Scott Schweitzer
June 2023

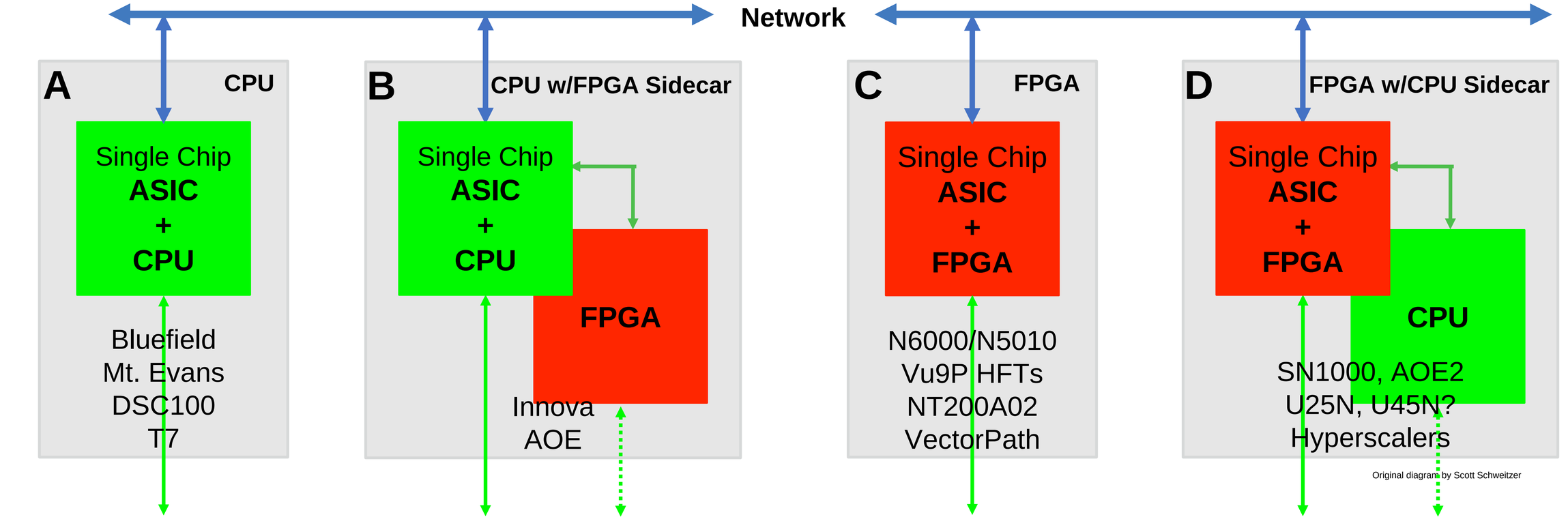
SmartNIC Summit 2023

Architectures, Boards, Firmware, Software

Agenda

1. Architectures
2. Boards and Chips
3. Software
4. “Future Architectural Directions” - A 2022 Slide
5. Future Architectural Directions 2023

