

Adaptive Technology Stack: Aeron, Artio, Agrona and SBE

MAY 2024

Aeron[®]

By  Adaptive

The Aeron story... so far



Martin Thompson



Todd Montgomery



2011

Martin & Todd create Real Logic, a low-latency trading technology development firm.

Aeron.

2015

First release of Aeron Open Source to the community.

Adaptive

2017

Adaptive begins to use Aeron Open Source in client projects.

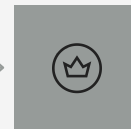
2022

Adaptive acquires Real Logic

Aeron Open Source Community



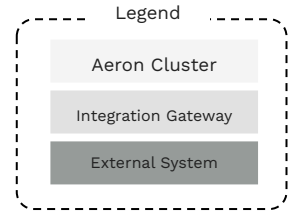
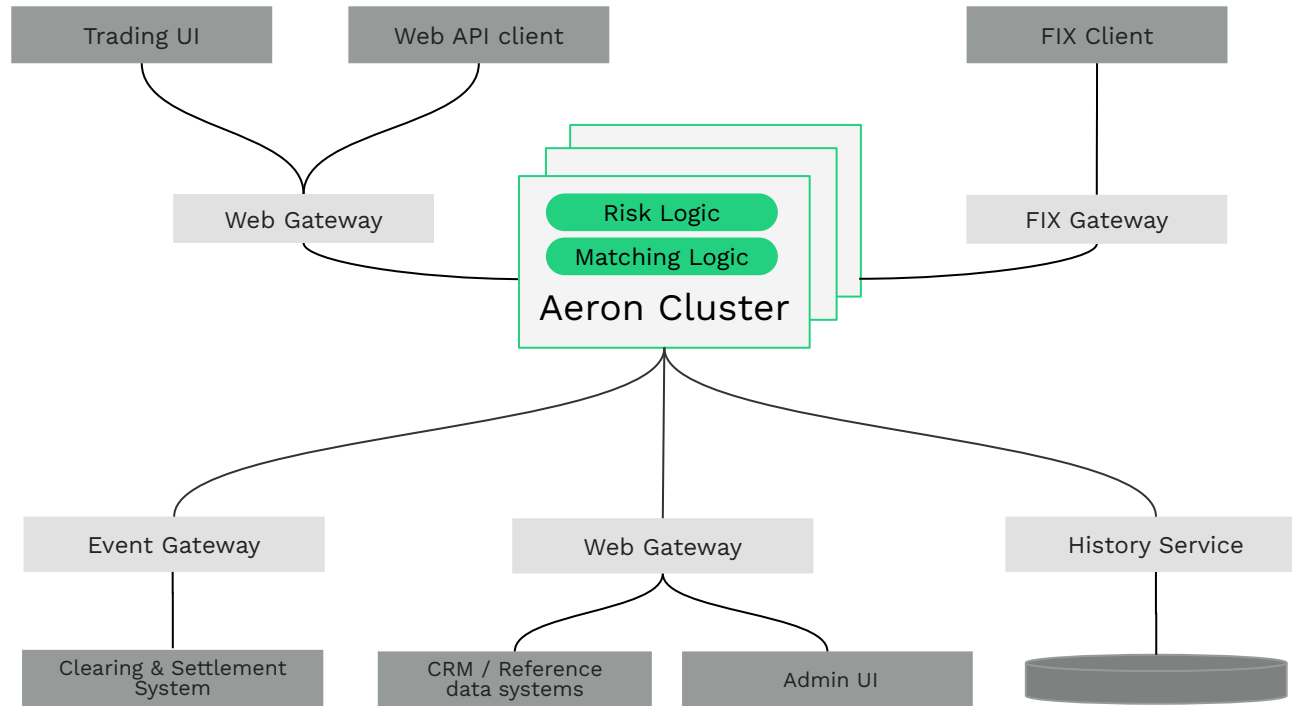
Aeron.
Sponsored by Adaptive



