![AimValley logo]

FPGA Packet Processing
Technology Brief

Enabling flexible and high speed data off-load!

Packet processing is a critical function at all levels in the modern network infrastructure, supporting traffic classification, protocol implementation as well as security functions. Increasingly higher line rates demand advanced hardware assisted packet processing solutions, and the constantly evolving functions and protocols call for programmability of these solutions.

Field Programmable Gate Array (FPGA) devices provide a natural technology fit for the implementation of high-speed programmable packet processing, e.g. using an FPGA on a Network Interface Card (NIC), often called a Smart NIC card. Instead of using CPU cores for packet processing, such as filtering, flow lookup and protocol handling, these functions can be delegated to the FPGA. Also other CPU intensive tasks such as wire-rate encryption or content processing, compression and reduplication can all be done on the FPGA, freeing up valuable CPU cores for end-user application level processing.

Another benefit of FPGA based Smart NIC cards is the capability to support non-standard interfaces to enable video capture, legacy telecom or industry control interfaces. Such solutions would eliminate the need for external and proprietary conversion equipment, and enable compact and cost effective system solutions with all the benefits of standard server platforms, software and management.

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 packet processing solutions:
- Heterogeneous compute with memory and DSP
- Fixed latency, providing true real-time results
- High I/O rates, and flexible protocol off-load
- Streaming and signal processing algorithms
- Machine Learning inference
- Data-flow algorithms and arbitrary data width
- In-field reconfiguration and upgrade

AimValley Packet Processing Expertise

A challenge has been the difficult programming model for FPGAs. Unlike CPUs and GPUs, FPGAs require expertise with dedicated programming languages such as VHDL or Verilog and design tools for synthesis and verification. These are covered by AimValley's experienced design team that has delivered 100s of FPGA and ASIC designs, and created an extensive library of field-strength logic functions, accumulating millions lines of source code.

> *"The combination of highly experienced engineers and access to an extensive library of building blocks enables us to deliver high quality designs in a shorter time-to-market"*

AimValley provides a wide range of expertise regarding FPGA based Packet Processing:

- Protocol conversion and tunneling, such as Ethernet to serial, video streaming via packet network, or IP over OTN; and support for multiple legacy protocol translations for Telecom or Industrial equipment
- Packet generation and monitoring, for multiple data flows, creating test patterns, e.g. for test and measurement equipment, or for on-line network quality monitoring and service assurance systems
- High bandwidth packet processing, supporting data rates at 100, 400 up to 800 Gb/s, utilizing a high performance packet processing pipeline and very wide on-chip data bus
- Productivity tools such as HLS and P4 to deliver complex designs with high flexibility and meeting the required quality in a shorter time-to-market
- Consultancy and architectural support, for example selection of FPGA chip vendor and device family, high speed transceivers, and memory subsystem solutions, including on-chip High Bandwidth Memory (HBM).

AimValley Proven Track Record

Our FPGA based packet processing designs are successfully deployed in many products across telecom, industrial and transportation sectors. The solution often includes our hardware board design, software drivers, protocol stacks, or system level test. Examples of FPGA enabled product designs and technologies are:

- TDM over Packet systems for Telecom
- CPRI and Mobile Fronthaul Solutions
- 400G FPGA PCIe card
- Smart SFP with packet processing FPGA
- Video Streaming over Ethernet

Why AimValley?

AimValley is a reliable provider of packet processing 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

We understand the full complexities as well as the subtle nuances of designing great edge solutions. Our experts excel in building complex systems that are part of your product in the fields of Telecom, Industry 4.0, 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 Telecom and Industrial markets and has shipped over 100 000 products.

Quality Focus

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

Delivering Solutions for a Connected World

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