

# *The* **Myricom ARC Series with DBL**

**Drive down Tick-To-Trade latency** with CSPi's Myricom® ARC Series of 10 gigabit network adapter integrated with DBL software. They surpass all other full-featured adapters, with industry-leading latency plus advanced capabilities to accelerate your trading application, enable advanced trading capabilities and meet MiFID II reporting regulations

### Driving Latency Close to Zero

All ARC adapters minimize latency by exploiting the parallel processing capabilities of powerful FPGAs and integrated acceleration software libraries to:

- Move packets into the host computer with the lowest possible latency
- Send a subset of these packets directly to specific CPU cores, bypassing the kernel entirely
- Stage TCP market orders or quotes in advance to further reduce latency



- 10GbE network adapters lead the industry in system-level Tick-To-Trade Latency
- Tightly integrated FPGA firmware and server software combine to accelerate trading applications
- Precise hardware timestamps on both ingress and egress packets
- Support for Linux and Windows

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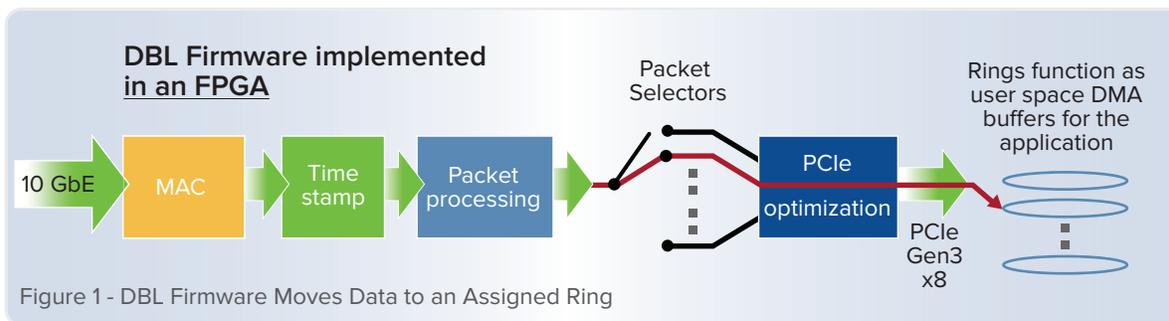
### System-level Tick-to-Trade Latency

DBL drives down Tick-To-Trade latency at multiple points in the trading process, allowing your application to deliver higher fill rates.

First, it minimizes Receive Latency by exploiting the parallel processing capabilities of powerful FPGAs to direct subsets of a multi-cast market feed to specified CPU cores, totally bypassing the OS kernel.

At initialization, your application uses our DBL software library for a quick and easy set-up of the selectors, targeting data from a specific address and port to an assigned ring.

(See Figure 1) Every packet does not need to move into the user space data rings, just the packets your application uses.

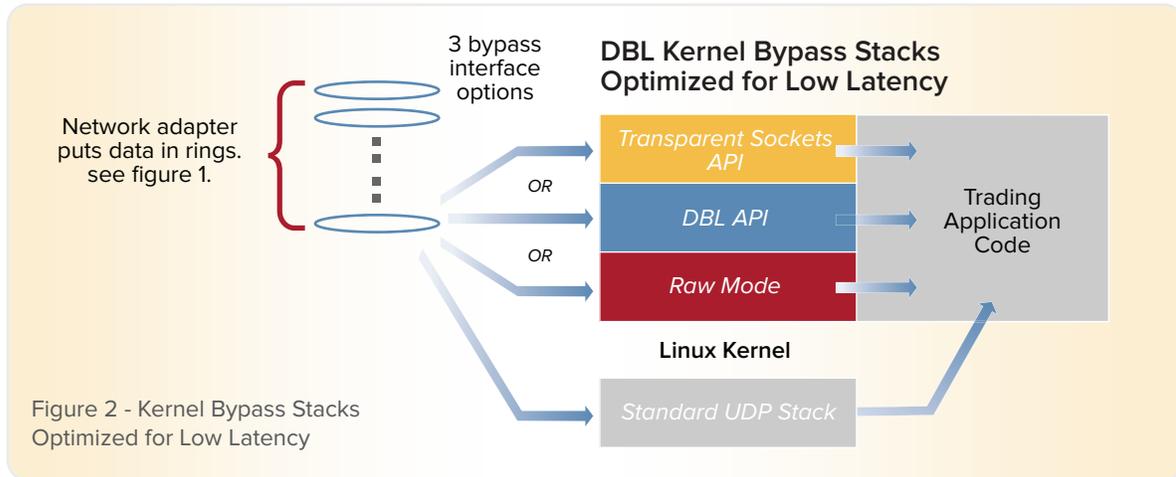


### Integrated DBL Software Accelerates the Application Layer

You can compress total Tick-To-Trade latency even further by accelerating your application with the tightly integrated DBL software (See Figure 2). Acceleration is delivered by Kernel Bypass Stacks, which move UDP packets directly to your application in user space. Doing that eliminates the cost of CPU context switches and also enables deployment of special-purpose network stacks in user space, which are faster than the general purpose stacks inside the kernel. The DBL software provides 3 interface options for implanting a faster network stack:

