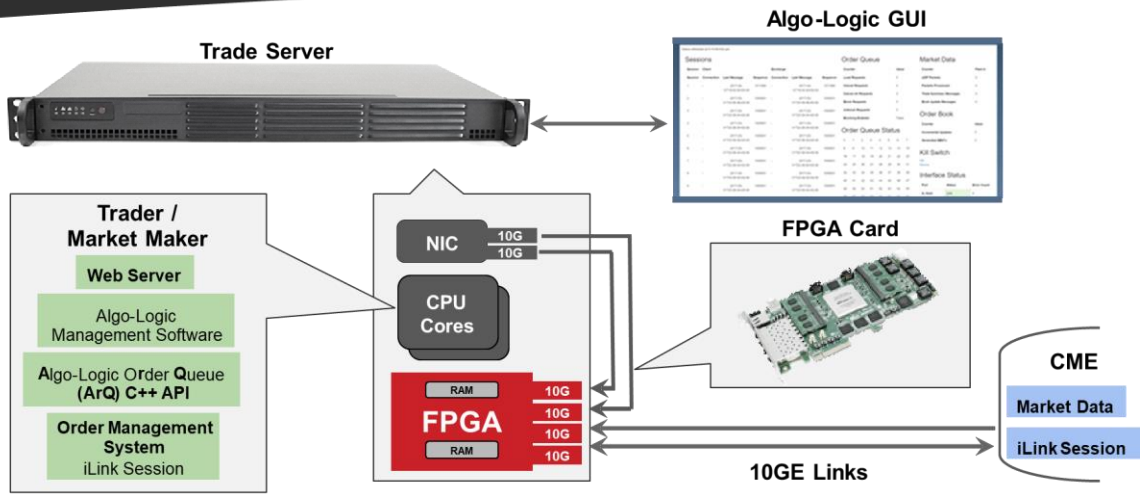
FPGA Accelerated CME Tick-To-Trade System



Description

Algo-Logic Systems' 4th generation FPGA accelerated Gateware Defined Networking® (GDN) CME Tick-To-Trade (T2T) System is a sub-microsecond trading solution. 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, and placing trades in form of FIX messages encapsulated in TCP packets using the ultra-low latency (ULL) 10G TCP Endpoint.

The 4th Generation CME T2T system includes new parametrized triggers for mass quote cancel, mass action request and hedging as well as the ability to modify FIX order fields in FPGA logic. It seamlessly integrates with existing Order Management Systems (OMS) and is managed through software interfaces. An ArQ C++ Library, Graphical User Interface (GUI), and RESTful APIs are provided for control and monitoring of the accelerator.

ArQ C++ Library and API:

- Low latency messaging protocol is used for specifying trigger conditions
- Sets up triggers and preloads FIX order to be injected

Control Software includes:

- Device parameter configuration (i.e., IP and MAC addresses), status monitoring
- Logging and event notifications reporting

Sub-microsecond Latency

Algo-Logic augments the existing Client Order Management System with FPGA modules that enable sub-microsecond trading.

ULL 10GE PHY+MAC:

- Lowest full round-trip latency of 89.6ns
- Cut through packet processing

CME Feed Handler:

- A/B faster feed arbitration resulting in earliest possible market data event detection
- Filtering on subscribed multicast channels
- MDP3.0 message processing and parsing

CME Futures & Options Order Book:

- Book building for real and implied orders
- L2 snapshots with best bid offer (BBO) information
- Recovery based on CME Natural Refresh mechanism

10G TCP Endpoint:

- 100% FPGA accelerated full TCP termination
- Lowest packet processing latency
- Full TCP protocol support including fast retransmission

FIX Message Processing:

- Session tracking
- FIX message processing and parsing
- FIX message modifications

