

Beyond the Bitstream: MLE FPGA Full System Stacks

Andreas Schuler

About the Speaker

- **Andreas Schuler, B. Eng.**
 - Director Applications, Missing Link Electronics
 - Product Owner, AMD Security and Partnership
- **Core Expertise: Leading projects to success**
 - Planning and Managing Projects
 - AMD Security Architectures



MLE – Experts for Domain-Specific Compute Architectures

Our Mission: From Software to Silicon!

- Deliver HW and SW for High-Performance (Embedded) Compute Systems & Solutions
- Offering pre-validated subsystems with FPGA IP blocks and open-source software
- Support customer projects with deep expertise and hands-on design services

Headquartered in Silicon Valley with Design Offices in Germany

- Founded 2010, employee owned
- 20+ Certified FPGA Designers
- Customers include technology leaders, US and European government agencies, Fortune 500 companies
- Partners to:



ulm university universität
uulm



THU
Technische
Hochschule
Ulm



Fraunhofer

Heinrich-Hertz-Institut

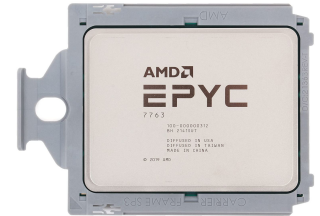
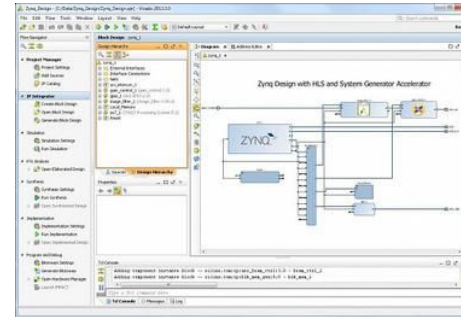
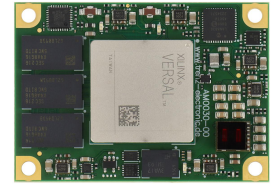
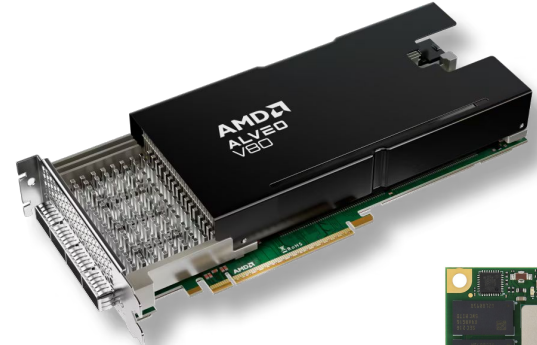


Fraunhofer

IPMS

MLE Design Services Expertise – FPGA as a Computer

- RTL and High-Level Synthesis using FPGA design flows
- AMD Zynq-7000 SoC in designs since Q1/2012
- AMD Zynq Ultrascale+ MPSoC in designs since Q4/2015
- AMD Zynq UltraScale+ RFSoC in designs since Q2/2018
- AMD Versal since Q1/2019
- PetaLinux / Vanilla Linux and Yocto-based SW development
- Multigigabit transceiver configurations
 - PCIe Gen2/3/4/5, SATA 3/6G, SAS 6/12G, NVMe, CXL
 - SDI-3/6/12G, JESD204B, DP/HDMI 4k, MIPI CSI-2 D-PHY
 - 10/25/40/50/100G Ethernet, Low Latency Ethernet
- Radar & Lidar for civil, mil/aero, automotive, industrial
- Image processing for HDMI, Displayport, SDI
- Time Sensitive Networking, Detnet, Layer-2/3 Switching
- Functional Safety Design Flows ISO 26262 (ASIL), IEC 61508 (SIL)
- Security & Trust (PUF, Crypto Accelerators , eFuses)



Our Technology Achievements

- Patented technology in the fields of acceleration, mixed-signal, functional safety
 - US Patent 9,209,828 – Configurable Mixed-Signal Systems
 - US Patent 10,140,049 – Partitioning Systems Operation in Multiple Domains
 - US Patent 10,509,880 – Automation for Configurable Mixed-Signal Systems
 - US Patent 10,708,199 – Heterogeneous Packet-Based Transport
 - US Patent 10,848,442 – Secure Heterogeneous Packet-Based Transport
 - US Patent 11,356,388 – Real-Time Multi-Protocol Heterogeneous Packet-Based Transport
- 60+ Presentations at Technology Conferences and in Technology Journals
 - Embedded World Conferences
 - PCI-SIG Developers Conferences
 - Flash Memory Summits, SmartNICs Summit
 - FPGA Conferences
 - IBM Open Power Summit
 - Automotive Ethernet Congress
 - XILINX Developer Forum and Security Workshops
 - SNIA Storage Developers Conferences



