XPU Based Cloud Native Server:
Architecture, Implementation & Applications
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Problem to Address?

The graph shows the increase in SmartNIC need from 2012 to 2022. The compute cycles per server (MIPS/socket) and network port speed per server (Gbps) are increasing over time.
Problem Revisit

One CPU *manage* multi NICs  ➔  One NIC *manage* multi CPUs
Real Problem Computing Cluster Faced!

- Optics are too expensive both in **power** and **cost**

![Graphs showing the cost and power consumption of switches and transceivers.](image)
About SOCNOC: Kill Optics in Short Distance!

**Socnoc** AI (https://www.socnoc.ai) is the startup aiming to provide low-cost, green and high-performance networking solutions to smart clusters and edge cloud computing. Socnoc employ PCIe and CXL based interface with its own RDMA protocol to build the best infrastructure for networked and composable systems.

**Our Goal:**

› Reduce the network cost to $3 per Gbps host-to-host

› Eliminate Optics and moving parts in Edge Clusters

Data Era Connected by SOCNOC

SOCNOC consolidate PCIe with Ethernet through combination of SW & HW to change the server & server interconnection architecture of data center, leading the traditional server industry into the New Ear-Data Centered Cloud Native Computing Era.
Data Fabric Landscape

TCP/IP

PCle/CXL

cxl.io/cxl.cache

UClle

Chiplet

I/O module

In-Package Links

System-in-Package

Interposer Fabric

In-Package Links

System-on-Board

Cloud-on-Board

PCle Net based Fabric

PCle Bus based link

Off-Package Links

XPU: Center of Data Fabric

The Linux Foundation Internal Use Only

公众号：Socnoc
Application Evolution: From Metal to API Ready!
Infrastructure Trends: Turn Metal into API

- **Standalone “Systems” Stack**
  - Converged management automates infrastructure provisioning and operations of standalone components
  - App (Bare Metal) | App (Container) | App (VM)
  - Host OS
  - Management
  - Network
  - Management
  - Servers

- **Software Stack on Server-Based Hardware**
  - Converged management automates infrastructure provisioning and automation using an intermediary hypervisor or host OS
  - App (VM) | App (Container) | App (Bare Metal)
  - Management
  - Hypervisor or Host OS
  - Servers
  - CPU
  - Memory
  - Storage
  - Network

- **Rackscale (Disaggregated) Hardware with Composable API**
  - Unified (composable) API automates provisioning and operations of pooled compute, storage, and network resources
  - App (Bare Metal) | App (Container) | App (VM)
  - Host OS
  - Hypervisor
  - Management

- Logos: AKRAINO, WeOpen, NextArch Foundation
Our Solution: Bridge BUS and TCP/IP with PCIe!

XPU: PCIe Switching and Routing SoC

- Native Lossless Data Fabric
- Coherency Supported
- Affordable and Expandable

- Native Cloud API Ready
- Heterogenous CPU Ready
- Affordable and Scalable
Roadmap and Ecosystem

The diagram illustrates the roadmap and ecosystem of different link scales and chiplet scales. It compares PCIe-based, CXL-based, and UCIe-based technologies. The x-axis represents link scale, ranging from 1cm to 10km, and the y-axis represents chiplet scale, starting with in-chip and progressing to QPI/UPI, PCIe, CXL, XPU PCIe Net, and UCIe. The diagram visually compares these technologies across different scales, highlighting their use cases and applications.
XPU Implementation & Applications
XPU Server: All in PCIe!

- Transform UPI/HT based multi-CPU Server into PCIe connected Server!
Cloud Native Drives PCIe-Centered Possible & Essential

**PCIe-centered**
Cloud Native Architecture, serverless API, every application demonstrates by docker, communication based on TCP/IP

**Scale Out Computer Clusters Technology**
Data processing in a data center but also low latency in application processing and optimization of communication traffic by providing a high-speed interconnect function
Cloud Native Server for Integrated Edge Computing

- GPU Module
  Standard PCIe Device

- XPU Chip
  All in PCIe

- Standard Server
  Formfactor
  1U, 2U, 3U, 4U supported

- CPU Module
  CPU, RAM, SSD combo

- NIC Module
  NIC or SmartNIC
Thank you!