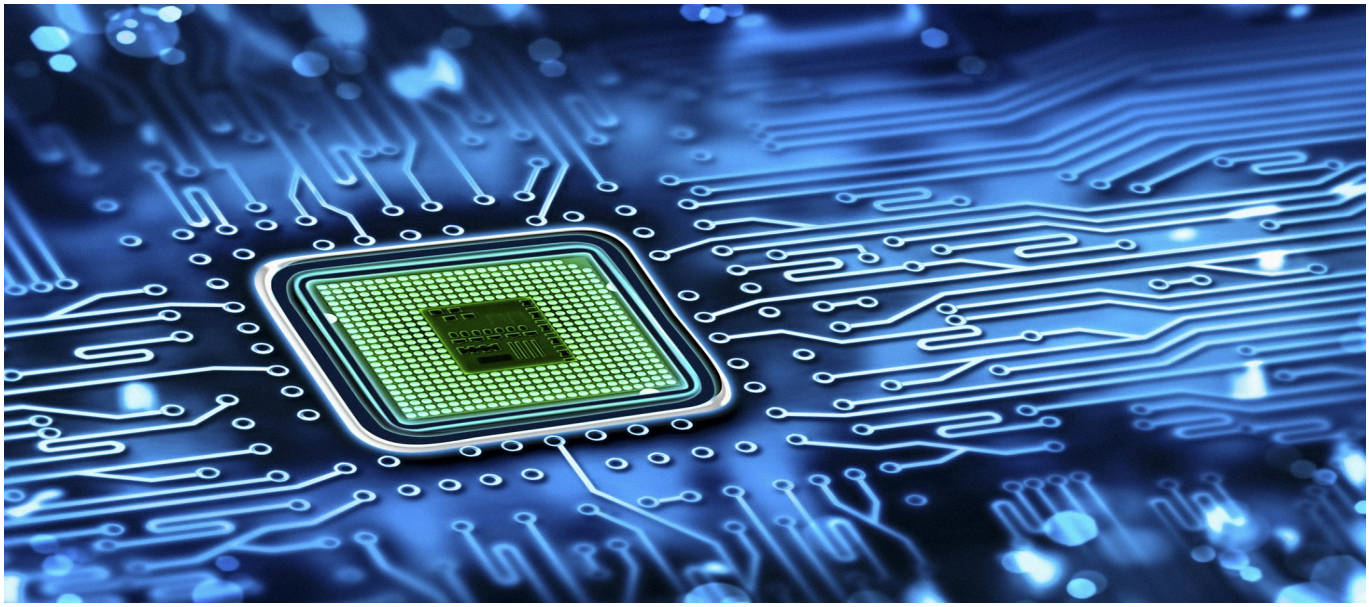
AimValley

FPGA Introduction
Technology Brief



Benefits of FPGAs in Edge Applications

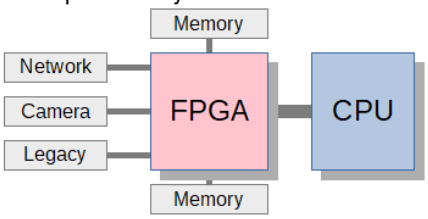
Performance, latency and energy efficiency are critical parameters for system solutions at the edge. Edge computing solutions facilitate data processing near the source of data generation and serve as a decentralized extension of the cloud or data center networks. This eases the integration of locally generated data with lower latency and reduces bandwidth by filtering the relevant data at the edge.

Acceleration with FPGA

Many edge applications are built on a standard x86 based server and combined with network interfaces they provide a great generic compute platform. However, applications at the edge have unique requirements that demand a different system architecture. For instance: integration of an application specific interface for a camera, a process control bus or other industry specific hardware. And to achieve lowest possible latency, dedicated hardware acceleration is needed. Lastly, power efficiency and compact size are mandatory, especially in brown field scenarios where only limited space and low power budget for new equipment are available. Field Programmable Gate Array (FPGA) technology is a great match for these applications.

What is an FPGA?

FPGAs are highly flexible compute devices, that enable fully optimized hardware for specific compute challenges. Unlike CPUs or GPUs, their architecture is re-programmable enabling efficient use of resources and power efficiency. In addition, FPGAs have large amounts of on-chip memory that can be flexibly combined with compute and logic functionality to build high performance data-flow oriented products. Furthermore, FPGAs support huge amounts of I/O capacity for high-speed network interfaces and wide buses to off-chip memory.