Hardware Architectures



NVIDIA

intel

PENSANDO

Chelsio Communications Accelerate

NVIDIA

SOLARFLARE A XILINX COMPANY

AMD SOLARFLARE A XILINX COMPANY

intel napa:tech; RECONFIGURABLE COMPUTING

Achronix Data Acceleration

LDA TECHNOLOGIES™

AMD SOLARFLARE A XILINX COMPANY

intel

AMD

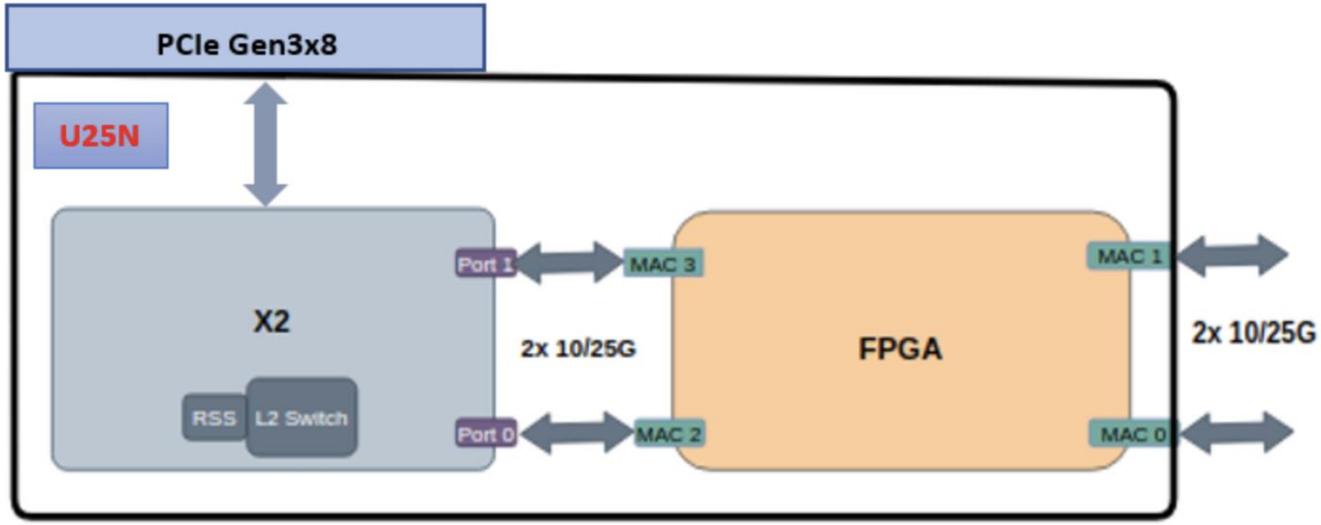
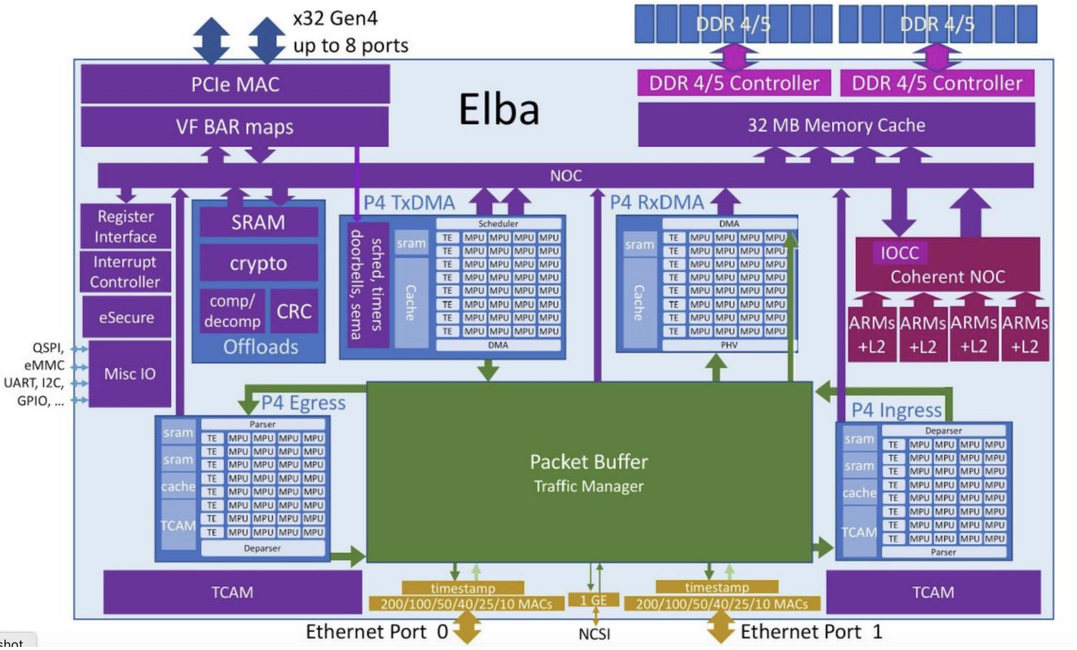
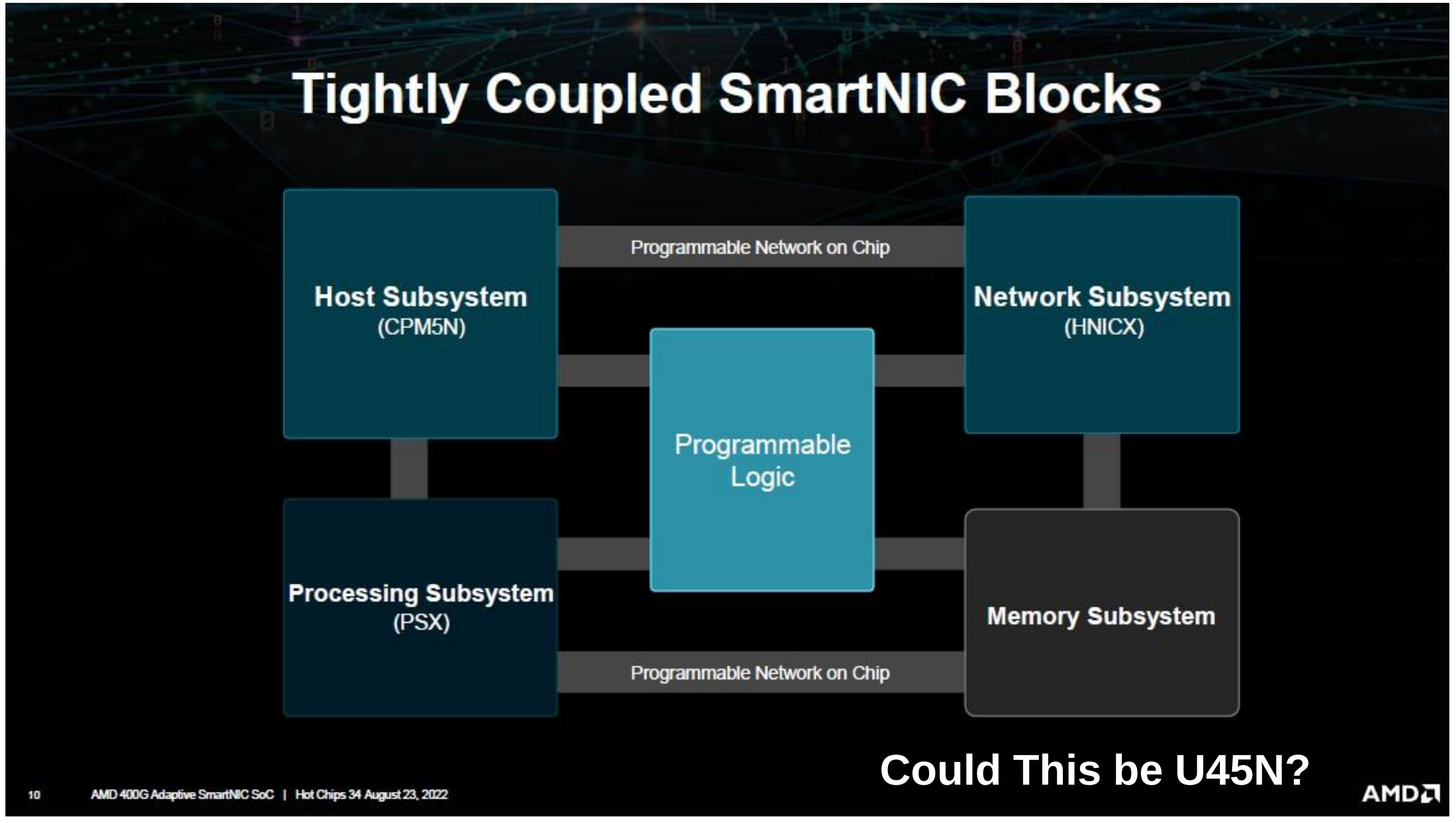


