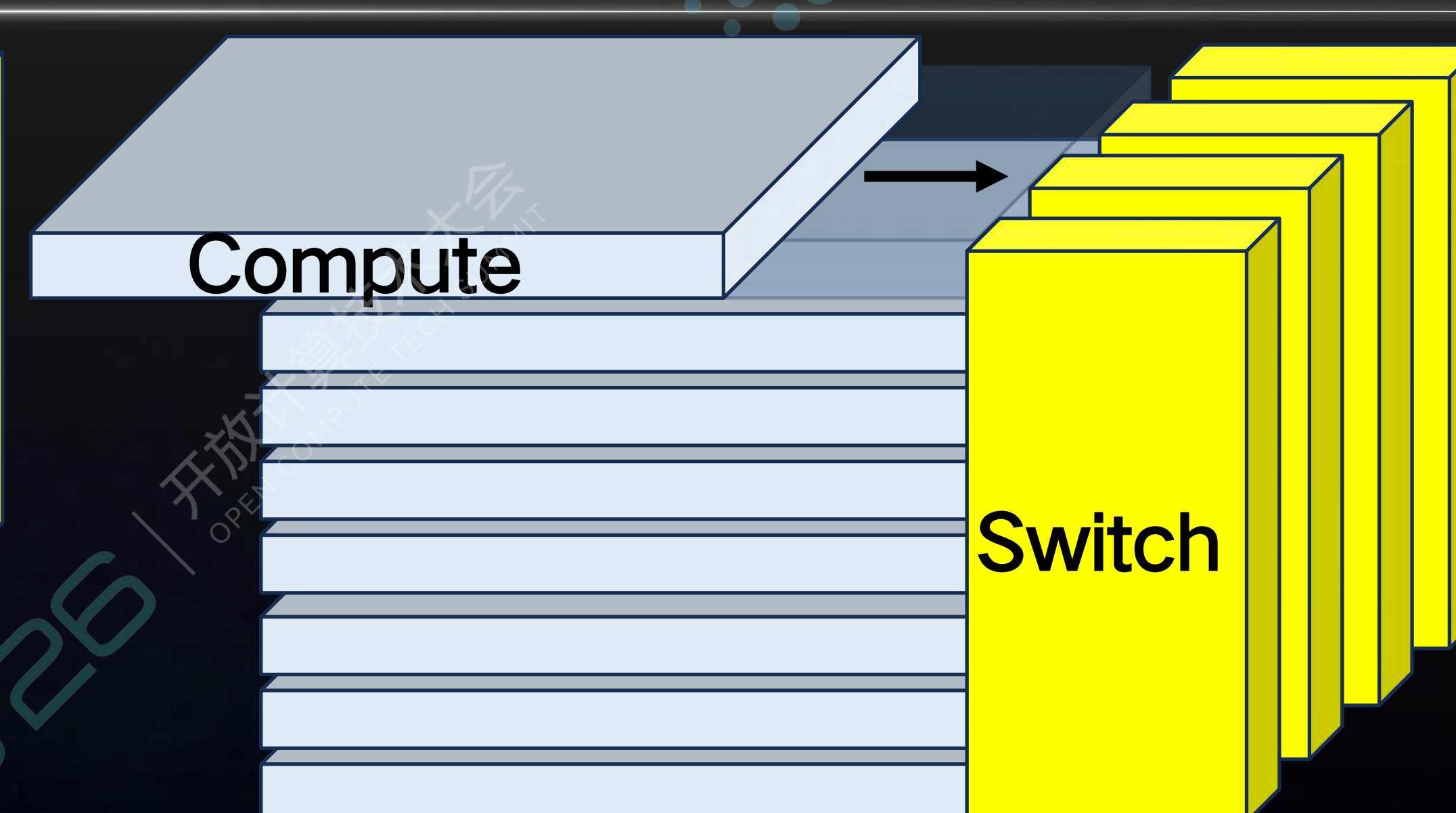
有中板正交互连

Orthogonal Interconnect



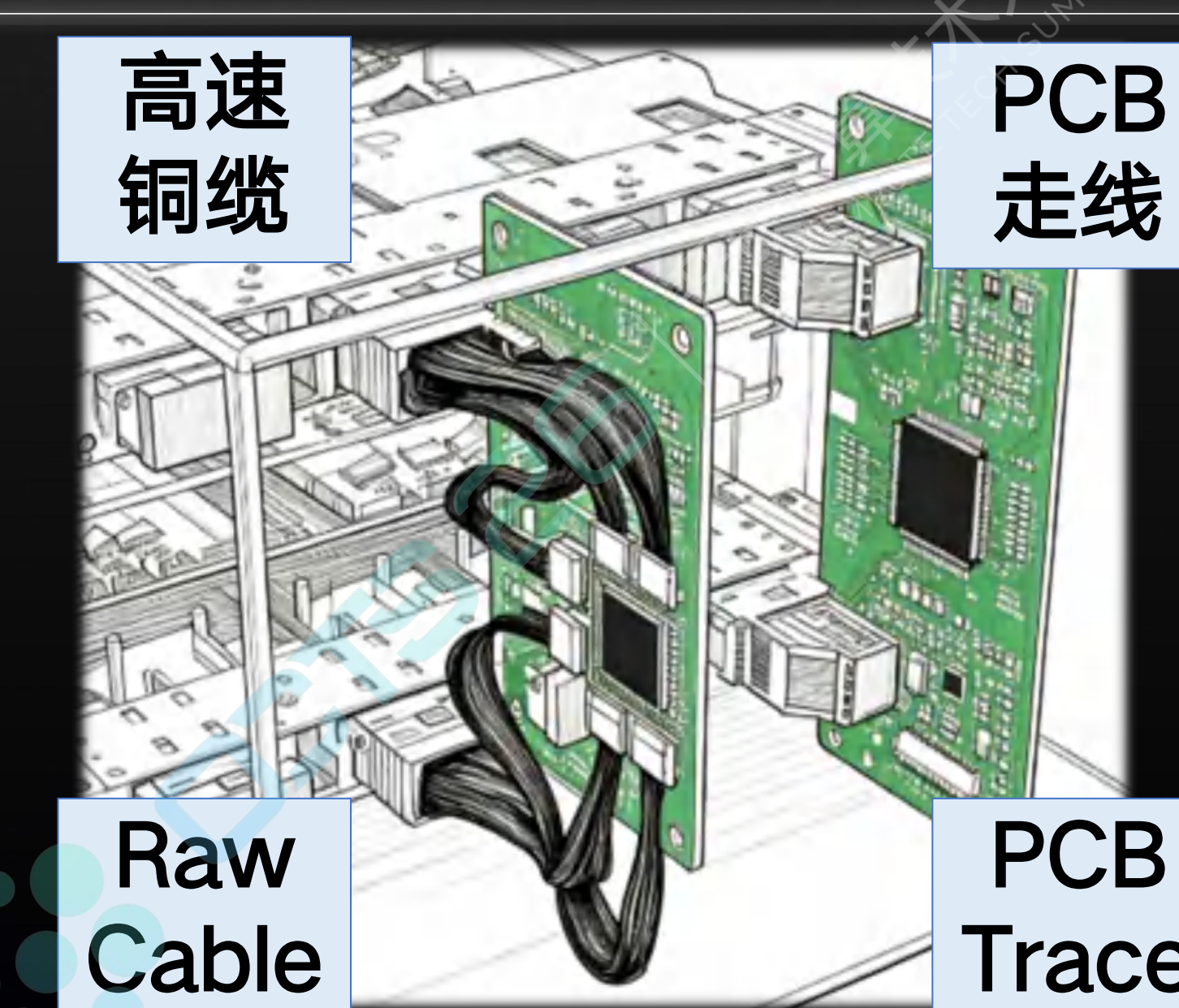
无中板正交互连

Orthogonal Midplane



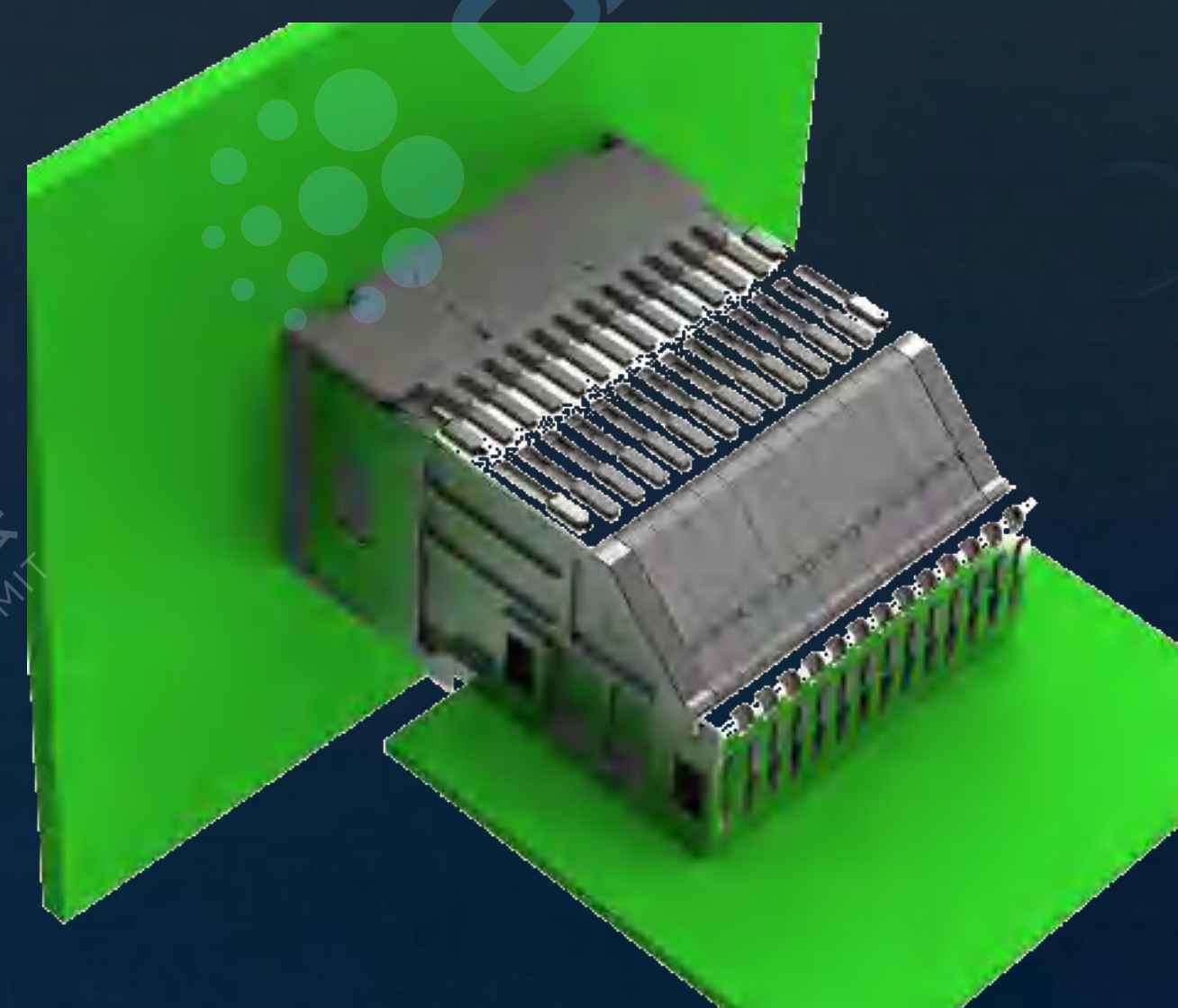
不同高速通道主体

Different High-Speed Entities