- Transparent Sockets allow your application to accelerate stack performance without code changes. Standard socket calls access the low latency DBL stack without recompiling.
- The DBL API accesses a set of Myricom-optimized sockets. It requires a software recompile, with renamed socket calls, but delivers even lower latency.
- Raw Mode allows customers to implement their own custom stacks with the Myricom ARC network adapters, using either raw sockets or a proprietary API.

In general, Raw Mode is useful for customers who have created their own UDP networking stacks to work with another vendor's products and are now migrating to the Myricom network adapters. Most longtime Myricom customers use the DBL API, gaining the advantages of a latency-optimized UDP stack function without investing time or money in additional software development.



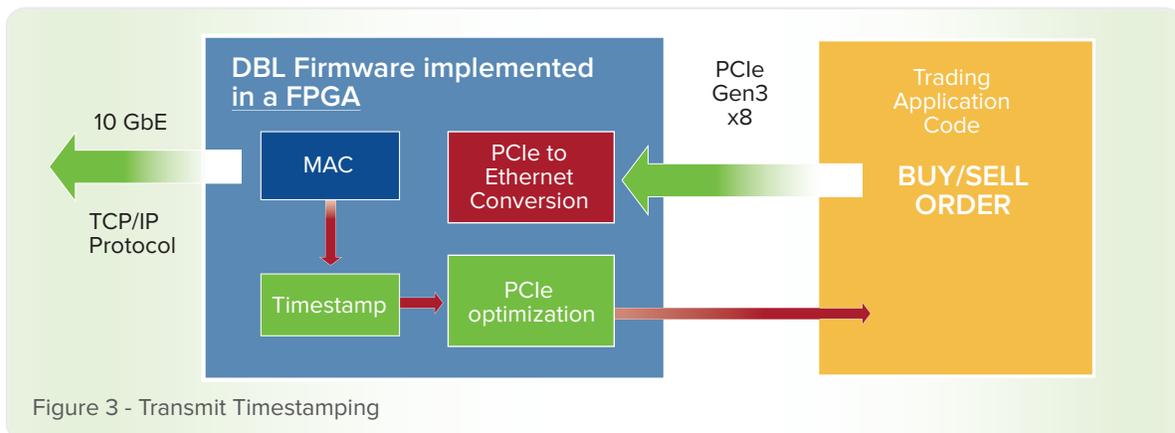
### Reducing Send Latency

DBL software accelerates outbound order processing by pre-populating the TCP/IP stack in user space, then filling in just the variable information from the application before sending the BUY/SELL order packet to the adapter. The Send Latency is further minimized with extremely efficient PCIe to Ethernet conversion firmware.

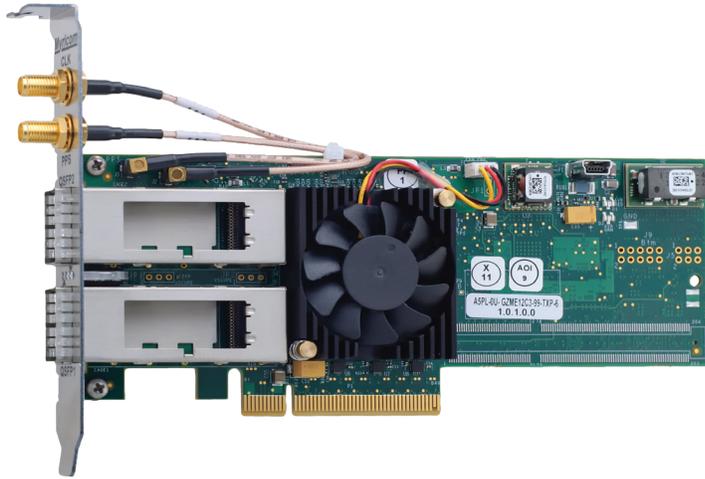
### Precise Hardware Timestamps

With DBL firmware, the ARC adapters are able to track latency in real-time with less effort and more accuracy than expensive packet capture devices, using precise hardware timestamps on both ingress and egress packets. This unique capability allows your application to calculate and display latency in real-time without needing to tag TCP/IP orders with UDP sequence numbers, for simplified trading performance verification.

