Task-9

By Group-6

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Survey Report on FPGA Development Solutions Using AI

Introduction

Field-Programmable Gate Arrays (FPGAs) are increasingly being integrated with AI technologies to accelerate tasks such as machine learning inference, real-time data processing, and more. This survey explores various solutions currently available for FPGA development specifically tailored for AI applications.

Methodology

The survey involved researching and evaluating multiple FPGA development platforms, tools, and frameworks that support AI workloads. The criteria for evaluation included ease of use, performance, scalability, community support, and integration capabilities with AI frameworks.

Findings

1. Intel (formerly Altera) FPGA Platforms
   - Intel® oneAPI Toolkits : Intel offers comprehensive toolkits that include FPGA development tools integrated with their AI frameworks like OpenVINO™ Toolkit. This allows developers to optimize AI workloads for Intel FPGAs.
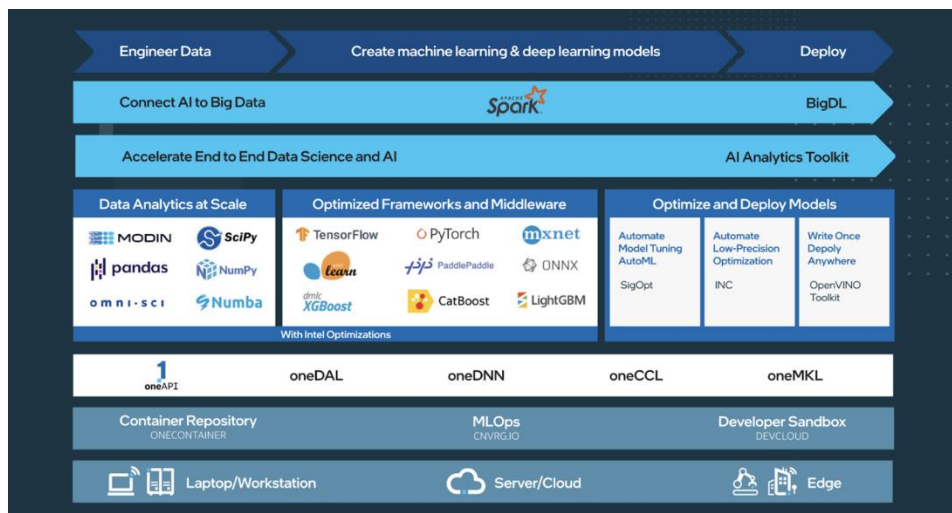
- Intel® Distribution of OpenVINO™ Toolkit : This toolkit provides a unified environment for deploying deep learning models across various Intel platforms, including FPGAs.
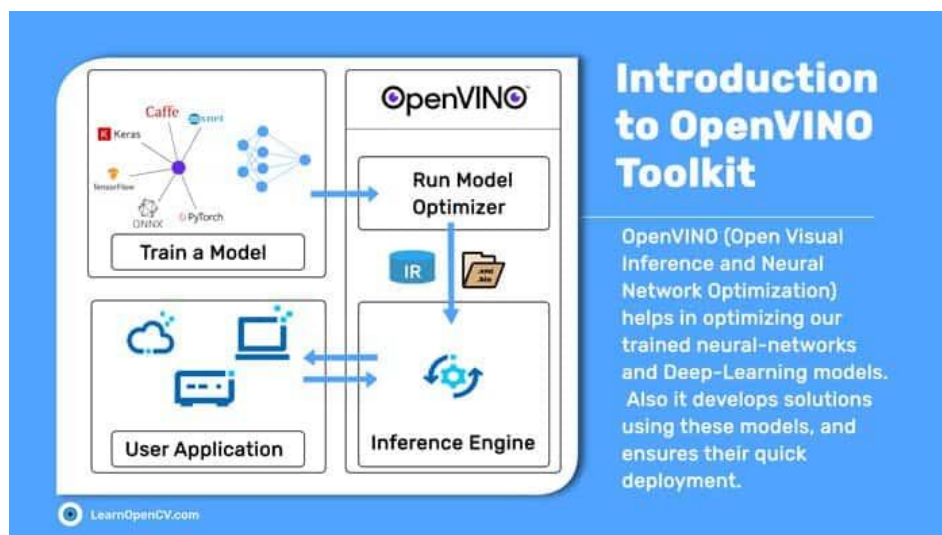