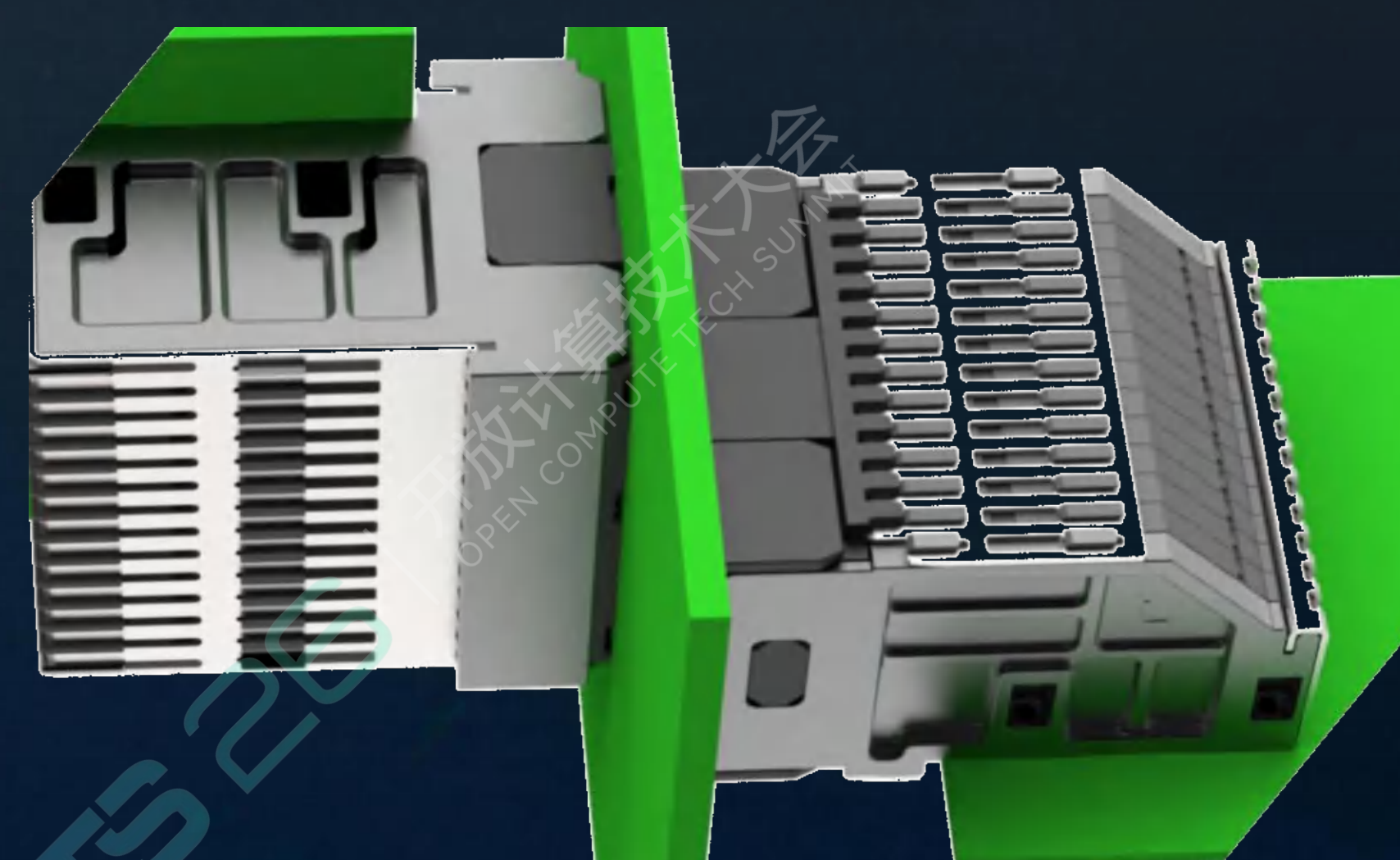


互联协议 Interconnect Protocol

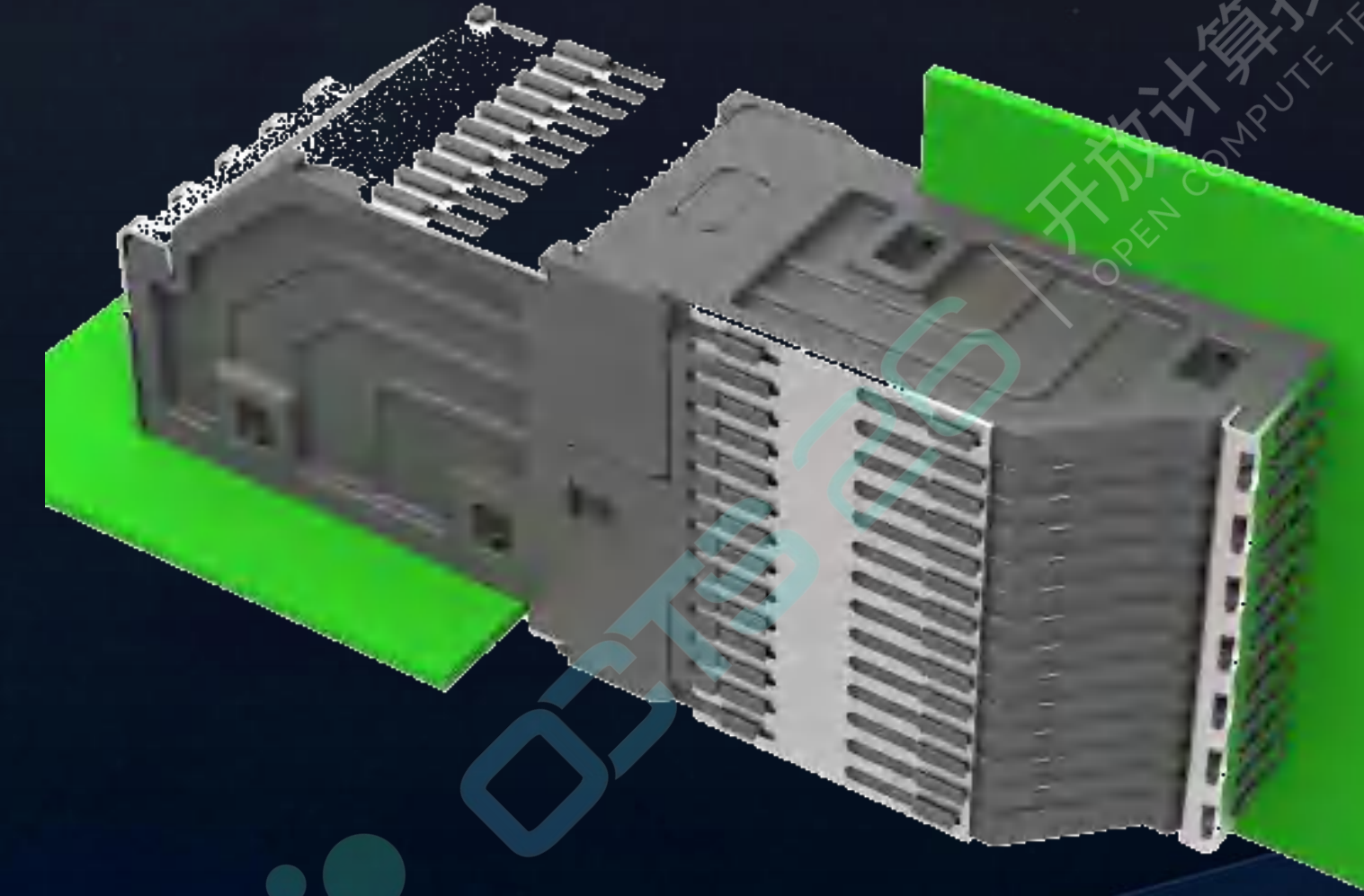
NV-Link



C-Link



UB-Link



OISA

UA-Link

UEC

XPU-Link



高速互连硬件形态

Hardware Forms of High-Speed Interconnects

线缆背板

BP Cable Tray



