FPGA Solutions for Financial Applications

Intel Arria® 10, Stratix® V, and Arria V FPGA Platforms for Financial Applications

- Industry-leading high-performance FPGAs with over 1.5 TeraFLOPS of processing
- 40GigE and 10GigE straight to the FPGA (no external PHY) for ultra-low latency, saving hundreds of nanoseconds
- Maximum processing performance per watt
- PCIe-compliant deployable slot-cards for blade server systems
- Complete FPGA development platforms: server-based, slot-card, and multi-FPGA high-performance computing
- Proven hardware that works out of the box, with validation, verification, and control software in place
- FPGA Development Kit with proven, hardware-specific IP
- Finance-specific FPGA IP for network or CPU acceleration
- Long standing FPGA platform vendor with a history of proven, successful, on-time supply

Financial Application Challenges

Whether handling a large-scale data feed or analyzing pre-trade market risk, financial applications have to account for a variety of challenges. These applications require ultra-low latency feed handling as well as ever-faster analysis/data correlation. They should also attain maximum performance per watt to minimize energy and thermal requirements. Many applications also require a scalable architecture to enable “FPGA Farm” implementation. BittWare offers FPGA-based PCIe COTS solutions to address the challenges of developing applications for the financial acceleration/HFT (High Frequency Trading) market.

BittWare Solutions to Financial Application Challenges

BittWare’s ultra-low latency hardware is based on Intel’s industry-leading Arria 10, Stratix V, and Arria V FPGAs and provides CPU offload along with the highest performance transceivers. With maximum processing performance per watt to minimize energy and thermal requirements and up to 100GigE straight to the FPGA for ultra-low latency, BittWare’s PCIe boards are ideal for applications in trading, market data/feed handling, risk analysis, and acceleration.

BittWare’s PCIe board platforms are based on the Intel Arria 10 GT/GX/SX, Arria V GZ, and Stratix V GX/GS, which are industry-leading FPGAs with up to 1.5 TeraFLOPS of processing. The boards provide up to 100GigE straight to the FPGA (no external PHY) for ultra low latency, saving hundreds of nanoseconds. Providing maximum processing performance per watt, these PCIe-compliant deployable slot-cards are proven solutions that work out of the box, with validation, verification, and control software in place.
BittWare Hardware

BittWare PCIe Board Platforms
BittWare offers PCIe board platforms based on the high-bandwidth, power-efficient Intel Arria 10, Stratix V, and Arria V FPGAs. BittWare’s board platforms are flexible and efficient solutions for high-performance network processing, signal processing, and data acquisition. BittWare offers solutions for financial acceleration to meet our customers’ specific requirements, a variety of memory types, including DDR4, DDR3, QDRII+, and RLDRAM3; HDL and OpenCL development environments; and the ability to customize products to your specific application.

Arria 10 based PCIe boards are available in low-profile and 3/4-length variants:

- **A10PL4**: Arria 10 GX low profile PCIe card with dual QSFP+ and DDR3
- **A10P3S**: Arria 10 GX/SX 3/4-length PCIe card with quad QSFP+, DDR4, QDR-II+
- **A10PED**: Arria 10 GX/SX full-length PCIe card with dual 12x Avago Fiber Optic, QSFP, and HMC

Stratix V based PCIe boards are available in several variants:

- **SSPH-Q**: Stratix V GX/GS x8 PCIe half-length card with dual QSFP+, QDRII/II+, DDR3
- **SSPE-DS**: Dual Stratix V GX/GS x16 PCIe card with quad QSFP+ and DDR3, QDRII+, or RLDRAM3
- **SSPE-F**: Stratix V GX/GS x8 PCIe card with RLDRAM3, DDR3, or QDRII+, VITA-57 FMC site, and expansion site with multiple SerDes and GPIO

We also offer a low-profile Arria V PCIe board:

- **ASPL**: Arria V GZ x8 low profile PCIe card with dual QSFP+ and DDR3, QDRII/II+, or RLDRAM3

BittWare’s PCIe boards offer:

- Support for Intel’s SDK for OpenCL™ (Arria 10 and Stratix V boards only)
- 40GigE and 10GigE connections straight to the FPGA: no separate PHYs for lowest possible latency
- Full support for PCI Express Gen 3 (x8 PCIe lanes)
- QDRII+ SRAM for lowest latency, DDR4 and DDR3 SDRAM for bulk storage, RLDRAM3 for low latency and storage
- Built-in support for 100, 40, and 10GigE
- Optional TCP/IP off-load engine (TOE)
- Fully validated, enterprise class, deployable boards

BittWare Integrated Platforms
BittWare also offers complete systems for developing and deploying FPGA applications. The PCIe Financial Acceleration Platform (PRDP-FN) is an application-ready server platform specifically designed for Financial Acceleration and High Frequency Trading applications. This platform features IBM/Lenovo, Dell, and HP server systems with PCIe 3.0 expansion slots and arrives tested and configured, enabling designers to quickly deploy their financial applications. BittWare is an IBM Industry Solution Reseller (ISR) and an HP Business Partner, which ensures that OS and application software and all platform components including chassis, processors, memory, disk drives, internal storage, and FPGA boards work together seamlessly.

BittWare’s TeraBox is an ultra high-performance FPGA platform ideal for network/packet processing and high performance computing (HPC) applications. Featuring up to sixteen of the largest Intel Arria 10 or Stratix® V Family FPGAs, the TeraBox offers up to 20 TeraFLOPS of processing power, along with up to 6.5 Terabits/sec of memory bandwidth and up to 1.28 Terabits/sec of I/O – all in a turnkey rackmount solution.