Figure 2: **U25N Architecture**¶

Pensando - DSC100





Could This be U45N?

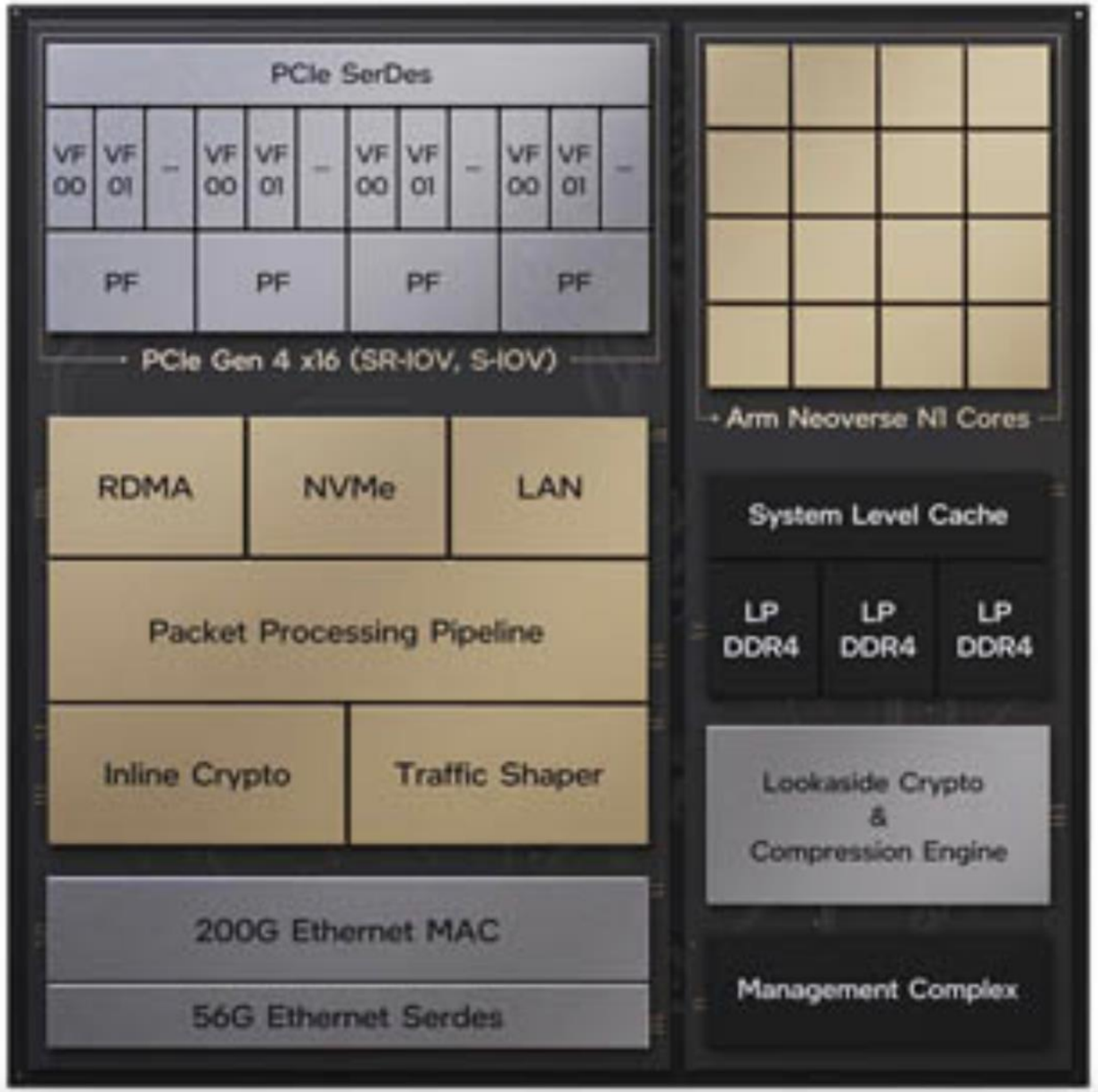
Mount Evans

Google Rebranded

FPGA IPUs N6000

Silicom Ltd.
Connectivity Solutions

napa:tech;
RECONFIGURABLE COMPUTING



Hot Chips 2021

NVIDIA

Mellanox TECHNOLOGIES