近芯片线缆-NPC

Near Package Copper



板外线缆-OTB

Over Board Cable



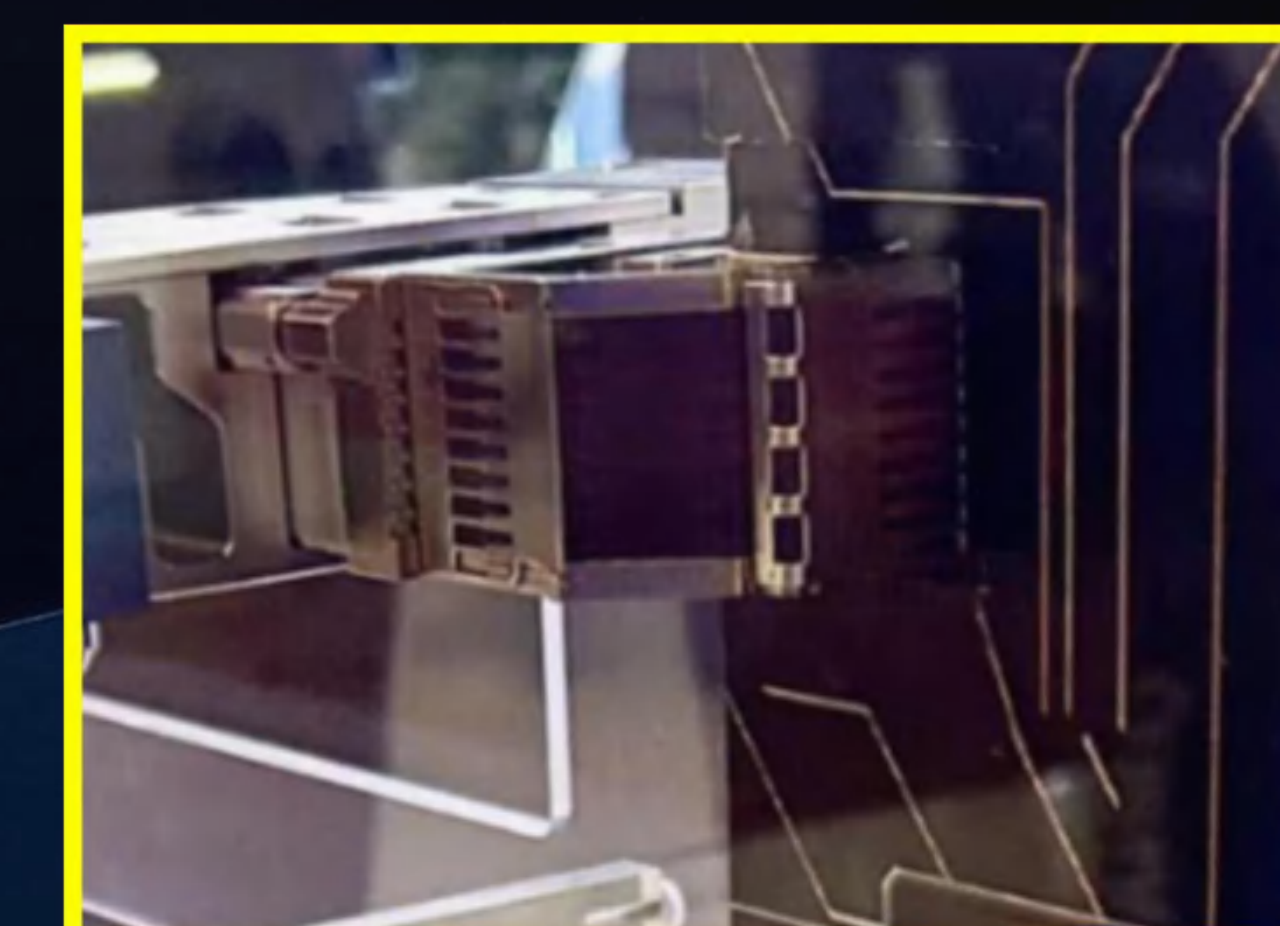
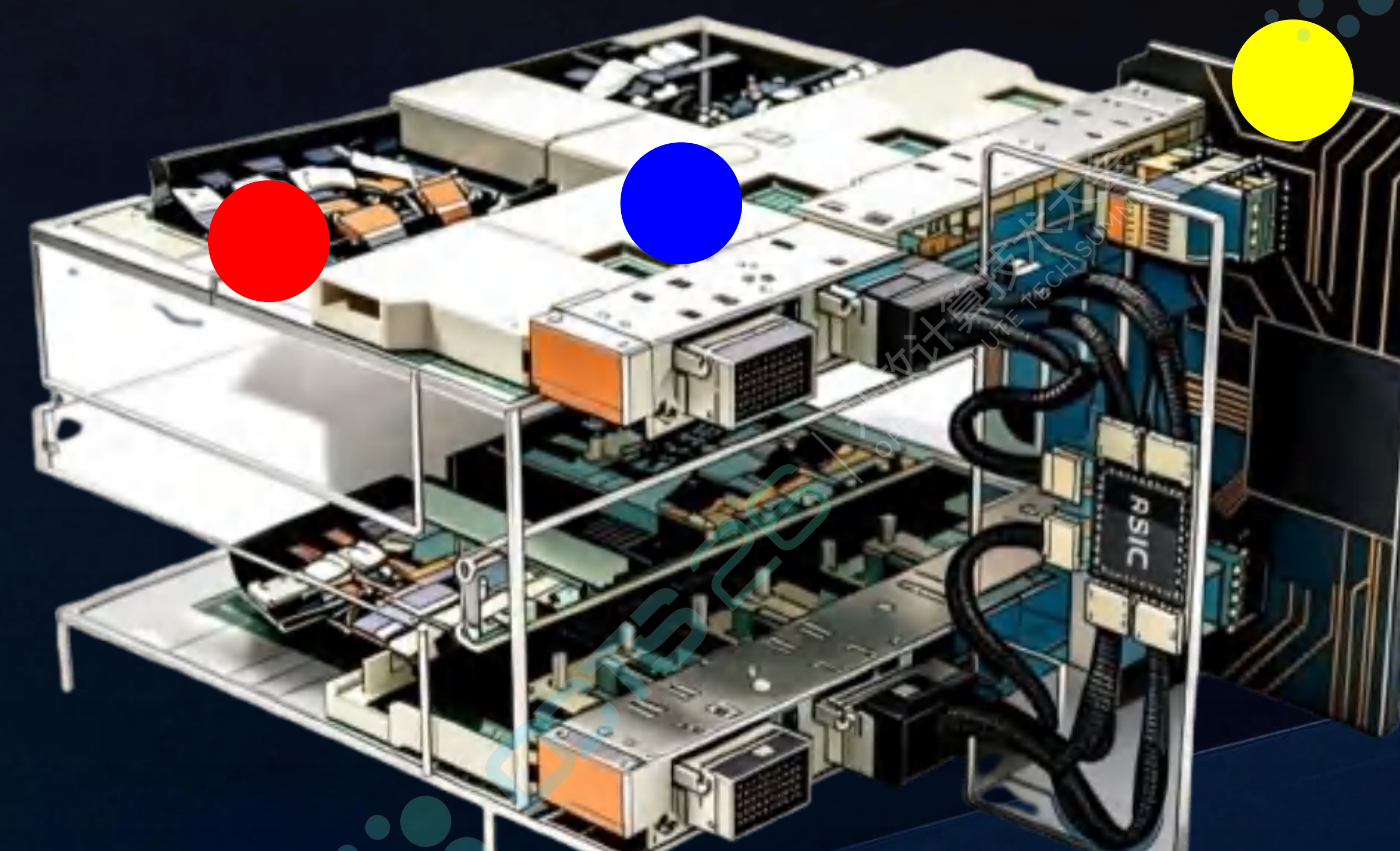
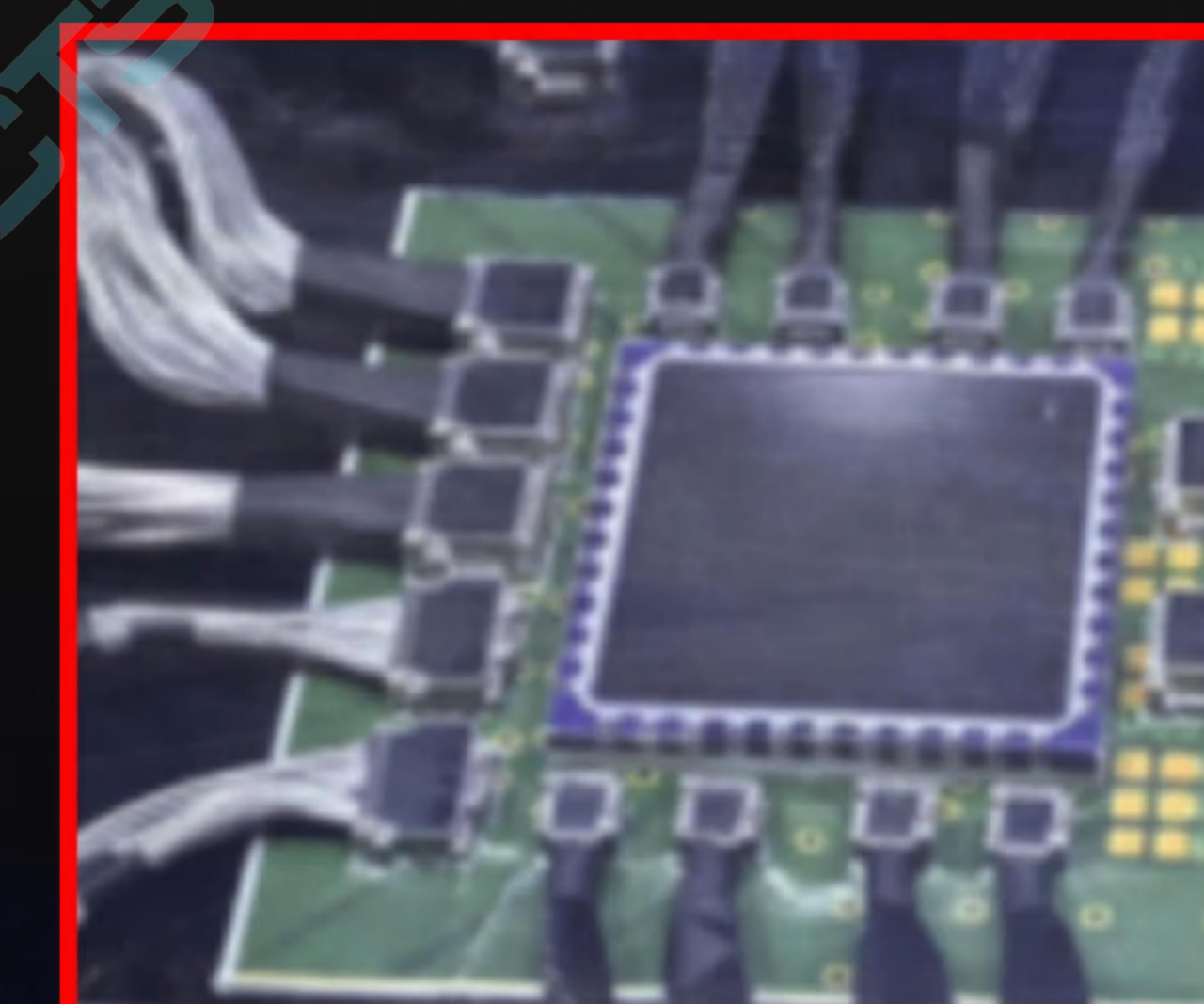
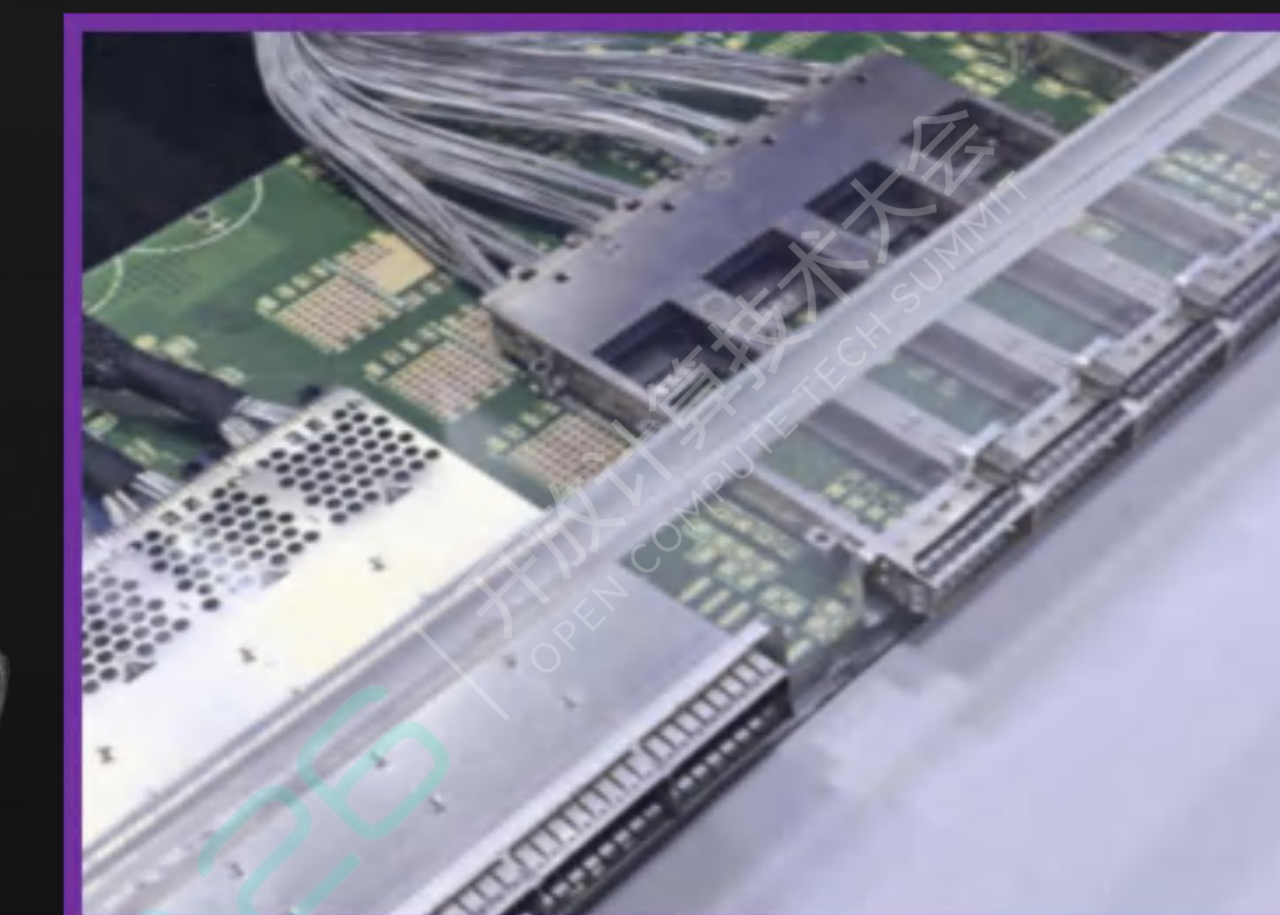
板外线缆-CPC