Challenges of new Projects

Architecture

1. Best approach for Performance?
2. What is available on the Market?
3. Design decisions which can be a burden later in the Project

Full System Stacks:

- Architecture and design choices come from +10 years of Design Service and IP Development in the fields industrial, medical, aerospace, automotive, test & measurement.
- MLE is specialised for High Speed and High Performance designs

Challenges of new Projects

IP Integration

1. High IP Core costs
2. Understand the Configuration
3. Understand the Registers
4. Understand the Handling
5. Fine Tuning everything around the IP, like Transceivers
6. IP Vendor may only care about his part of the solution

Full System Stacks:

1. Single Unit Licensing creates low entry costs
2. As IP creator we understand all implications of the IP interfaces and deliver an optimized configuration
3. We deliver a Full System Stack so we can help in all aspects of the design

Challenges of new Projects

Drivers

1. Integrate and compile drivers
2. Integrate the needed packages

Full System Stacks:

1. Drivers and needed packages are already integrated when delivered

Challenges of new Projects

Applications

1. Write an application which handles the driver well

Full System Stacks:

1. The package also includes an Application Example which show the initialisation, operation*:
read/write/connect/disconnect and teardown

* Depends on the FPGA Full System Stack

Challenges of new Projects

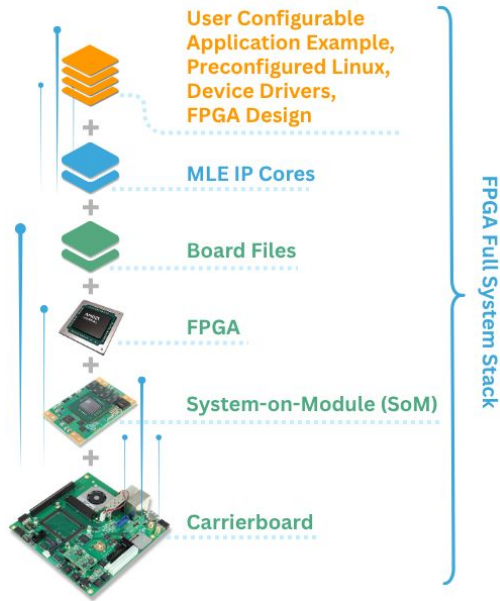
Hardware

1. Turnaround time of Hardware development und later ramp up time.

Full System Stacks:

