**Description**

Algo-Logic Systems’ 5th generation FPGA accelerated Gateware Defined Networking® (GDN) CME Tick-To-Trade (T2T) System is a sub-500 nanosecond trading solution. It supports all CME Group exchanges including CBOT, COMEX, and NYMEX. The solution is built using Algo-Logic Systems’ internally developed, pre-built IP cores that significantly reduce time-to-market and provide flexibility for customizations.

Sub-microsecond wire-to-wire latencies are achieved by receiving CME MDP 3.0 tick data directly into the FPGA on a 10G link, detecting opportunities by building order books, and placing trades in form of FIX messages encapsulated in TCP packets using the ultra-low latency (ULL) 10G TCP Endpoint.

The CME T2T system includes parametrized triggers for mass quote cancel, mass action request and fast arbitrage as well as the ability to modify FIX order fields in FPGA logic. It integrates with existing Order Management Systems (OMS) through C++ Application Programing Interfaces (APIs). A Graphical User Interface (GUI) and RESTful APIs are provided for control and monitoring of the accelerator.

**FPGA-Accelerated Trading**

- **Quote Cancellation**
  - Ultra-low-latency mass quote cancellation by product, instrument group or each instrument
- **On Fill Trigger**
  - Instantly reacts to market data or order fill, whichever comes first, to trigger response order(s)
- **Turbo Spreading**
  - Auto-reload enables multiple hedges and quotes to be sent using pre-loaded FIX order
  - Allows trading on multiple instruments with simultaneous multi-leg strategies
  - Supports hardware trading strategies in logic
- **HLS Triggers**
  - High-level synthesis allows customers to implement custom triggers to support their proprietary strategies
  - Allows trigger inputs from Market Data, Customer generated parameters, Top of Book, and incremental updates

**Short Time to Market**

- **ULL 10GE PHY+MAC**
- **CME Feed Handler**
- **CME Futures & Options Order Book**
- **ULL 10G TCP Endpoint**
- **ULL EMSE**
- **FIX Message Processing**

**Augments existing Order Management Systems**

- Minimal changes to software through well-defined APIs
- No FPGA programming skills required
FPGA Accelerated CME Tick-To-Trade System
With HLS & Turbo Spreader

CME Tick-To-Trade System Features and Specifications

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<tr>
<th>Feature</th>
<th>Description</th>
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<tbody>
<tr>
<td>FPGA Accelerated Trading</td>
<td>Multi-leg turbo spreading, quote cancel, and on fill triggers</td>
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<tr>
<td>Pre-Built IP Cores</td>
<td>CME Feed Handler, CME Futures &amp; Options Order Book, ULL 10G TCP Endpoint, ULL 10GE PHY+MAC, ULL Exact Match Search Engine</td>
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<td>Multicast Channels for Market Data</td>
<td>Up to 16</td>
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<tr>
<td>Order Book Configuration</td>
<td>512 security IDs with L2 snapshots containing BBO, up to 5 levels</td>
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<tr>
<td>FIX Sessions and Order Queues</td>
<td>32 and 64 respectively, with 2 Kbyte per queue message size limit</td>
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<td>Configurable Number of lean Legs</td>
<td>2 with full support for quoting one or two legs of a spread or strategy</td>
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<td>Logging and Event Notifications</td>
<td>FIX logs, Raw Market Data logs, CME Order Book BBO, Trigger events</td>
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<tr>
<td>FPGA Device and Platform</td>
<td>Xilinx UltraScale+ with 10 Gbps Ethernet on Exablaze ExaNIC V5P</td>
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CME Tick-To-Trade System Diagram