Co-Packaged Copper



板级连接器-BP/IO

Board-Level Connectors



高速互连硬件形态-NPC扩展应用

Hardware Forms of High-Speed Interconnects NPC Extended Applications

基础
4x4

Base Unit



节点内互连应用
(NPC-NPC)



核心优势

Core Advantages

兼容 ST 950芯片

16~64 Dp 切换

灵活拓普规划

(大通道 集中/分散)

深度拓展
4x8x2

Depth
Expansion



后窗互连应用
(BP-NPC)

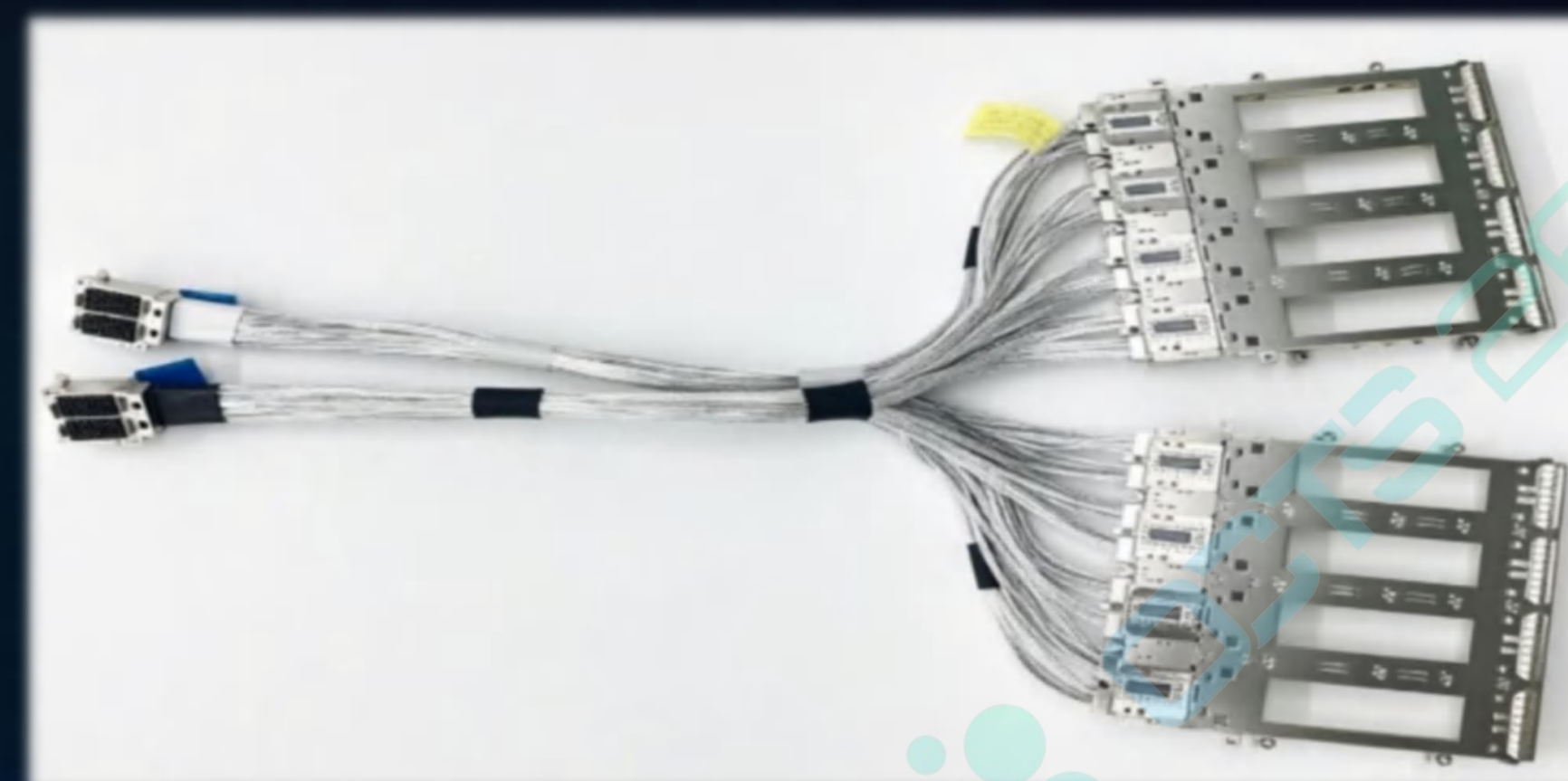


宽度拓展
12x4

Width
Expansion



前窗互连应用
(IO-NPC)



