

ApplicationOnload™ Engine Second Generation Firmware Development Kit

The Solarflare® ApplicationOnload™ Engine (AOE) Second Generation Firmware Development Kit (FDK 3) enables customers and developers to create and deploy customized FPGA-based and hybrid network applications for the Second Generation AOE. Solarflare's FDK 3 builds on the first generation allowing accelerated RTL deployment for a variety of industries, including financial services, with a rich development environment and toolkit. Key changes in this second generation product include full RTL source code to the board services cores as well as reference source code and complete control of the packet data path across the FPGA.

Custom Application Deployments

Solarflare's SFA7942Q ApplicationOnload™ Engine is an open platform that combines a high performance, ultra-low latency server adapter with a tightly coupled bump-in-the-wire programmable FPGA. The integrated FPGA subsystem provides the capability to run latency-sensitive and high-throughput mission-critical applications directly within the AOE network adapter, accelerating host application performance while reducing overall latency and footprint. Solarflare's AOE FDK 3 delivers the framework to enable custom application deployments.

Simplifies the Process

As the ApplicationOnload Engine is also an Onload-enabled adapter it has full access to all Onload functionality. One key recent development allows Onload to be instructed to return TCP header templates to an application. The application may then populate the payload and send finished frames directly to the wire rather than handing the payload to Onload to be sent. In this mode, once the application has the template, there is no further TCP processing required to send it.

Solarflare is shipping a worked example representing the fast-path of a financial trading application, with all source (Verilog, C) code, demonstrating this functionality. This example essentially provides the means for a "trading" application running on the FPGA to receive UDP data, parse it and return a TCP segment to an already open socket (owned by an application running on the host) in under 250ns. Due to Onload pre-preparing TCP templates, the TCP

processing contribution to this use-case in the time between the UDP datagram arriving and the TCP segment going can be made to be zero. The purpose of this worked example is to demonstrate and provide a starting point for financial trading clients to implement their own ultra-low-latency trading algorithms.

The FDK also greatly simplifies the development and deployment process by providing board management services, including initialization, image deployment, network connectivity (third-party PCS/MAC of choice required), DDR3 RAM access, power, and thermal management as well as reference application source code. FDK users can modify the reference design implementing the network data path across the FPGA or even rewrite it completely while taking full advantage of the board services offered. The FDK provides a development platform with both inline streaming Ethernet data path interfaces and host-based configuration and management interfaces. Additionally, it integrates seamlessly with Altera's Quartus® II design suite to enable the entire development flow for the AOE FPGA allowing final download to the development platform via either Quartus or Solarflare download mechanisms. The FDK comprises a number of board services RTL cores as well as code providing services to be run on an Altera NIOS II soft-processor. A number of reference network data path and DDR3 RAM access reference implementations are also provided. All of the above are delivered as source RTL with documentation. Host drivers, management and configuration utilities and documentation are also included.



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Firmware Development Kit Components

- Host OS drivers
- Pass-through FPGA image providing 2x10GbE or 1x40GbE for testing network connectivity/debugging
- Board Services Cores
- Reference RTL designs ready for customer development for Packet Passthrough allowing development of applications leveraging up to 8x10GbE or 2x40GbE interfaces and access to the board's four channels of DDR3 RAM
- User Guide and Documentation
- Memory-Mapped access library for host software configuration & management of applications & services on FPGA
- PCS/MAC cores from Tamba are supported directly by the FDK (separate purchase); other MAC/PCS products are available from 3rd party vendors.

Advanced Features and Benefits

Firmware Development Kit Board Services

- Supplied as RTL source code
- Functionality includes MAC wrapper for Tamba PCS/MAC ready to be adapted to PCS/MAC of choice
- Communication channel configuration and management of control plane
- FPGA power supply configuration and management
- On-board sensor configuration and management
- FPGA boot from flash error notification
- Control plane memory-mapped API
- AOE Linux driver
- SF update utility to update

Specifications

Third-party Required Components

- Altera Quartus II Software
- Altera NIOS II embedded Design Suite
- Altera Triple-Speed Ethernet MegaCore Function
- 10/40GbE PCS/MAC of choice

Documentation

- Full description of board, firmware, and architecture
- Description of FPGA board services cores
- Description of MM API including register map, bit/register definitions
- Description of MM access
- Description of Cores used in Reference Design
- Source code compilation instructions
- How to load firmware onto the board using either Quartus II and ByteBlaster, or Solarflare's update utility

Getting Started Is Simple

- SFA7942Q-A7-4
- Extra memory AOE-MEM-004D-1600 or AOE-MEM-008D-1600 (optional)
- Linux Operating Systems: RHEL 5/6/7/ MRG 2/Real Time 7, SLES 11/12, Canonical Ubuntu Server 14/15, Debian 7/8 (all update releases which are within OS vendor support)
- Server with full height, half length PCIe slot
- Third-party Required Components
- Altera ByteBlaster cable
- HDL simulator (free with Quartus II)

Order Information

The Application Onload Engine Second Generation Firmware Development Kit will be made available via download from the Solarflare support site, upon request, following purchase of a SFA7942Q board.



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