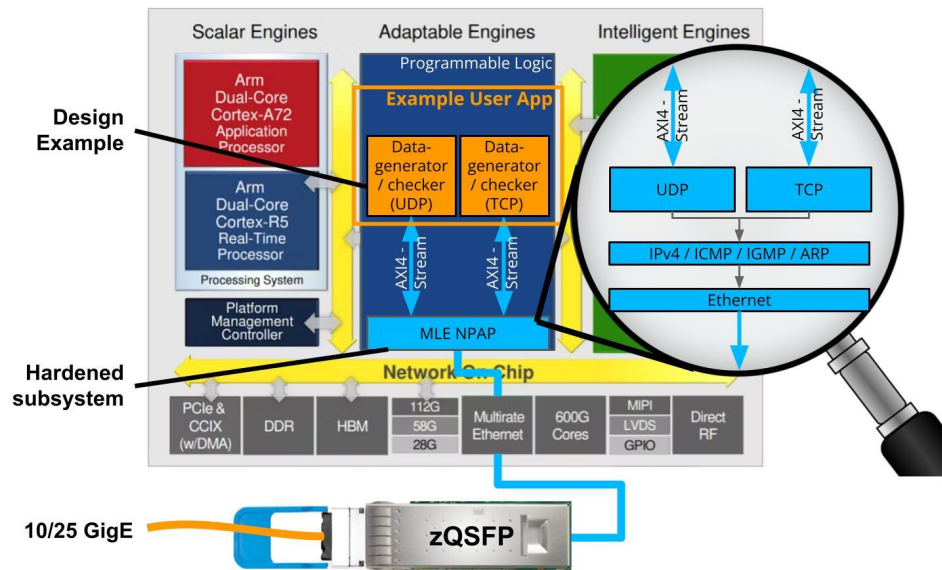
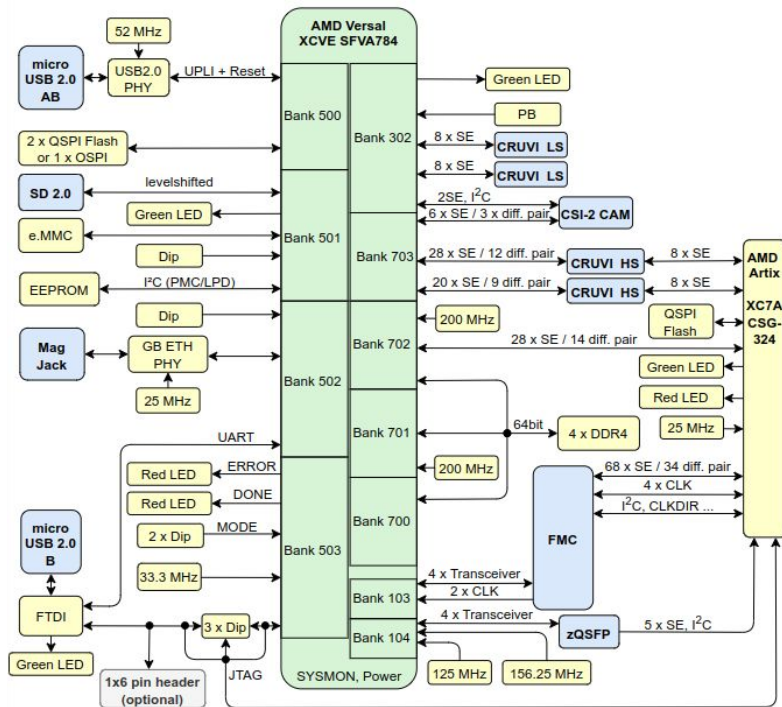
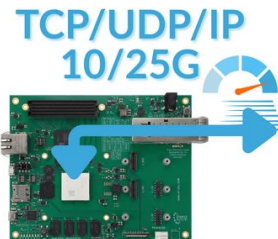
1. Hardware turnaround time reduced due to SOM based approach: Spinning just the carrier board is simpler and cheaper then spinning the full board
2. Software Development can start immediately with an eval carrier
3. For ramp up: Chip down design together with SOM vendor can be much faster as starting with a full PCB design as clock, power, reset und many interfaces are already available