QSFP-DD

OSFP

覆盖行业主流

800G~1.6T

多种IO模块

超节点高速互连的实践-质量保障

Super-Node Interconnect Practices: Quality Assurance

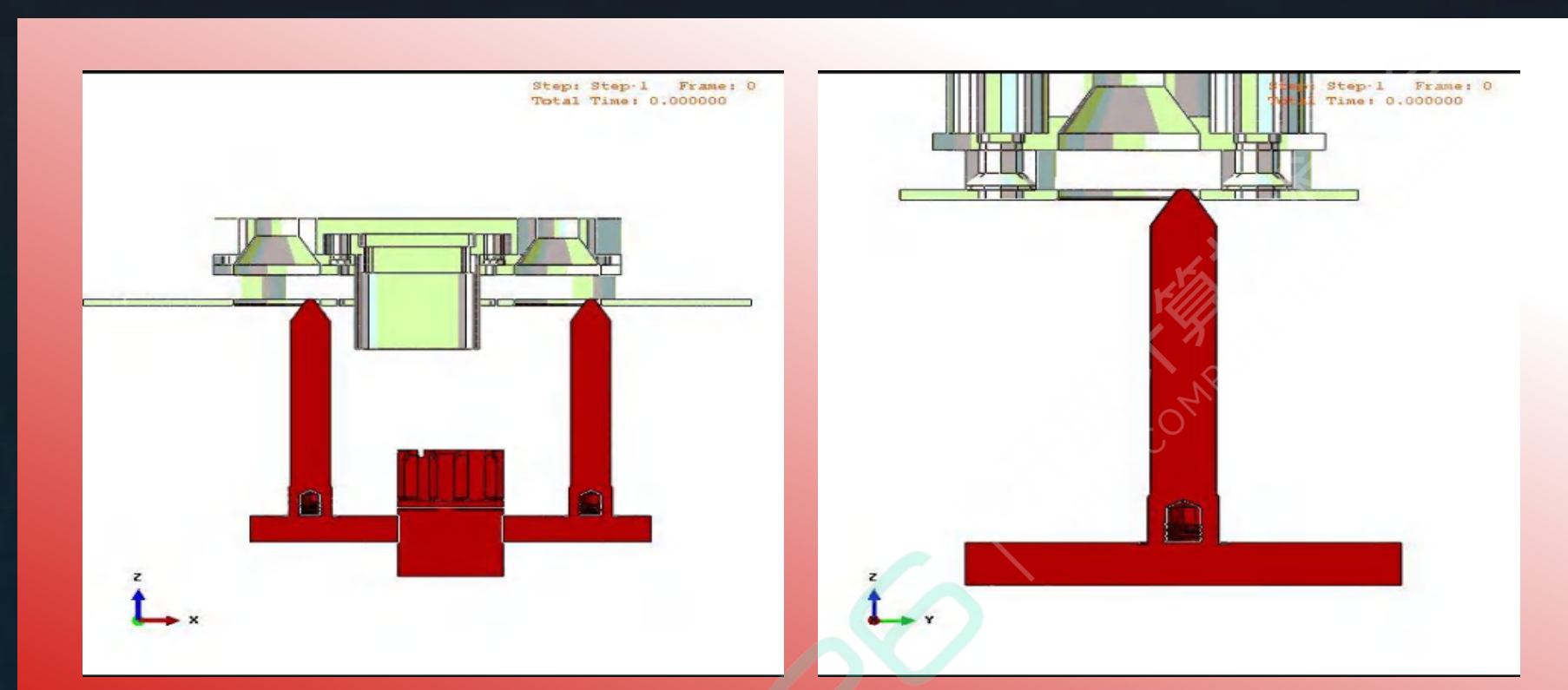
设计与试验

Design and Validation

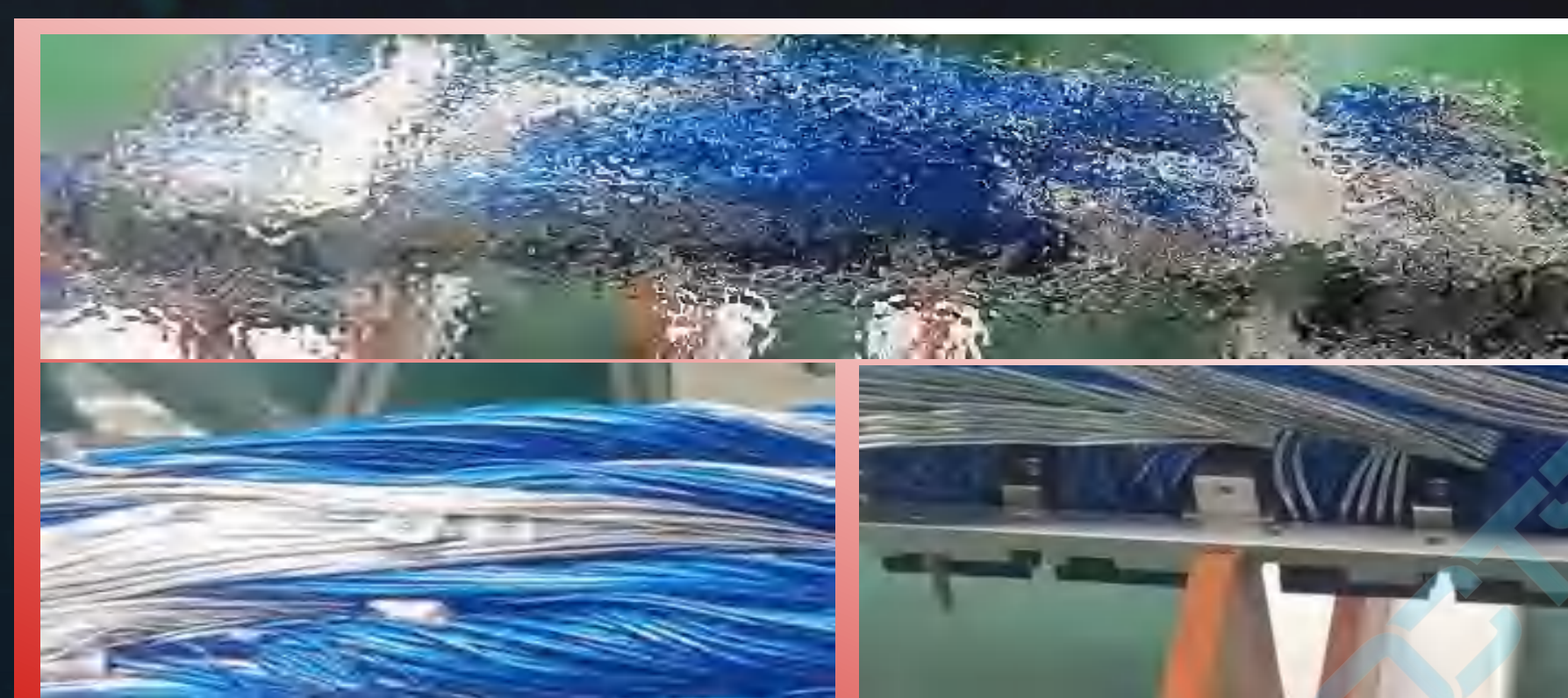
制造与检验

Manufacturing and Inspection

浮动设计



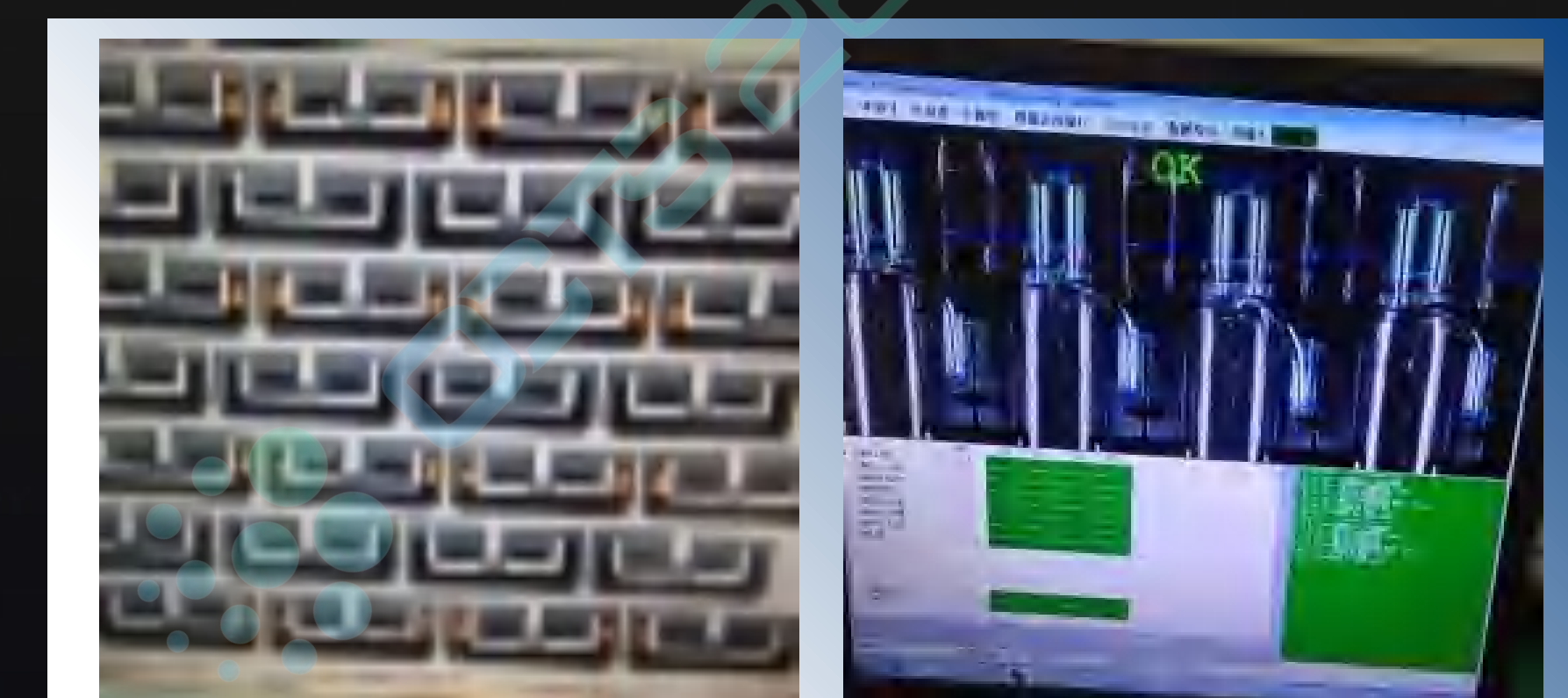
BP线缆布线设计



