

AOE Line Arbitration

The Solarflare® Line Arbitration application for ApplicationOnload™ Engine (AOE) transparently arbitrates between two redundant UDP multicast feeds, significantly reducing host server processing load and increasing its capacity to perform other financial functions. AOE offloads line arbitration from the application running on the host, while performing line arbitration faster than host-based software and providing the lowest deterministic latency with improved reliability.

Many financial institutions utilize data feeds based on UDP multicast. This technique enables providers to efficiently deliver a high volume of messages to a broad set of customers. However, the UDP protocol is inherently unreliable, and messages can be lost or delivered out of order. To improve reliability, consumers frequently subscribe to two identical UDP multicast feeds that provide resiliency, typically referred to as the A and B feeds. Financial data handlers then receive both the A and B feeds, and transparently arbitrate between them. This process, referred to as line arbitration, insures that a reliable set of data is consumed by financial data applications.

AOE Line Arbitration Benefits

An undesirable side effect of host-based line arbitration is that the application load doubles as the server must process 2x the message rate as a result of the redundant feeds, and support an additional layer of application processing to resolve the arbitration between the feeds.

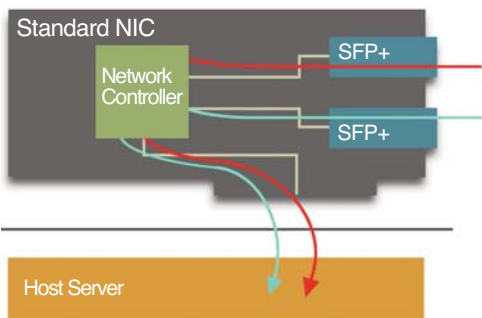
With ever-increasing message rates which result in higher server workloads, AOE Line Arbitration provides the following benefits for financial applications:

- Highest line arbitration performance with ultra-low latency feeds
- Single reliable data stream at half the message rate for faster host processing
- Processing in the network adapter frees the host CPU for other algorithmic or trading functions
- No changes to host software

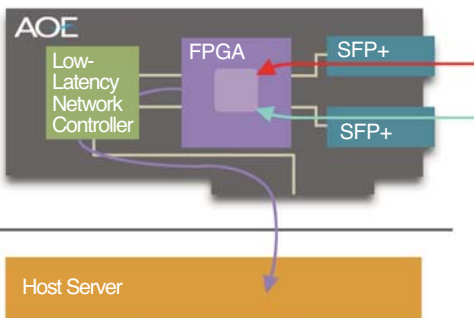
AOE Line Arbitration Performance Optimization

AOE Line Arbitration selects packets from the redundant feeds to pass to the host server, and can be configured to optimize performance for minimum latency, maximum reliability or a compromise between the two.

Line Arbitration Without AOE

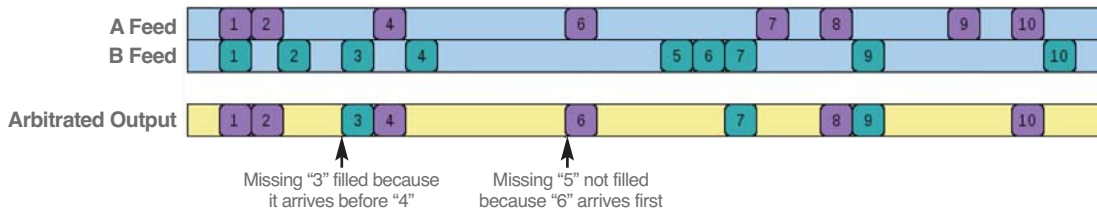


Line Arbitration With AOE



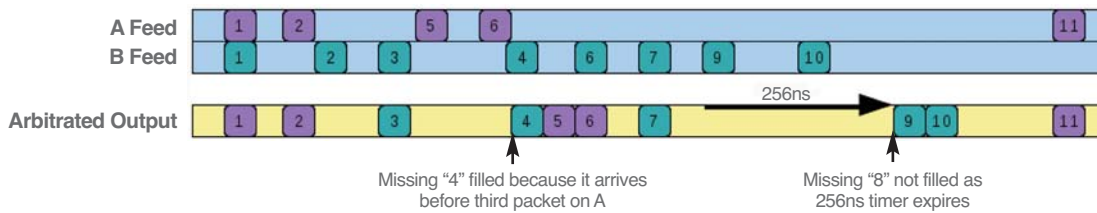
Line arbitration is performed by selecting packets from the ingress feeds to forward to the host. The packet sequence number is used to track the status of each ingress feed. The feed arriving ahead is selected as the primary feed on a per-packet basis. If a packet on an alternative feed has already been received on the primary feed, the packet is dropped.

AOE Minimum Latency Mode



In AOE "minimum latency" mode, latency is minimized, as packets are never buffered. Each packet is immediately forwarded to the host or dropped. Additionally, AOE may be configured to deliver missing packets ("gaps") in the primary ("A") feed from redundant packets arriving in the alternate ("B") feed. Filling gaps from the B feed may result in packets delivered out of order.

AOE Maximum Reliability Mode (timer = 256ns, lag = 3 packets)



In AOE "maximum reliability" mode, the number of missing packet ("gaps") are minimized in the arbitrated output. When packets are missing on the primary ("A") feed, subsequent packets are buffered until the missing packet arrives on the alternate ("B") feed, filling the gap in the arbitrated output. Packets are delivered in order. External buffering enables the use of maximum reliability mode when large latency differences exist between the feeds.

Transparent Header Reconciliation

Combined feeds typically contain arbitrated packets from different multicast groups with different header content. AOE Line Arbitration can automatically rewrite the source and destination IP address and port numbers, so the host receives a reconciled UDP multicast stream for the combined feed.

Line Arbitration v1.0 Features Include:

- Two-way arbitration of up to 512 redundant pairs of UDP streams
- Minimum latency mode
- Out-of-order missing packet gap filling
- Tool for configuring feed support
- Transparent header reconciliation
- Packet statistics for A & B feeds

Line Arbitration v2.0 includes all features above and support for maximum reliability mode, in-order missing packet gap filling, and external buffering (up to 16GB) to support large latency differences between A and B feeds.

Supported Feeds for Line Arbitration

The growing list of feeds that are tested and supported by AOE Line Arbitration include:

1. CME Globex Market Data Platform FIX/FAST v3.7
2. NYSE ArcaBook Multicast for Equities v4.2
3. NYSE OpenBook XDP v1.2a
4. NASDAQ TotalView Itch4.1 MoldUDP64 (identical A & B feed framing)
5. OPRA binary v1.0

AOE Line Arbitration can be configured to support any binary feed with fixed offset sequence numbers and identical framing. See your Solarflare sales representative for more details.

System Requirements

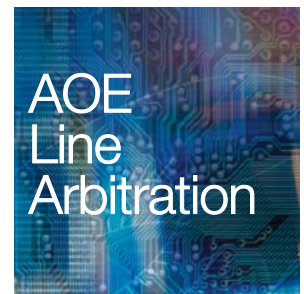
- AOE hardware: SFA6902F-A5, ordered separately
- Linux operating system (as supported by Solarflare server adapters)

Order Information

AOE-LINEARB-SOLR

AOE Line Arbitration application, includes license, 1 year of maintenance. No additional memory required.

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