NVIDIA BLUEFIELD-3 DPU

First 400Gb/s Data Processing Unit

22 Billion Transistors

400Gb/s Ethernet & InfiniBand Connectivity (1-4 Ports)

PCIe Switch Gen 3/4/5 x32+x4

400Gb/s Crypto / Security Acceleration

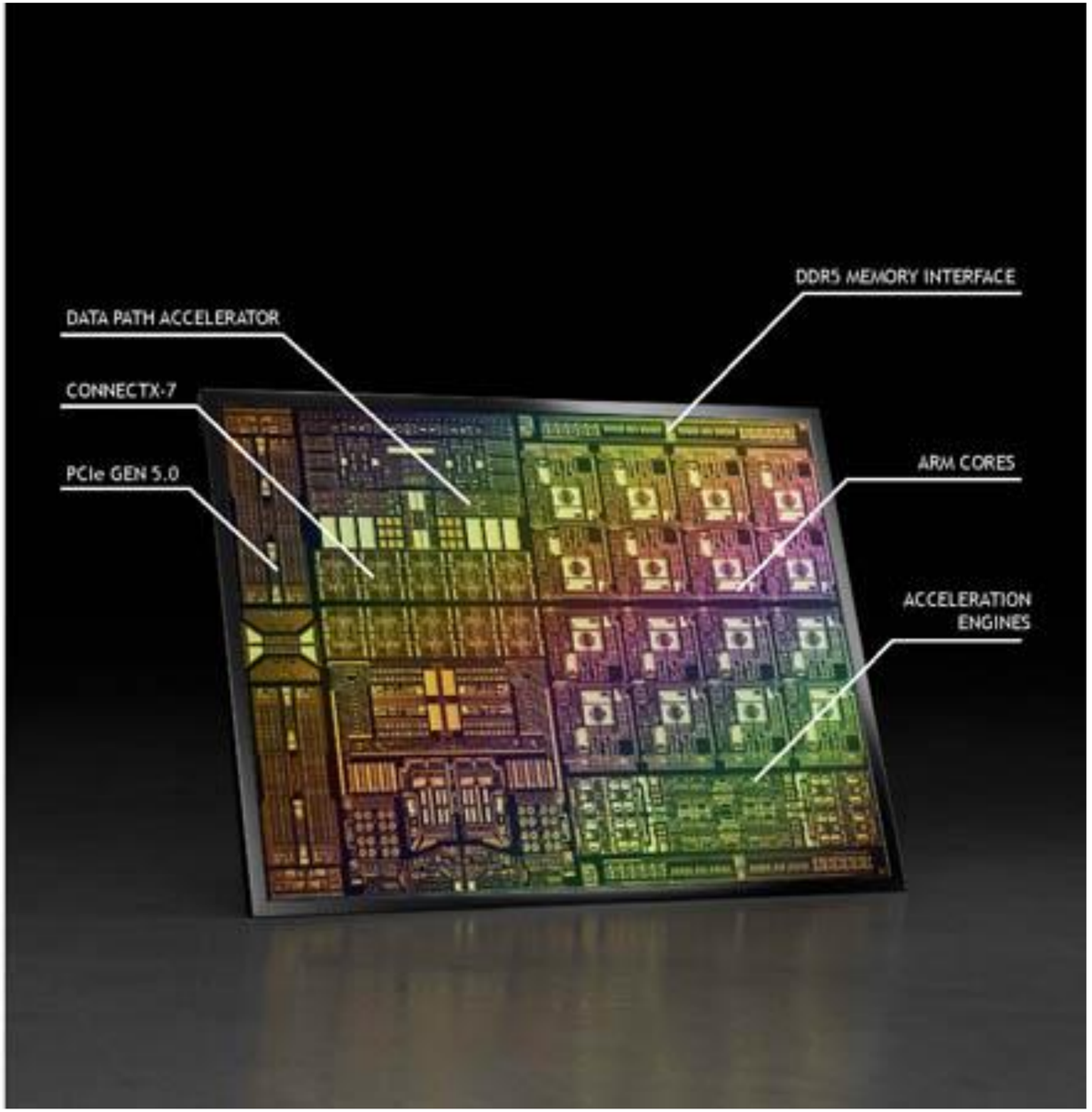
330M PPS, 80M PPS at scale of millions of flows