Precise timestamping also prepares trading systems for compliance with the detailed reporting defined in the MiFID II regulations. By implementing both Receive and Send timestamps in the Myricom ARC Series hardware, your trading application can meet the new transparency requirements while still executing with extreme low-latency.



**D-Class**



**Features**

- Competitive latency
- Cost optimized
- Timing kit is optional

**E-Class**



**Features**

- Industry's lowest latency
- Performance optimized FPGA
- Timing kit is standard

**ARC NETWORK ADAPTER FAMILY**

**- KEY SPECIFICATIONS**

Bus Interface	PCI Express Gen 3, 8 lanes wide
Form Factor	Low-profile PCI Express x8 add-in card. Ships with a standard height faceplate installed; low profile faceplate in the box. The optional timing kit has a standard height faceplate with coax connectors installed. The E-series does not require a timing kit.
Environmental	CSPi recommends that adapters be installed into servers that provide some air flow over the PCIe slots (very common). Use in an office or computer room environment.
DBL Endpoints	Support for 16 simultaneous rings (DBL endpoints). The size of each ring is limited by the amount of available host memory. Support for up to 511 simultaneous UDP multicast groups open per Ethernet port (1022 per board).
Packets Per Second	Every adapter optimized for ultra-low latency will bump into a maximum packet-per-second rate when the packets hit Intel's PCIe implementation. That maximum depends upon the Intel chip on the other end of the PCIe bus.

On-board clock tick precision	The process associating timestamps with packets has $\pm 5$ nanoseconds of uncertainty. If you elect to synchronize with an external time source ("trim the clock"), that process has $\pm 10$ nanoseconds of uncertainty.
Timestamp stability	Timestamp stability is determined by the on-board oscillator (a Vectron VT 804 TCXO) or by any optional, user-provided 10 MHz clock.
IEEE 1588	Myricom time stamps are captured in a manner that allows IEEE-1588 software implementations to deliver highly accurate, synchronized time.
Ping-Pong latency	1.31 $\mu$ is the minimum latency for a 1-byte-payload UDP 1/2 roundtrip using the E-Class adapter. For a full set of more meaningful latency measurements see our Tick-To-Trade Latency application note.
Passive Copper Cable Length	7 meters with a quality, passive, copper cable. Not all passive cable specifications support this length. Using a QSFP to SFP+ adapter may also limit cable length.
Operating Systems	Support for all major Linux distributions as well as Windows 2008R2 and newer.
Virtualization	Myricom adapters are compatible with all popular virtual environments, provided that users assign the adapter to a single virtual machine. The alternative, sharing an adapter, conflicts with delivering high performance.
Connections	D-Class: Dual SFP+ 10GbE ports (configured as a dual QSFP with bundled SFP+ adapters) E-Class: Dual SFP+ 10GbE ports

REGULATORY APPROVALS, COMPLIANCE

Emissions	Emissions and safety authorities do not certify board-level products. They certify complete systems with all boards installed. To minimize risk for OEM customers, CSPI uses a third-party certification organization to test its Myricom adapters installed into a generic PC. Final test reports are available to customers. We meet US, Canadian, and European emissions, Class A.
Compliance	RoHS (Reduction of Hazardous Substances)
Country of Origin	USA

OTHER DETAILS

Cables and transceivers	Contact your Account/Sales representative for more information on cables and transceivers that are compatible with each adapter.
Warranty and add-on support	One year for hardware defects and 90 days for software defects. 90 days of "getting started" telephone and email support, as well as any software upgrades shipped within that window. Refer to the support datasheet for options extending the 90-day window.

## About CSPI

CSPI (NASDAQ: CSPI) is a global technology innovator driven by a long history of business ingenuity and technical expertise. A market leader since 1968, we are committed to helping our customers meet the demanding performance, availability, and security requirements of their complex network, applications and services that drive success.

**CSPI Corporate Headquarters**  
175 Cabot Street - Suite 210  
Lowell, MA 01854  
800.325.3110 (US & Canada)

**CSPI High Performance Products**  
800.325.3110 (US & Canada)  
us-hpp-sales@cspi.com

**CSPI Technology Solutions**  
800.940.1111  
us-ts-sales@cspi.com



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