CPUs and GPUs execute instructions very fast, but in serial fashion only. In FPGAs, each clock cycle new data is processed for all data elements in parallel. This makes FPGAs very well suited to data-flow oriented computing and run many different algorithms in parallel.

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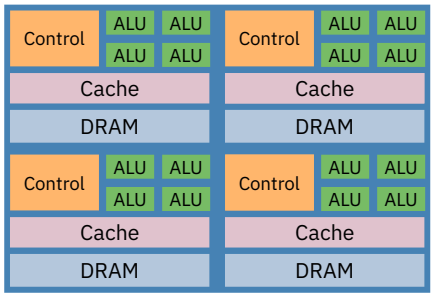
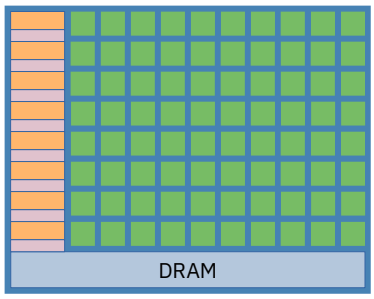
CPU



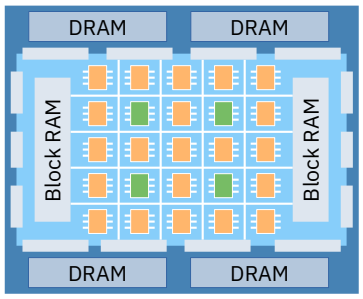
- 10s of processing cores
- Pre-defined instruction set
- Serial execution of instructions
- Optimized for general purpose computing

GPU



- 1000s of processing cores
- Pre-defined instruction set
- Single Instrument Multiple Dat-flow
- Highly effective parallel execution

FPGA



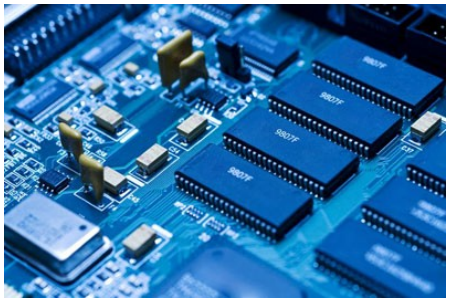
- Millions of programmable logic cells
- Fully flexible datapath widths
- Fine grained memory blocks
- Many high speed interfaces

Unique capabilities with FPGA

FPGAs are typically used to resolve complex calculation tasks with unsurpassed performance due to massive parallel compute capability and high I/O bandwidth. The functionalities and attributes of FPGA can be combined on a single chip to enable uniquely differentiated solutions:

- Heterogeneous compute using logic, memory, and DSP
- State machines, fixed latency, providing hard real-time
- High I/O rates, including protocol off-load
- Streaming and signal processing algorithms
- Machine Learning inference
- Data-flow algorithms and arbitrary data width
- In-field reconfiguration and upgrade

A challenge has been the difficult programming model for FPGAs; but that is solved by AimValley's Accelerated Edge Computing team. Existing applications can be translated and optimized for FPGA logic using high-level languages such as C/C++, OpenCL, HLS, and modern design compilers.



Why AimValley?

AimValley is a reliable provider of Edge technology since 2003, delivering solutions for:

- High speed data processing applications
- Complex FPGA-based accelerated systems
- High speed, low power hardware equipment
- Robust Embedded software
- Early adopter of Acceleration Technology

AimValley understands the full complexities as well as the subtle nuances of designing great edge solutions. We excel in building complex systems that are part of your product in the fields of Factory 4.0, Big Data, Healthcare and Transportation markets. Our combined skills represent all the important aspects required for the development of end-to-end systems. Our customers enjoy the benefits of working with a strong team with more than 2 000 years engineering experience. AimValley is a trusted partner of Tier 1 customers in Telco and Industrial markets, and has shipped more than 100 000 products.

Quality focus

- Outstanding track record of on-time delivery
- Best in Class Designs – Time, Budget & Quality
- ISO9001, ISO140001, Ecovadis Platinum CSR

Learn more about FPGA.