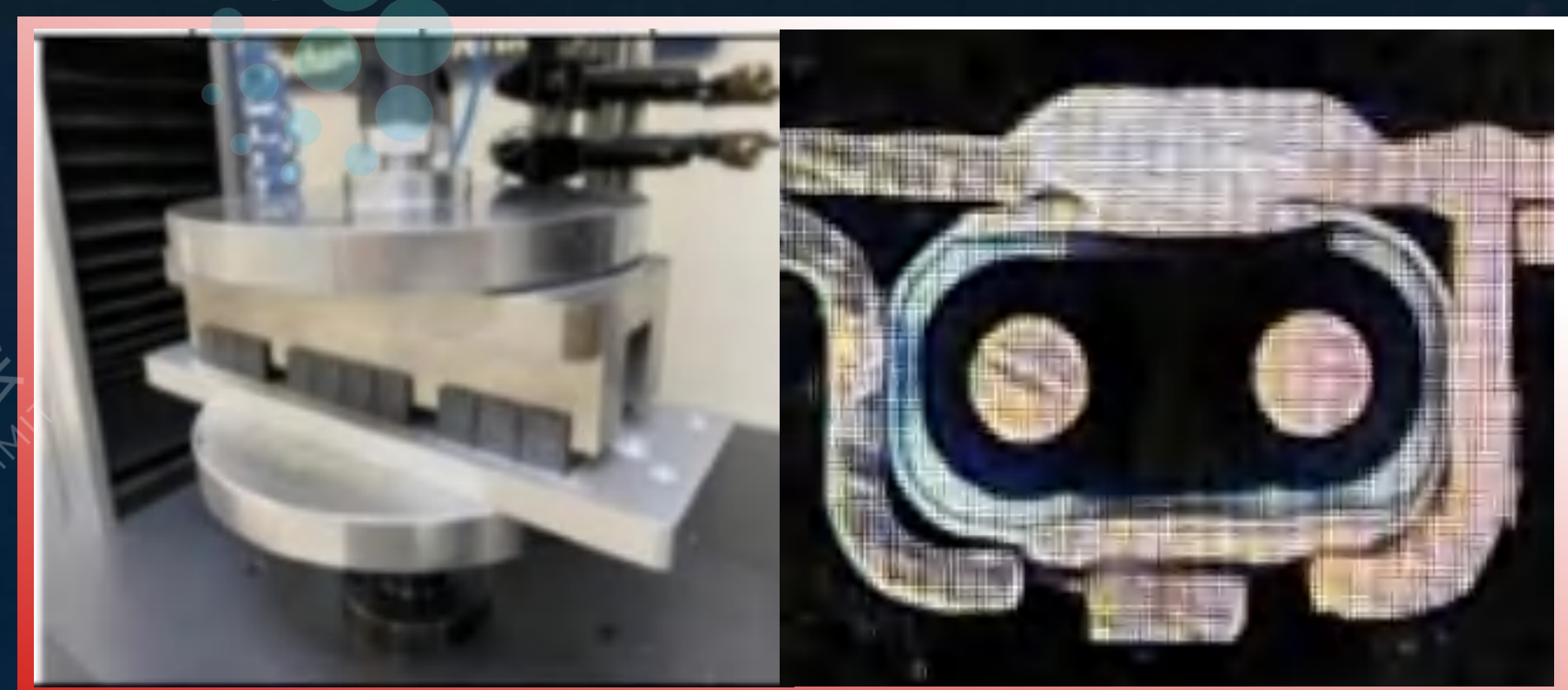
全流程监控

来料监控 检验监控
设备监控 排产监控
加工监控 出货监控

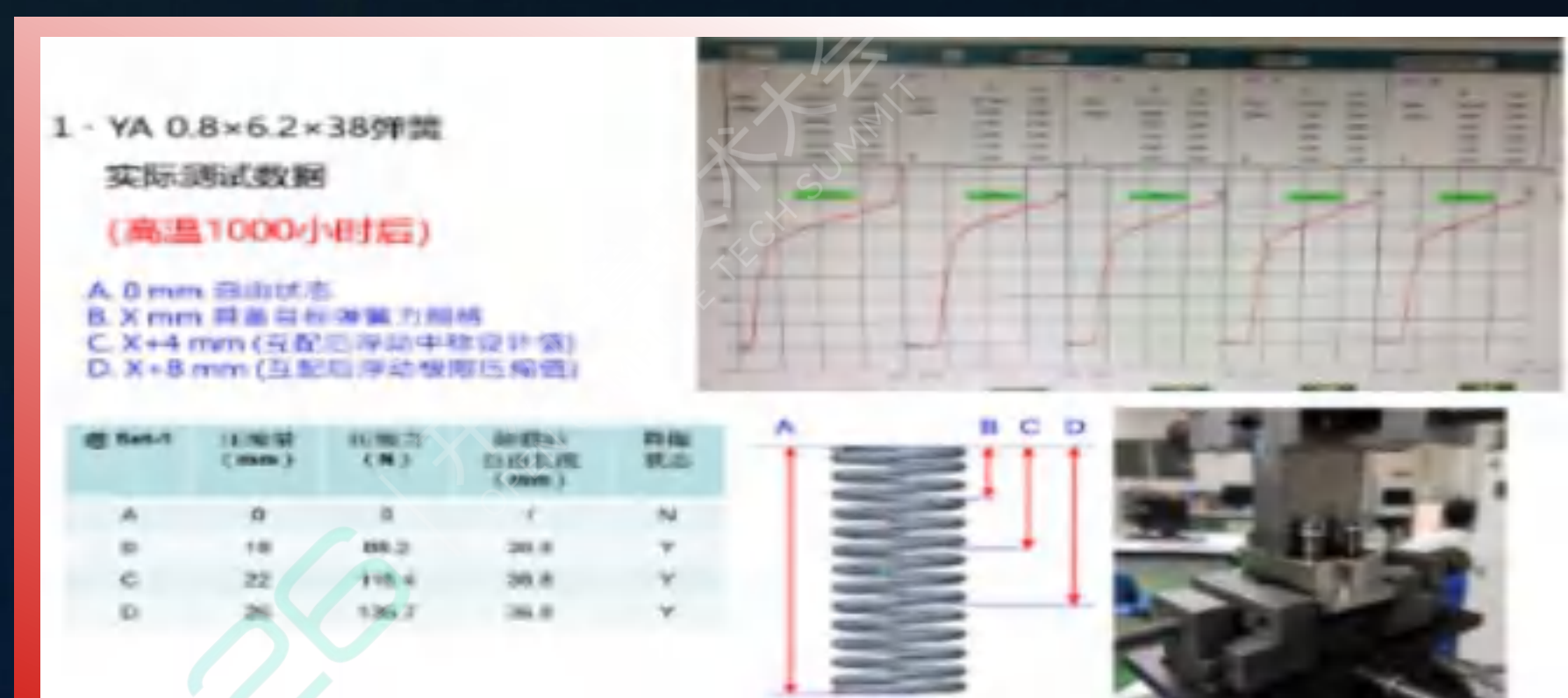
关键工序检测



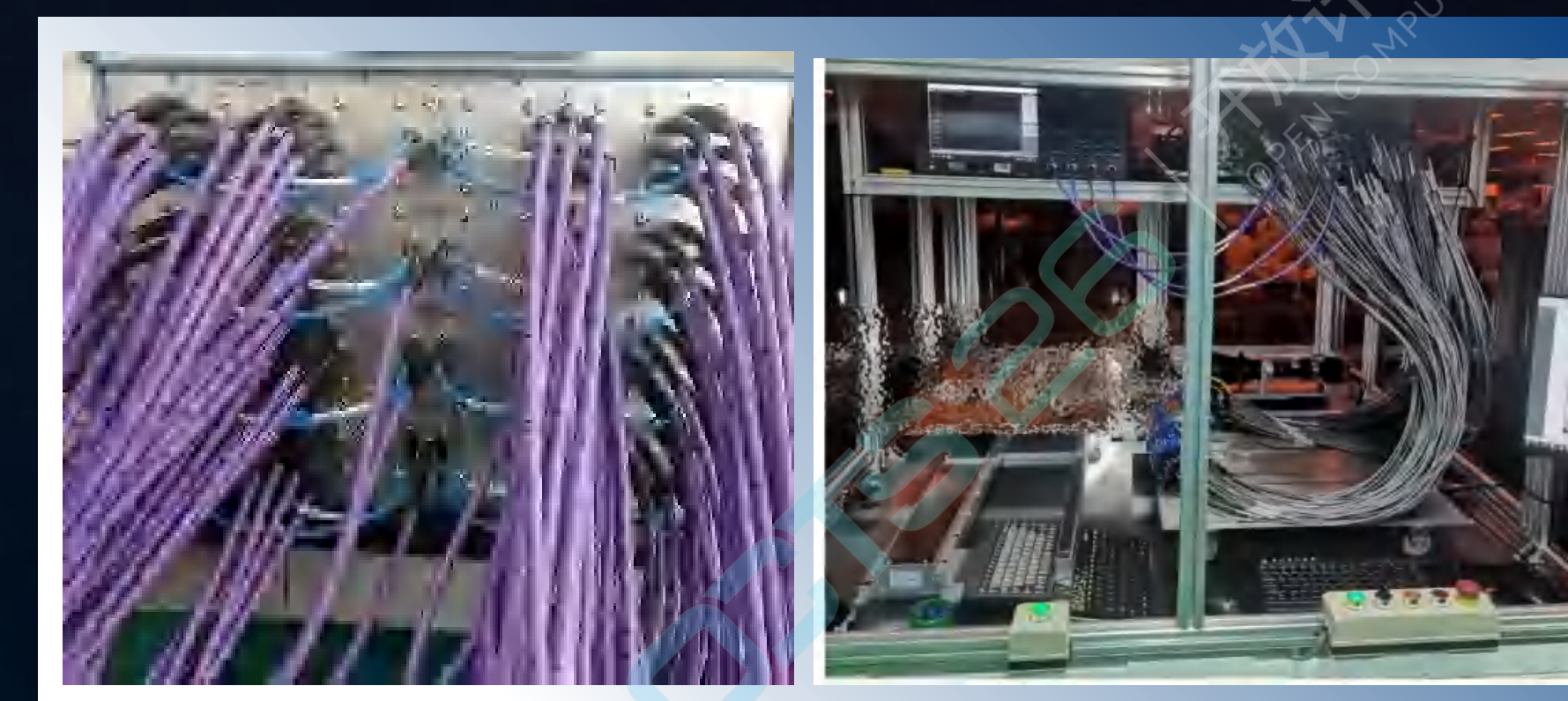
极限测试



长期可靠性试验



Tray级TDR检验



智能体&自动化系统



超节点高速互连的实践-质量保障

Super-Node Interconnect Practices: Quality Assurance

... 理线工序作业检 整机作业动作检 整机错漏反检 焊接前芯线检 员工岗前培训 ...