18M IOP/s Elastic Block Storage

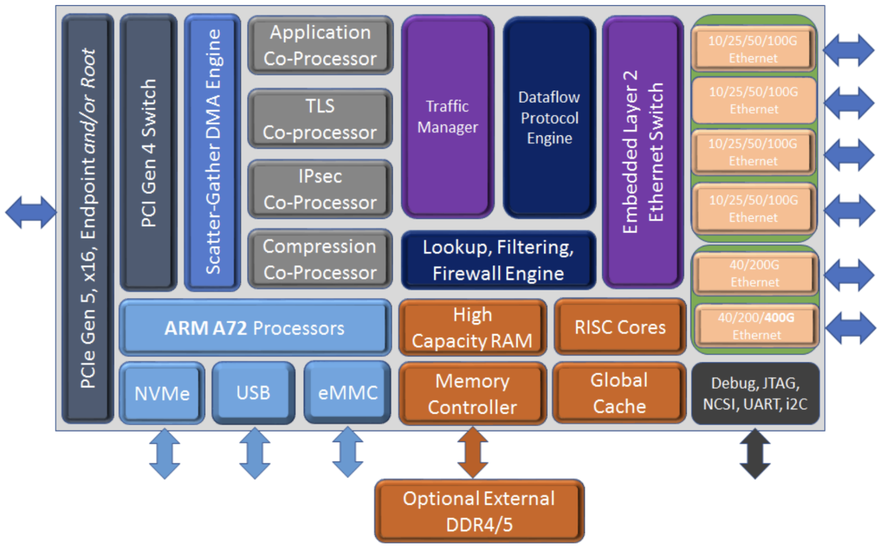
300 Equivalent x86 Cores

42 ARM SPECINT2k17

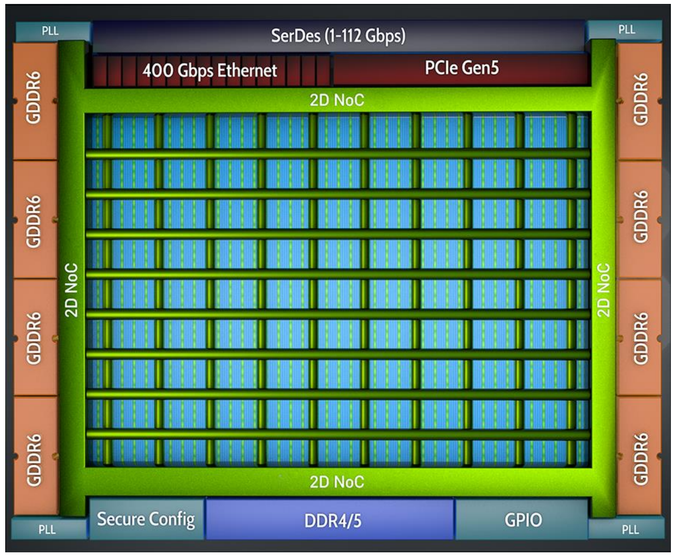
128b DDR5-5600

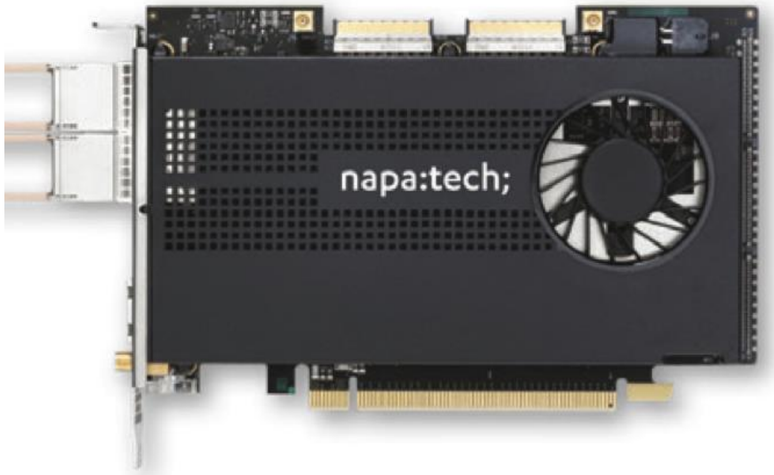


Everyone Else



T7 Block Diagram





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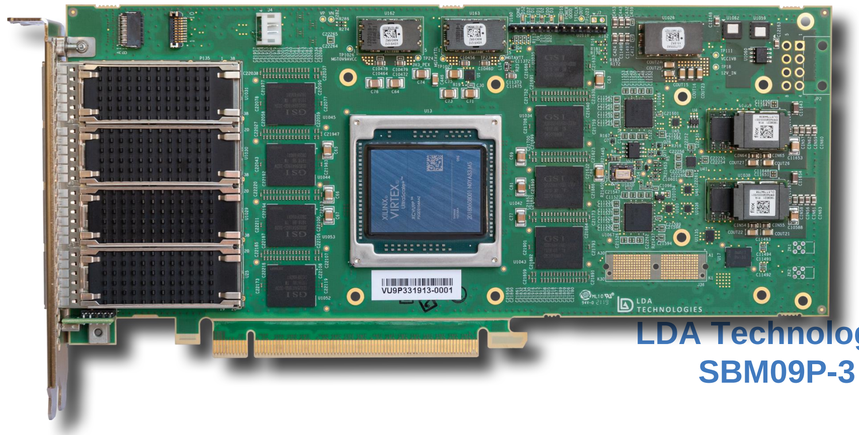

LDA Technologies
SBM09P-3

BittWare VectorPath

Software

- NVIDIA is moving DOCA forward and said at some point it may support Open Programmable Infrastructure (OPI)
- Microsoft SONiC Dash is gaining traction
- What happened to Project Monterey? Appears to be slow rolling, but moving forward
- Redhat Openshift

Future Architectural Directions - 2022

- Control plane:
  - More powerful Arm/x86 Complex
  - ~~**Security concerns for physical separation, real out of band management**~~
  - **Growth of control plane OSes**
  - *CXL expanded to enable greater SmartNIC control over host*

- Data plane:
  - Explosion of Hard-IP
  - *Chiplets will dominate in 2024 and beyond*
  - *Huge extensible FPGA fabrics supporting containerized bitstreams*
  - **More P4 Engines for increased traffic**
  - More powerful ARM cores for complex packet transforms
  - *AI/ML within FPGA fabric and chiplets will prove invaluable*

Future Architectural Directions -2023

- **Control plane:**
  - Air gap and security concerns for physical separation.
- **Software:**
  - Common API/Language/SDK integrated into the control to manage the data plane, and capture telemetry
- **Data plane:**
  - P4 may become more pervasive
  - AI/ML within FPGA fabrics will begin to prove invaluable for adaptive routing and security applications
  - Secure Computings impact on the data plane
- **NIC/DPU Silicon on Switch Ports:**
  - Myricom failed with this, HFT has had some stealth success and Pensando may be onto something

Thank You All

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