2. Xilinx FPGA Platforms
   - Xilinx Vitis AI : Vitis AI provides a development platform for AI inference on Xilinx FPGAs. It supports popular AI frameworks like TensorFlow and PyTorch and allows optimization of models for deployment on Xilinx devices.
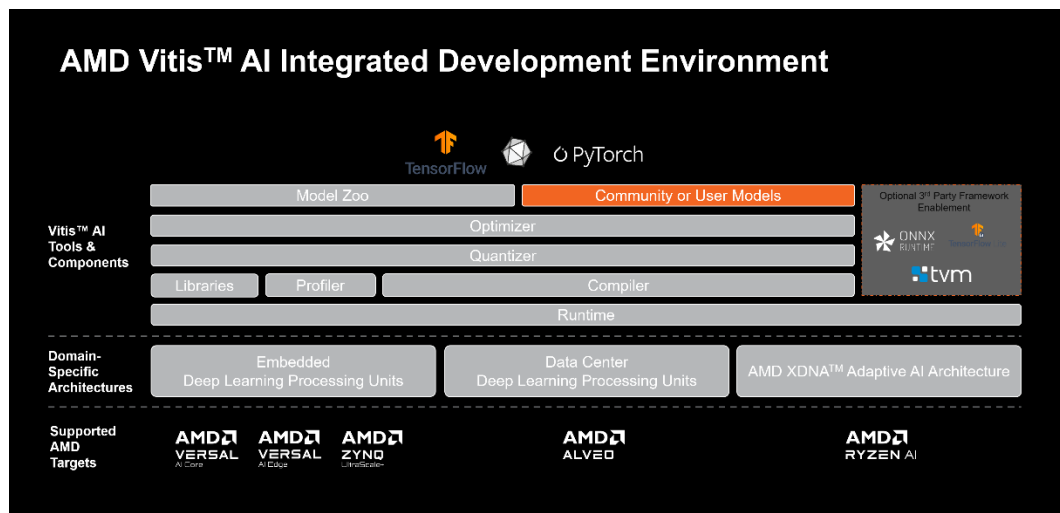
- Xilinx Deep Learning Processor Unit (DPU): DPUs are specialized AI engines within Xilinx FPGAs designed to accelerate AI inference tasks efficiently.
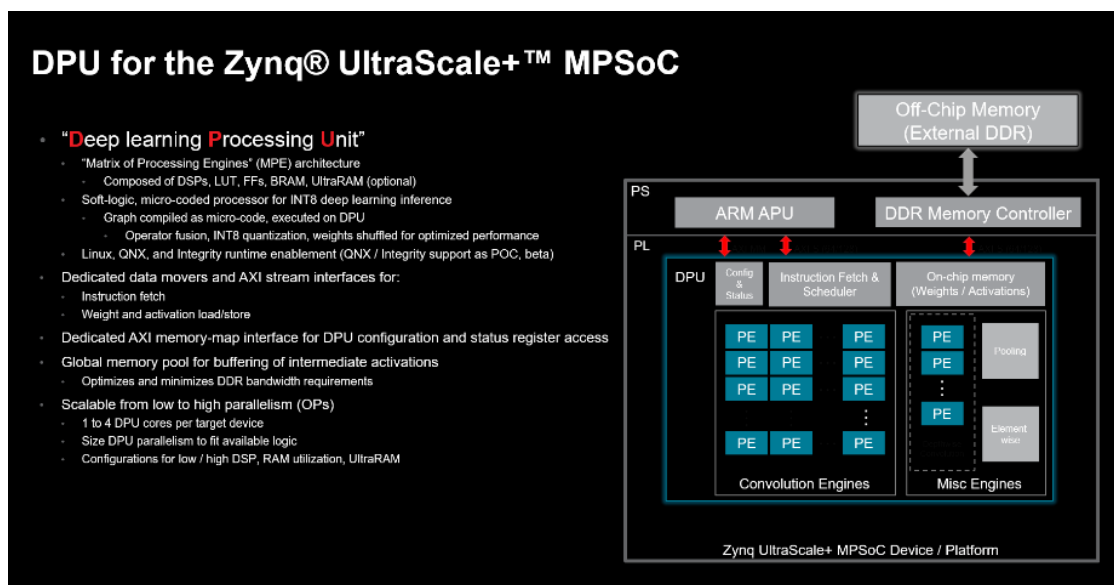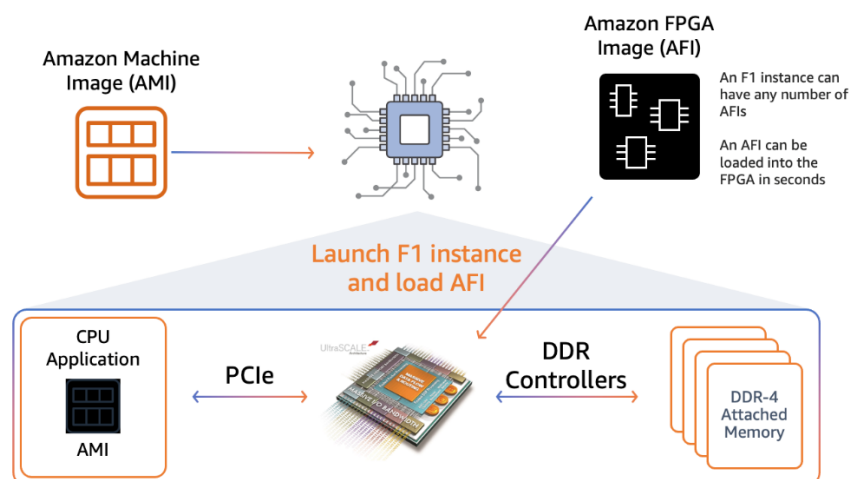