Example for Rapid Prototyping with Trenz Hardware



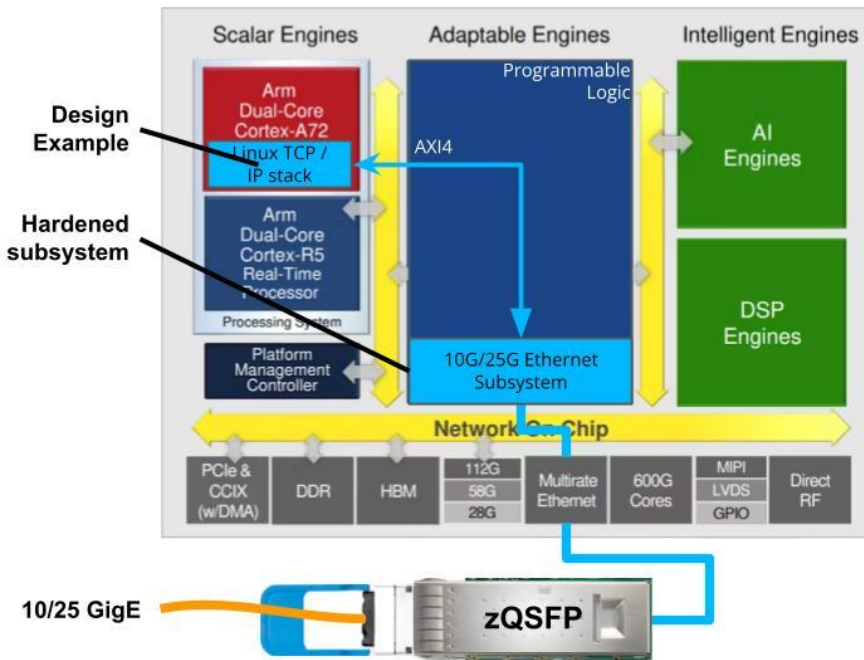
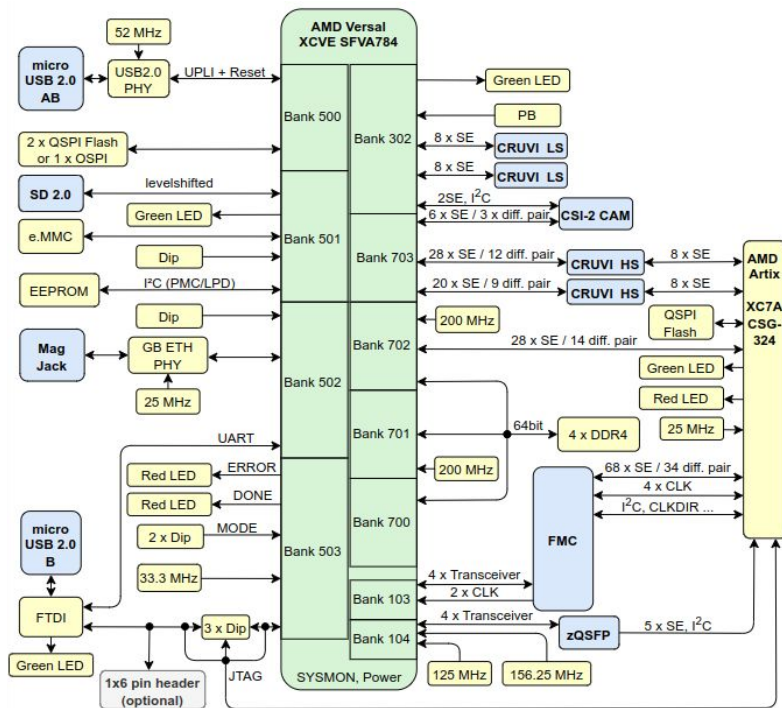
Trenz FFSS Spec

- FFSS-TE0950-NPAP-10/25G



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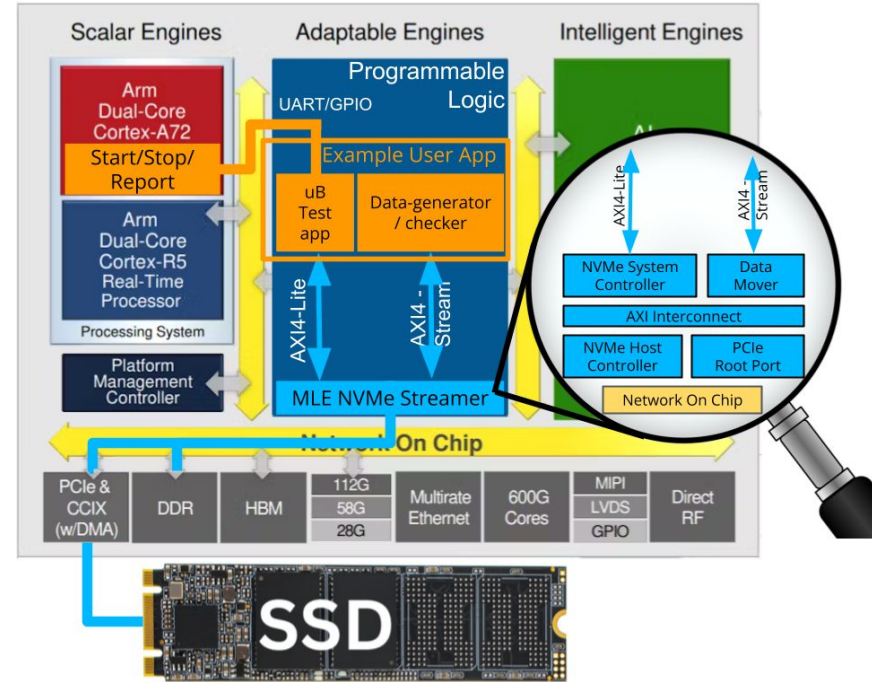
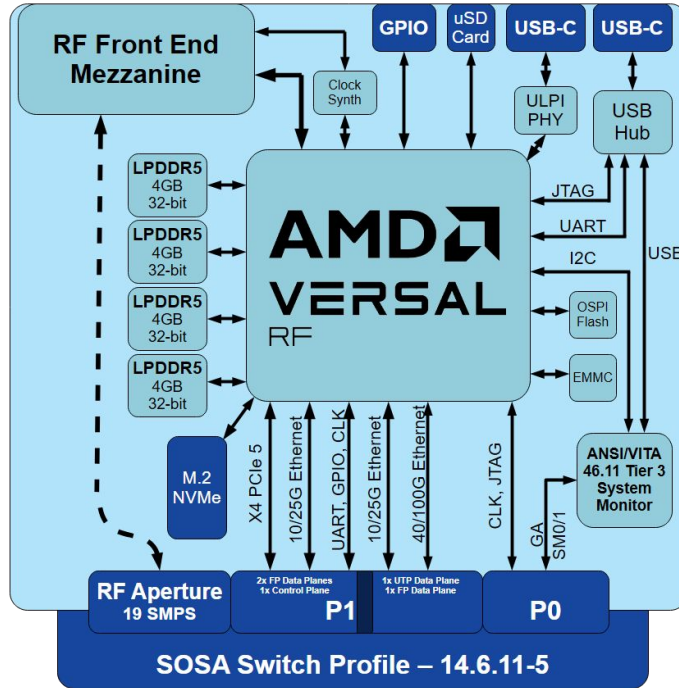