信息读取

条码识别
信息识别

组装错漏反

通用工艺

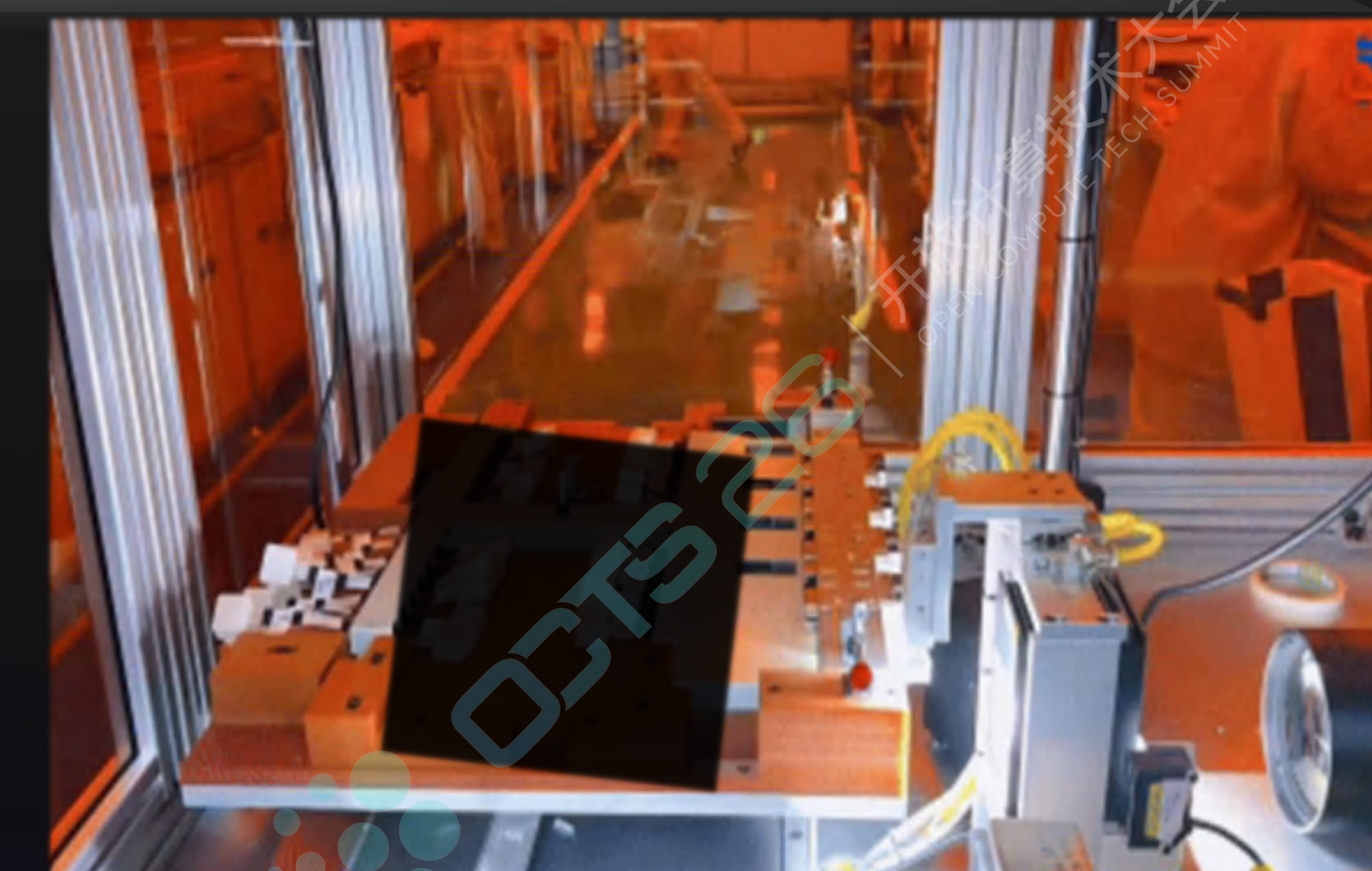
行为动作分析

加工装配
封包装

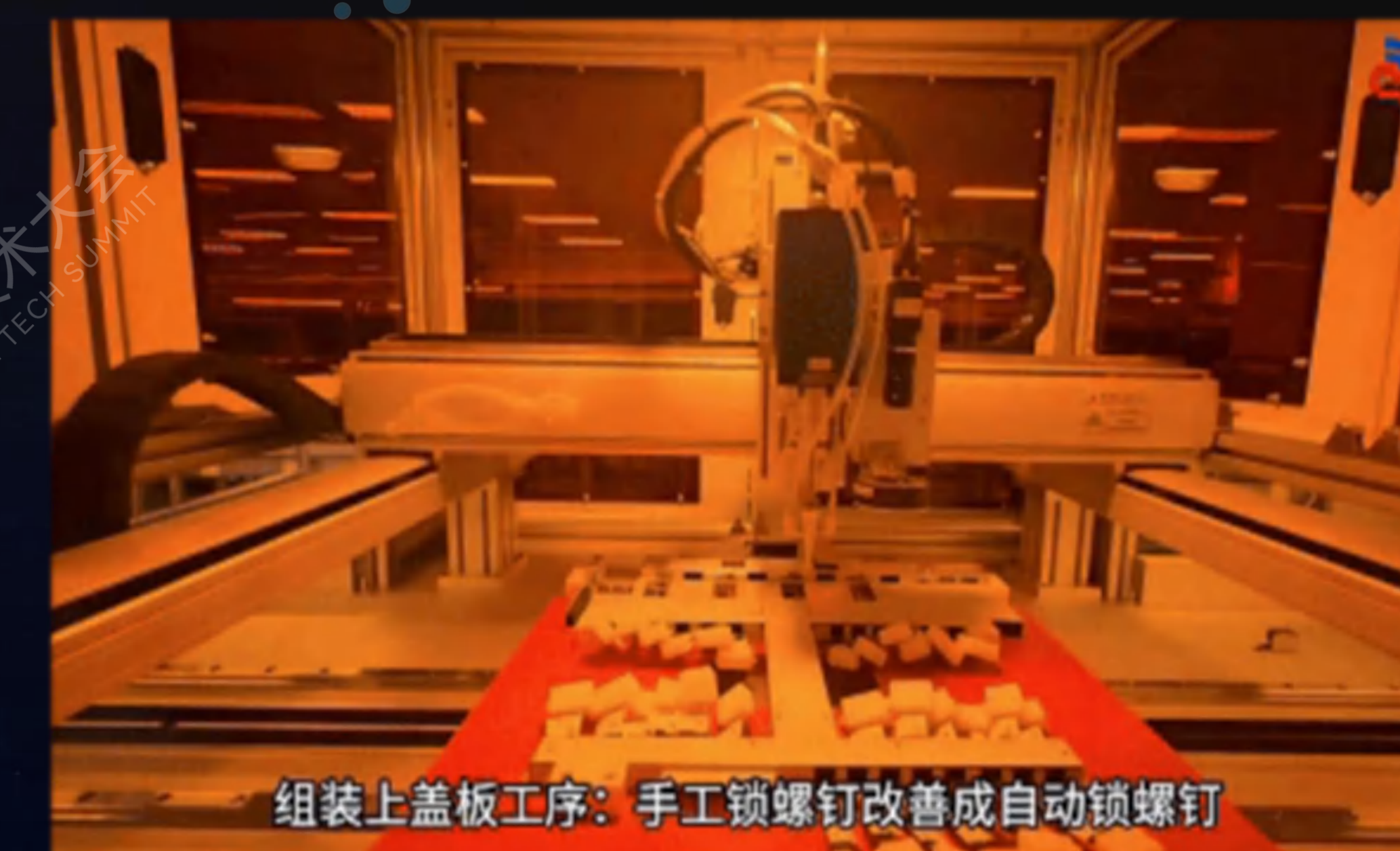
尺寸测量

AI测量

易演进



上线快



门槛低

老厂数据中心

AI训练推理工具链

ModelMate

训练资源池 推理资源池

通算资源池

通算服务器 存储 网络设备

跨厂专线

跨厂专线

神州新厂（112产线）

工控机

摄像机

工控机

摄像机

工控机

摄像机

.....

26年新建厂（112-224G产线）

工控机

摄像机

工控机

摄像机

.....

庆虹电子AI质检方案：源自核心客户工厂及30+代工厂优秀实践，提升产线质检效率、保障产品质量

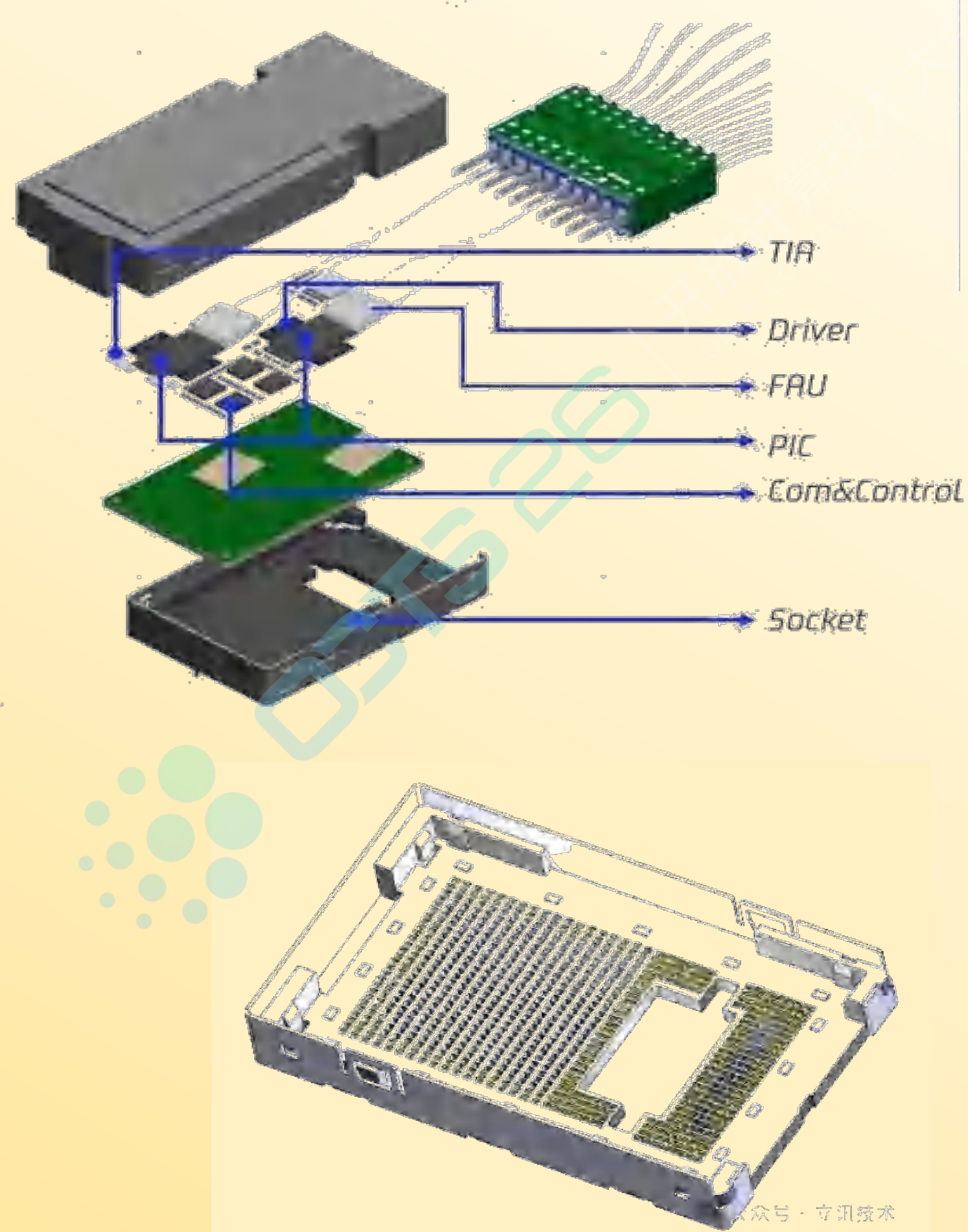
技术发展-下一代速率 光电协同应用 (NPO & CPX)

Technological Evolution: Next-Gen Speed & Opto-Electronic Synergy (NPO & CPX)