FPGA Based Network and Algorithm Acceleration for Financial Trading

System Example:

In this example, the FPGA in the customer’s high frequency trading application receives market data via 10GigE from the financial institution. The FPGA decodes, parses, and filters the feed; keeps the books; runs trade/risk algorithms; and manages orders. The CPU is used for system management. Orders are sent back to the financial institution via the FPGA over Ethernet.
BittWare Firmware and Financial Solutions Partners

BittWare offers firmware for its Arria 10, Stratix V, and Arria V FPGA-based PCIe boards, targeted specifically for financial applications. BittWare’s FPGA development kit provides a solid base for your financial application, including the following:

- 10GigE MAC
- PCIe multi-channel DMA engines
- DDR3 SDRAM and QDRII/II+ controllers

BittWare has also partnered with the leading suppliers for financial acceleration and validated their IP on BittWare hardware:

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Customer Success Stories

Fixnetix iX-eCute Trading System Second Phase Solution

Fixnetix, a global managed services provider for trading, market data and risk control, came to BittWare looking for a solution for the second phase of their iX-eCute trade execution and pre-trade risk service. Like most financial applications, Fixnetix had very specific requirements for their iX-eCute trade execution and pre-trade risk service product. The company was embarking on a technology refresh to take advantage of increased performance from a more powerful FPGA technology, and they were looking for a COTS board design company to provide a solution for these next generation products. BittWare worked with Fixnetix to create a complete solution that included a BittWare PCIe deployable slot-card based on the Intel Stratix V GX with large banks of DDR3 memory, and BittWare’s FPGA development kit with proven, hardware specific IP.

Myricom Next Generation Network Adapter

CSPI/Myricom, an IT integration solutions and high-performance computer system provider, came to BittWare after determining that FPGAs were the logical solution for its next generation of network adapters. In a joint development effort, CSPI based its next-generation Myricom network adapter on BittWare’s Arria V GZ low profile PCIe board platform (A5PL), which provides two 40 GigE or eight 10 GigE network interfaces and optional DDR3 or QDRII+ SDRAM. The solution uses BittWare’s FPGA board platforms and value-add expertise, enabling Myricom to go to market quickly and efficiently with their proprietary Intellectual Property (IP). Teaming with BittWare on the development of their Arria V based platform provided CSPI with a high quality foundation for their application-targeted IP.

NovaSparks 3rd Generation Feed Handler for Financial Applications

NovaSparks, a leader in FPGA-based high performance and ultra-low latency market data solutions for the financial industry, came to BittWare for an FPGA solution for their 3rd generation feed handler for financial applications. Designed for time-sensitive trading strategies, NovaSparks’ data feed handlers use the highest performance FPGA technology and board designs. Historically the company designed and developed these FPGA boards in-house. With its 3rd generation feed handler, NovaSparks chose to rely on BittWare to develop its new FPGA platform. The feed handler – NovaTick – is based on a BittWare Stratix V custom form factor board platform that features 8 QSFP+ and 8 SFP interfaces augmented by QDRII+ memory and an optional DDR3 SDRAM module.
Tools and Support

OpenCL™ Support
BittWare’s PCIe boards are optimized for the most current Intel device architectures and design software and are supported by Intel’s SDK for OpenCL. OpenCL dramatically simplifies FPGA development by enabling designers to code their systems and algorithms in a high-level C-based framework. This gives developers access to the latest generation of high-performance FPGAs on a validated PCIe board, while also significantly reducing their time-to-market by using OpenCL kernels to target Intel FPGAs.

BittWare is a preferred board supplier for Intel OpenCL and works closely with Intel to ensure that our boards are certified to support the OpenCL SDK.

BittWorks II for System Development
For system development tools, BittWare offers the BittWorks II Toolkit, which is a collection of libraries and applications for BittWare’s Stratix V based boards. It provides complete hardware and FPGA interfaces, allowing customers to focus on application coding.

Board Management Controller
BittWare’s Arria 10, Stratix V, and Arria V boards feature an advanced system monitoring subsystem, similar to those typically found on today’s server platforms. At the heart of the board’s monitoring system lies a Board Management Controller (BMC), which provides a wealth of features, including control of power and resets, monitoring of board sensors, FPGA boot loader, voltage overrides, configuration of programmable clocks, access to I2C bus components, field upgrades, and IPMI messaging. Access to the BMC is via PCIe, USB, or serial port. BittWare’s BittWorks II Toolkit also provides utilities and libraries for communicating with the BMC components at a higher, more abstract level.

Custom Product Design Services
We offer custom product and software design services for our customers, based on Intel FPGAs. Whether modifying an existing design from our extensive off-the-shelf product line or building a product to meet a customer’s exact specifications, our team can deliver a broad range of solutions.

Why BittWare?
BittWare is a long-standing, ISO 9000 certified FPGA platform vendor with a history of proven, successful, on-time supply to our customers, who include a number of Fortune 500 companies. With over 25 years of experience serving diverse industries, including defense and telecom, we develop our products to adhere to strict standards and processes. Our hardware works out of the box, with validation, verification, and control software in place, allowing our customers to focus on their own expertise – their unique applications. We offer compatible hardware variants for alternate formats, functions, and technology upgrades, so developers can be creative and improve their system implementations without having to redesign components. The result is high-quality, reliable, deployed solutions with a quicker time to market and less risk.

FPGA Development Kit
BittWare’s FPGA Development Kit (FDK) provides FPGA board support IP and integration for BittWare’s Intel FPGA-based board platforms. The FDK includes FPGA components that provide preconfigured physical interfaces, infrastructure, and examples, drastically cutting development time and easily integrating into existing FPGA development environments.