Alpha Data FFSS Spec

- FFSS-ADA-VA330-NVMePL-x4/-x1



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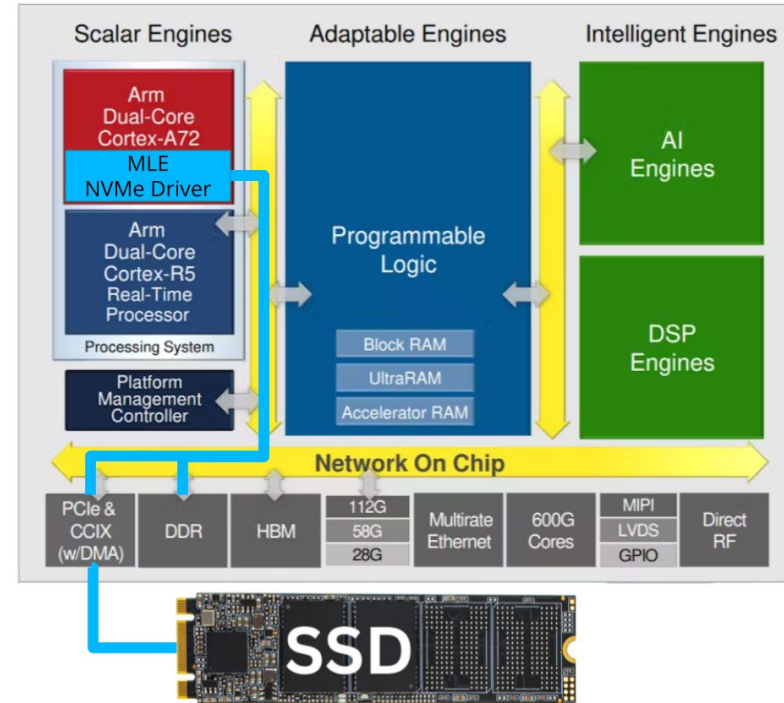
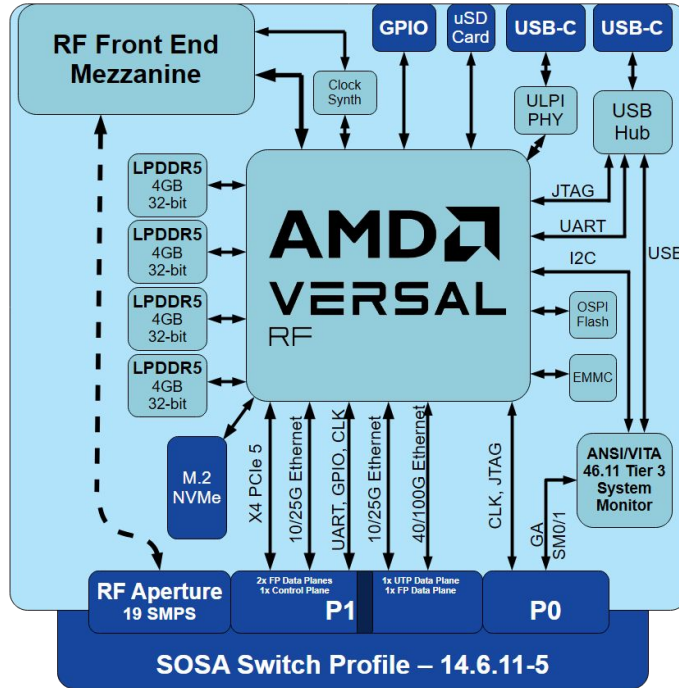