OIF

Implementation Agreement for a 3.2Tb/s Co-Packaged (CPO) Module

NPO 模组



- 16 x 3.2T Modules = 51.2T Switch Capacity

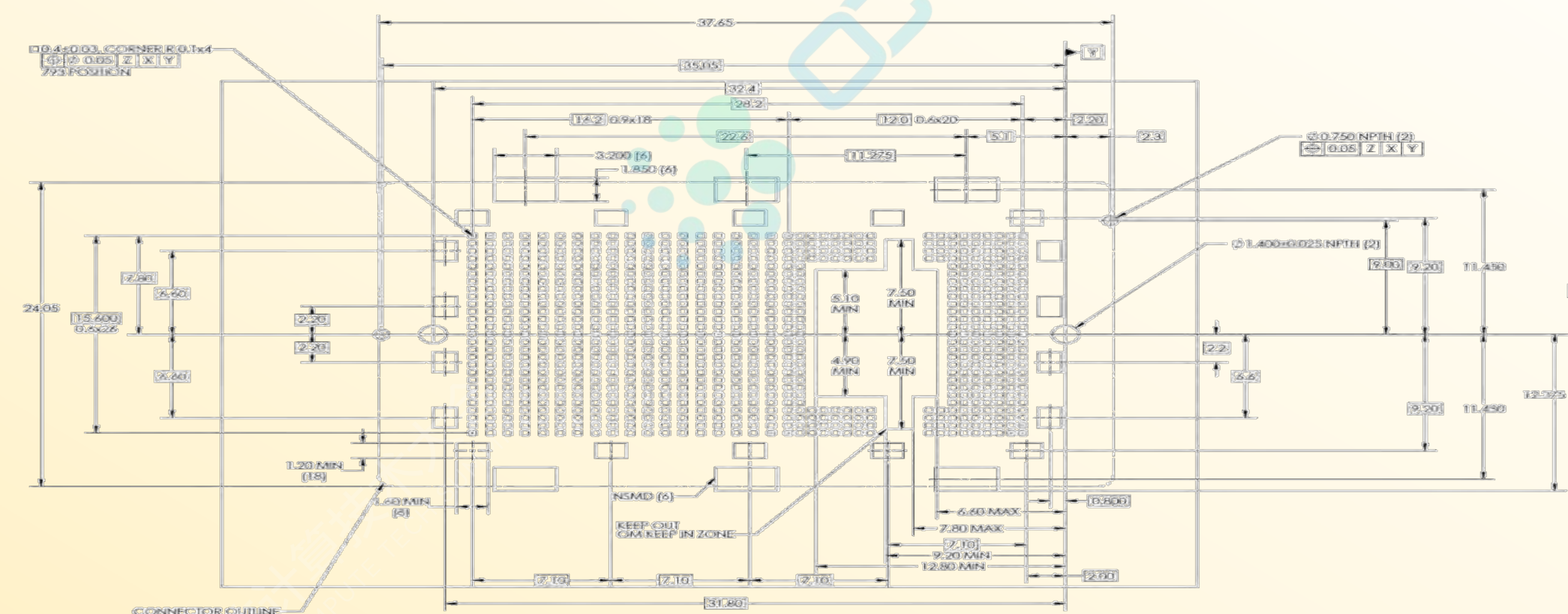
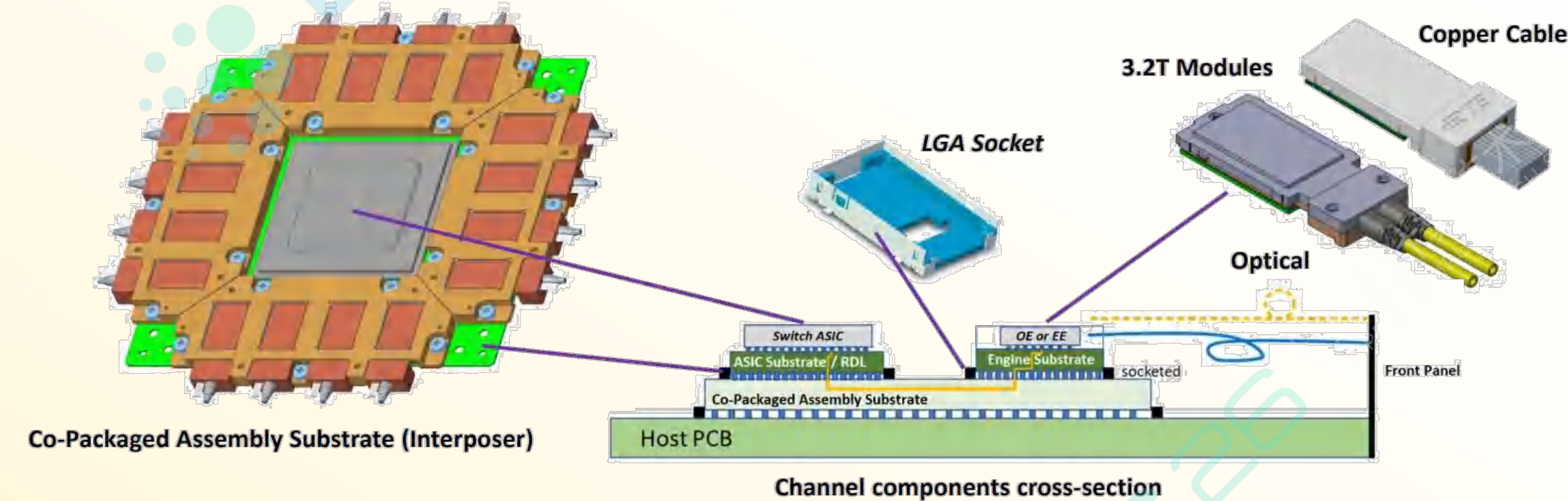
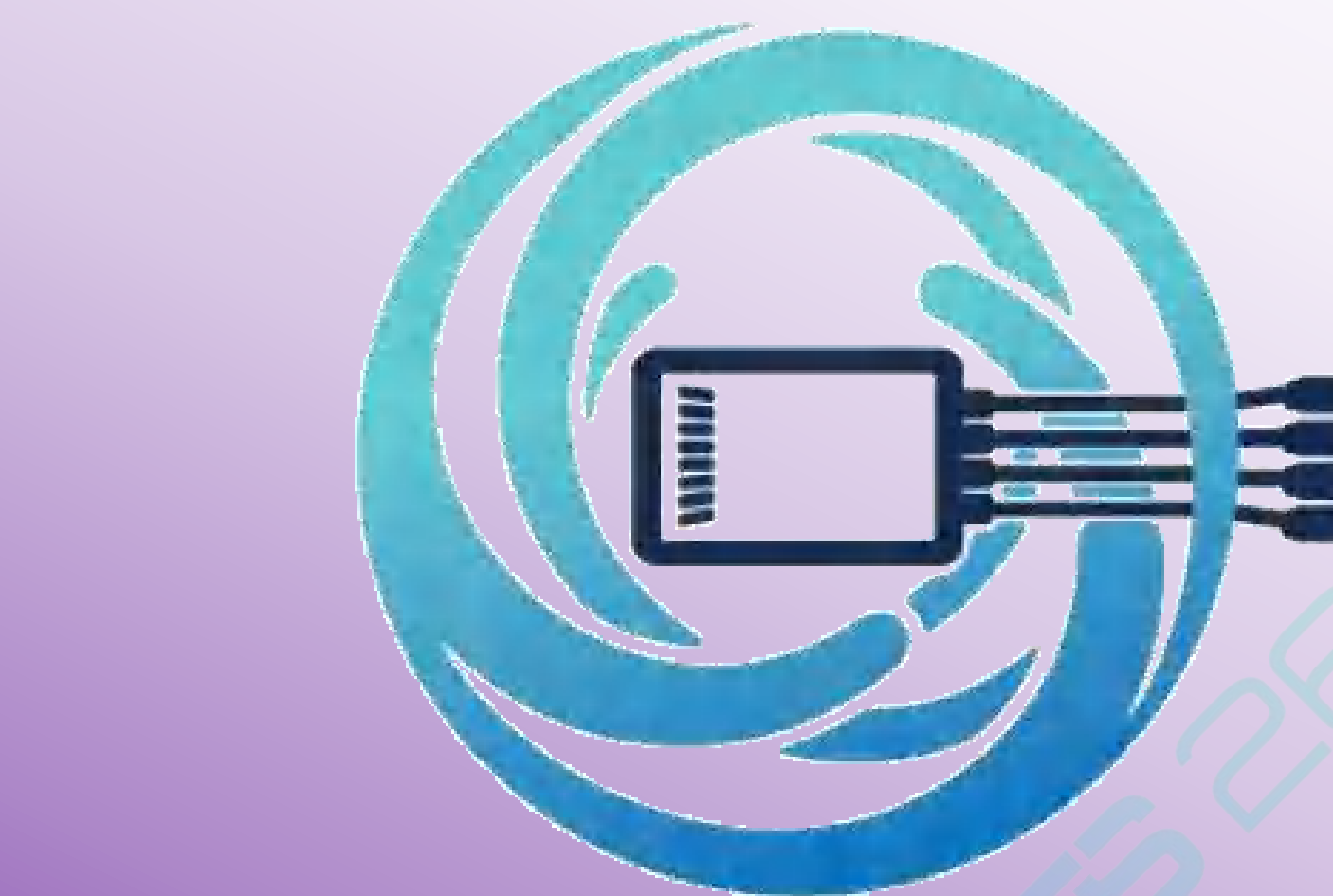


Figure 16 Substrate socket mechanical footprint (see notes below)



OPEN CPX MSA

ODCC UPO MSA

OAI NPO MSA

(引用-OPEN CPX MSA 网站 / OIF网站 / ODCC 网站 / OAI 网站 / 网路公众号)

超节点高速互连系统架构思考

Super-Node High-Speed Interconnect Architecture Insights

设备内高速信号互连应用 Intra-System Signal Interconnect Applications

高速背板连接器 = “骨架”

高速线缆组件 = “血管”

高速背板模组 = “任督二脉”



开放驱动创新 Driving Innovation through Openness

ARK 224G 系列开放开源

图纸 & 规范文件

助力行业协同创新



技术方向 Technical Trends

光电协同 & 持续探索



关于庆虹电子-高速互连系统解决方案供应商

About Qinghong Electronics: High-Speed Interconnect System Solutions Provider

参数

匹配



主要据点

核心工艺



关于庆虹电子-产品地图

About Qinghong Electronics: Product Portfolio

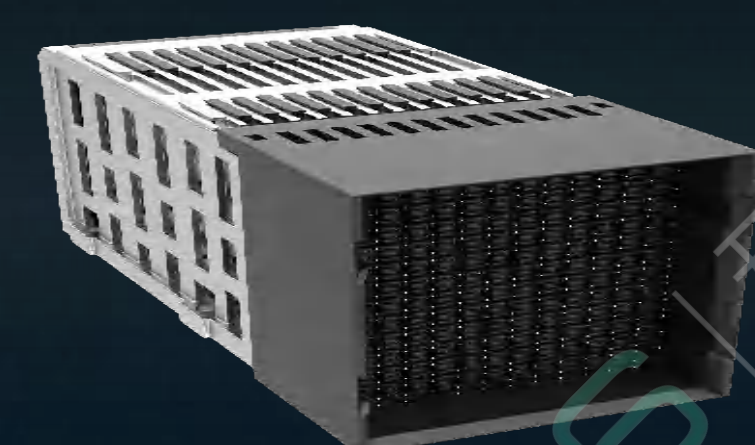
高速背板连接器 High-Speed Backplane Connectors

集成型-定制化产品 Integrated Custom Solutions

Viper (224G)



Ark (224G)



线缆背板



IO-NPC-线缆



NPC & CPC



背板-NPC-线缆



预折 & 一出N

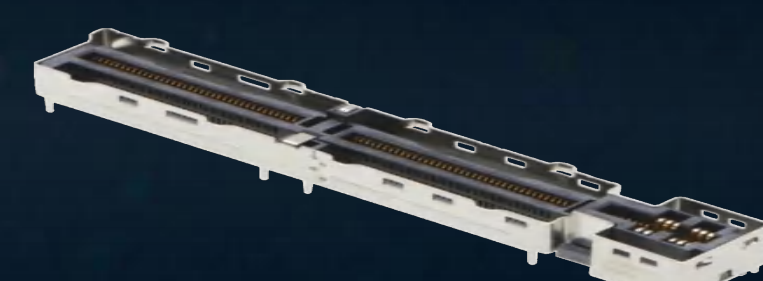


通用型高速连接器与线缆 Standard High-Speed Connectors & Cables

PCIe Gen5 & 6



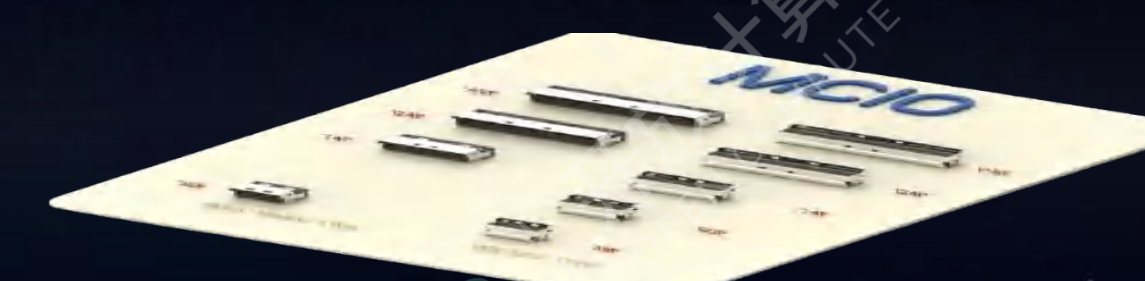
MXIO



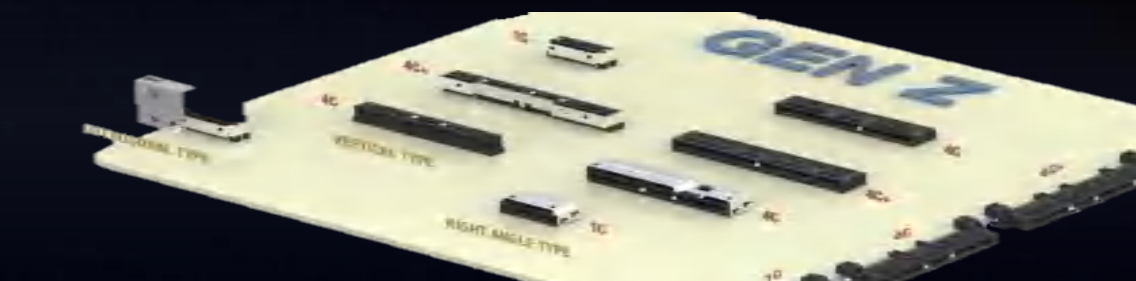
UBC(DD)



MCIO



GenZ



Power Conn. & Guide Pin



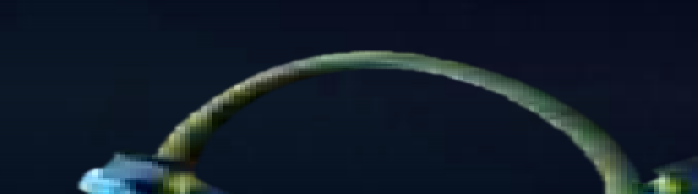
HS-IO



NVMe & PCIe



IO-Cable



DAC /ACC /AEC Cable



THANKS