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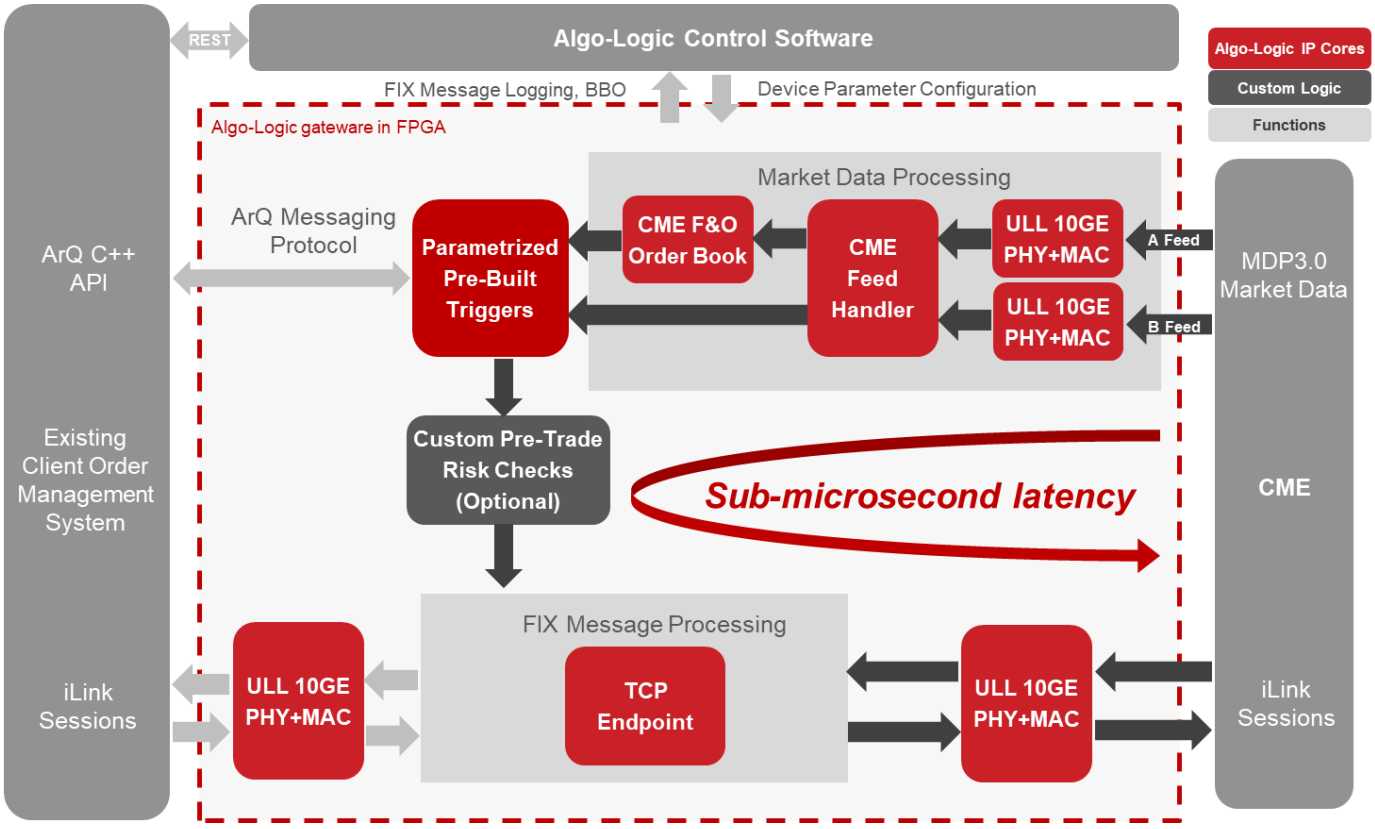
CME Tick-To-Trade System Features and Base Specifications

Multicast Channels	Up to 16
FIX Sessions and FIX Order Queues	32 and 64 respectively, with 2 Kbyte per queue message size limit
Pre-Built IP Cores	CME Feed Handler, CME Futures & Options Order Book, 10G TCP Endpoint, ULL 10GE PHY+MAC
Order Book Configuration	20 security IDs with L2 snapshots containing BBO, all 10 book levels
Parametrized Pre-Built Triggers	Mass Quote Cancel, Mass Action Request, Hedging
Pre-Trade Risk Checks (Customer Provided)	Session based limits, Max Shares per Order, Order Value limits, and Number of Order limits
Logging and Event Notifications	FIX logs, Raw Market Data logs, CME Order Book BBO, Trigger events
FPGA Device and Platform Supported	Stratix V @ 10 Gbps Ethernet on Terasic DE5-Net

CME Tick-To-Trade System Diagram



Algo-Logic Systems builds FPGA accelerated Gateware Defined Networking® (GDN) solutions that achieve high throughput with minimal power and sub-microsecond

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