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- FFSS-ADA-VA330-NVMePS



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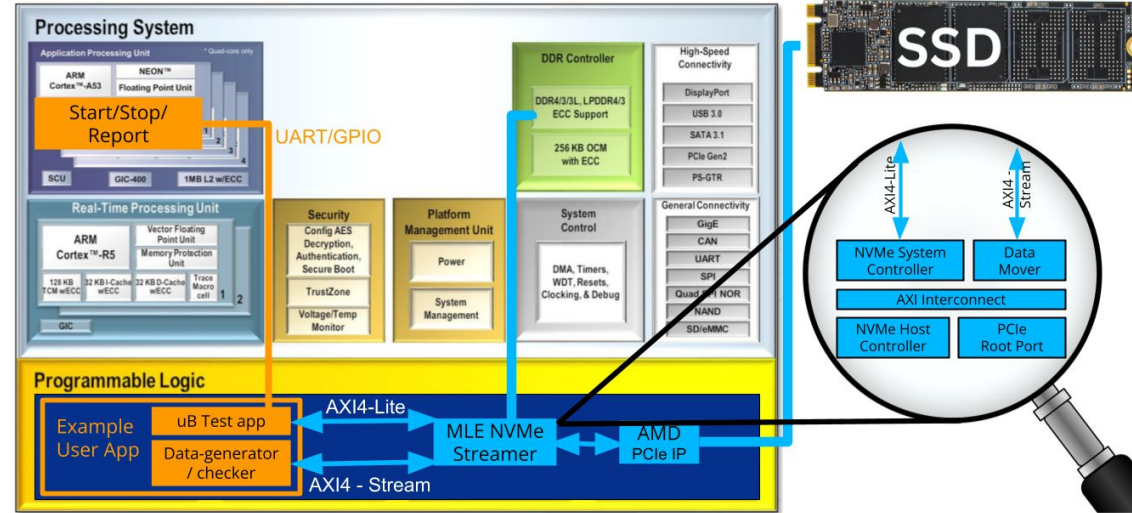
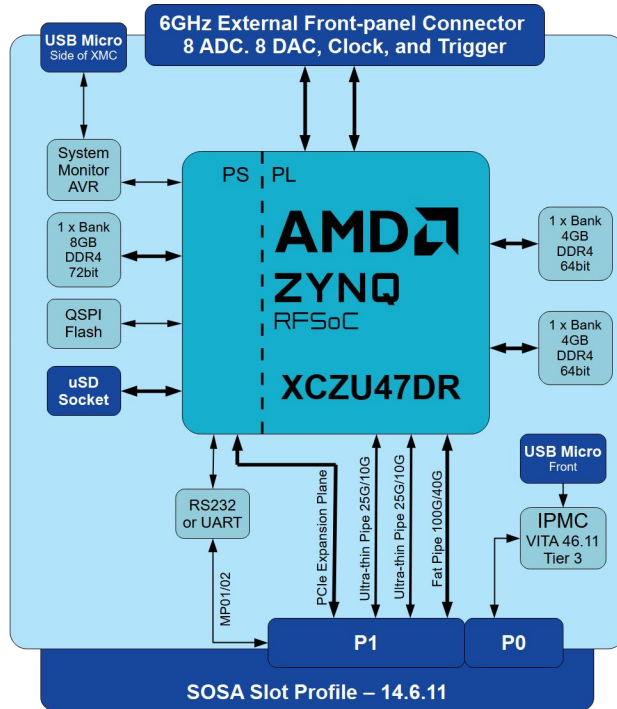
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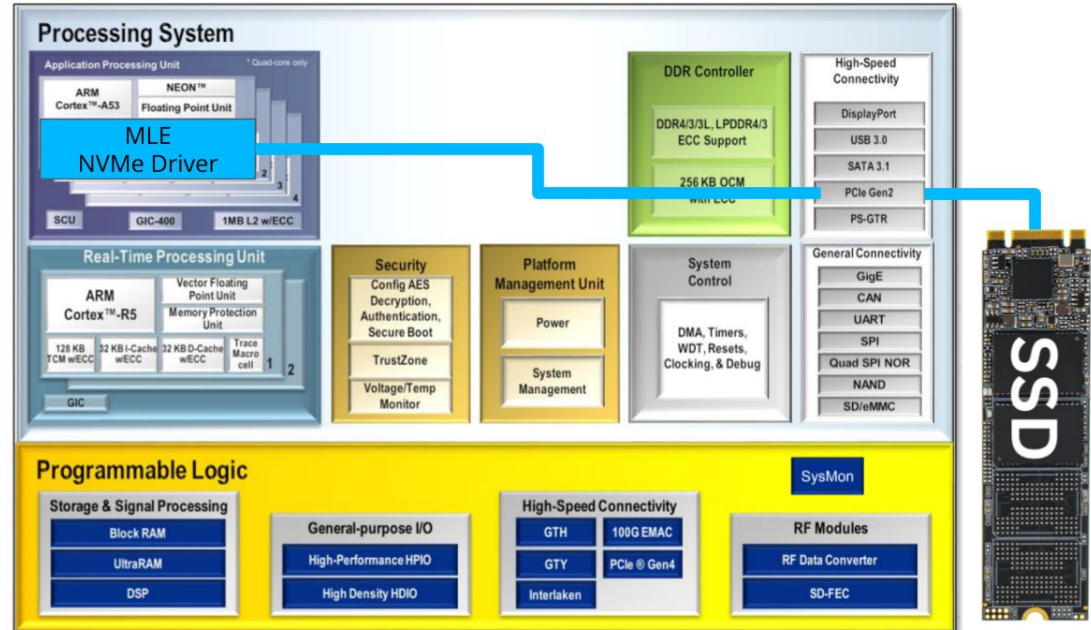