3. NVIDIA

- NVIDIA Deep Learning Accelerator (NVDLA): While primarily targeted at GPUs, NVIDIA has initiatives to integrate AI capabilities with FPGAs through frameworks like CUDA-X AI and collaborations with FPGA vendors.
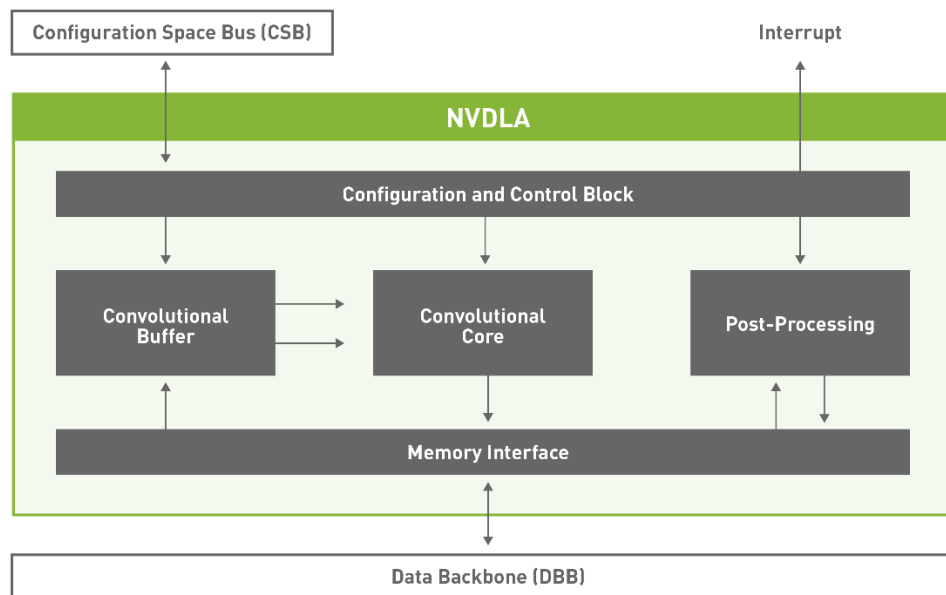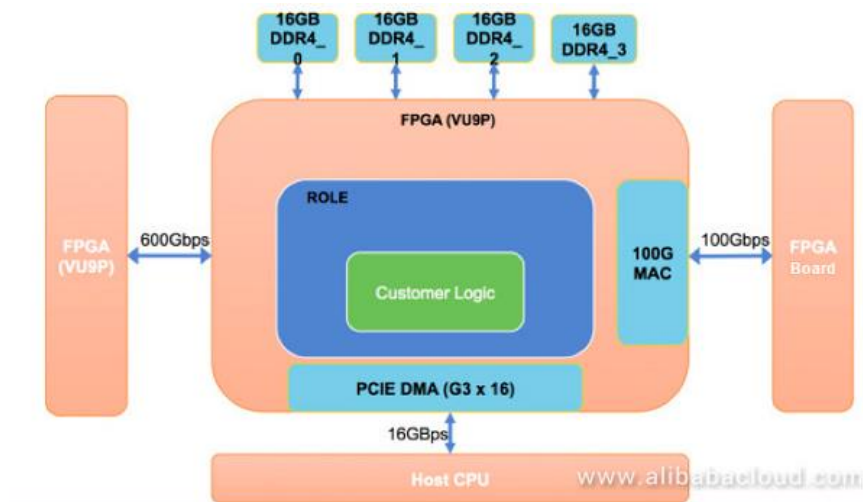
3. Amazon Web Services (AWS)

- AWS EC2 F1 Instances: These instances provide access to FPGAs on AWS cloud, supporting development and deployment of custom hardware accelerators for AI workloads.

4. Alibaba Cloud

- Alibaba Cloud FPGA: Alibaba Cloud offers FPGA instances for accelerating AI inference tasks through their FPGA-accelerated cloud services.

Conclusion

The field of FPGA development for AI applications is rapidly evolving, with major players like Intel and Xilinx offering robust platforms and tools. These solutions enable developers to harness the power of FPGAs for accelerating AI workloads efficiently. Integration with popular AI frameworks and cloud services further enhances accessibility and scalability of FPGA-based AI solutions.

Future Directions

Future developments may focus on improving ease of use, expanding support for emerging AI models and frameworks, and optimizing FPGA architectures for specific AI tasks. Collaboration between FPGA vendors, AI researchers, and cloud providers will likely drive innovation in this space.

References

- [Intel oneAPI Toolkits](https://software.intel.com/oneapi)

- [Xilinx Vitis AI](https://www.xilinx.com/products/design-tools/vitis/vitis-ai.html)

- [AWS EC2 F1 Instances](https://aws.amazon.com/ec2/instance-types/f1/)

- [Alibaba Cloud FPGA](https://www.alibabacloud.com/products/fpga)