- FFSS-ADA-V9202-NVMePL-x4/-x1



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Solution	Category	SoM	(Carrier) Board	IP/Driver	Status
FFSS-TE0950-NPAP-10G	Network	-	TE0950	NPAP-10G	Launch
FFSS-TE0950-NPAP-25G	Network	-	TE0950	NPAP-25G	Launch
FFSS-TE0950-Netdev-10G	Network	-	TE0950	Linux Netdev 10G	Launch
FFSS-TE0950-Netdev-25G	Network	-	TE0950	Linux Netdev 25G	Launch
FFSS-TE0950-NVMePS	Storage	-	TE0950	Linux nvme.h	Available soon
FFSS-TE0950-NVMePL-x4	Storage	-	TE0950	NVMe Streamer x4	Available soon
FFSS-TE0950-NVMePL-x1	Storage		TE0950	NVMe Streamer x1	Available soon
FFSS-TE0955-NPAP-10G	Network	TE0955	TEB0955	NPAP-10G	Available soon
FFSS-TE0955-NPAP-25G	Network	TE0955	TEB0955	NPAP-25G	Available soon
FFSS-TE0955-Netdev-10G	Network	TE0955	TEB0955	Linux Netdev 10G	Available soon
FFSS-TE0955-Netdev-25G	Network	TE0955	TEB0955	Linux Netdev 25G	Available soon
FFSS-TE0955-NVMePS	Storage	TE0955	TEB0955	Linux nvme.h	Available soon
FFSS-TE0955-NVMePL-x4	Storage	TE0955	TEB0955	NVMe Streamer x4	Available soon
FFSS-TE0955-NVMePL-x1	Storage	TE0955	TEB0955	NVMe Streamer x1	Available soon
FFSS-ADA-VA330-NVMePLx4	Storage	ADA-VA330		NVMe Streamer x4	Launch
FFSS-ADA-VA330-NVMePS	Storage	ADA-VA330		Linux nvme.h	Launch
FFSS-ADA-V9202-NVMePLx4	Storage	ADA-V9202		NVMe Streamer x4	Launch
FFSS-ADA-V9202-NVMePS	Storage	ADA-V9202		Linux nvme.h	Launch
FFSS-ADA-VA210-NVMePLx4	Storage	ADA-VA210		NVMe Streamer x4	Available soon
FFSS-ADA-VA210-NVMePS	Storage	ADA-VA210		Linux nvme.h	Available soon

Thank you

Any questions?

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