Aeron Premium

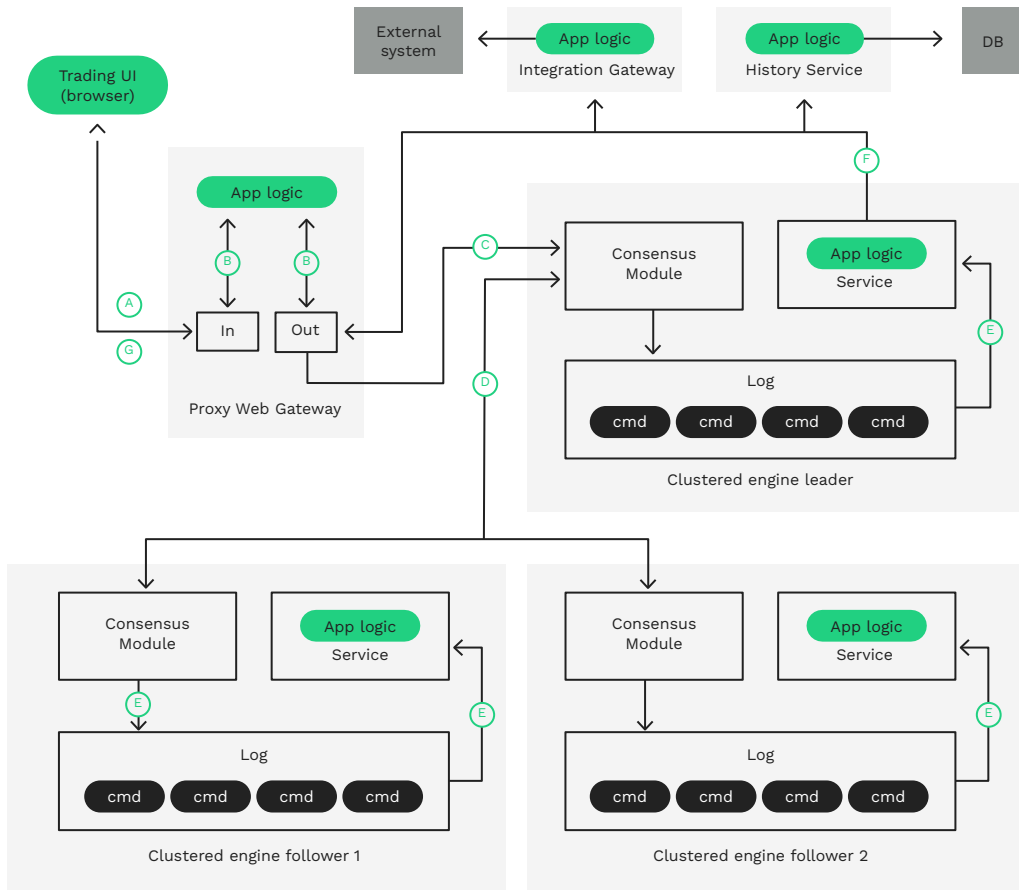


Marketplace on Aeron Cluster



Example message flow

- A** UI user submits NewOrderCommand
- B** Proxy Web Gateway translates input into object, hands off to App Logic which validates and submits to Cluster
- C** Message is transmitted to Cluster Leader
- D** RAFT Consensus sequences & co-ordinates the writing of the Command to local disk based log and followers. Once leader & at least one follower accepts the new command, the Log releases the NewOrderCommand to the Service
- E** All three Service instances accept and processes the NewOrderCommand
- F** App logic produces 1..more events, Leader submits them to Gateways
- G** Proxy Web Gateway distributes events to appropriate connected UI's



LEGEND

App logic

Aeron

RAFT CONSENSUS

The protocol used to keep the three cluster nodes in a guaranteed consistent state. It handles the sequencing of all messages despite multiple gateways and all while handling server failure. Only one node is a leader at any time. Should the leader fail, a follower can automatically step in within a short period.



Aeron Cluster Latency on Google Cloud Platform C3 instances 288B @ 100K msg/sec

Aeron Cluster benchmark with different Media Drivers & NIC APIs

Test Rig

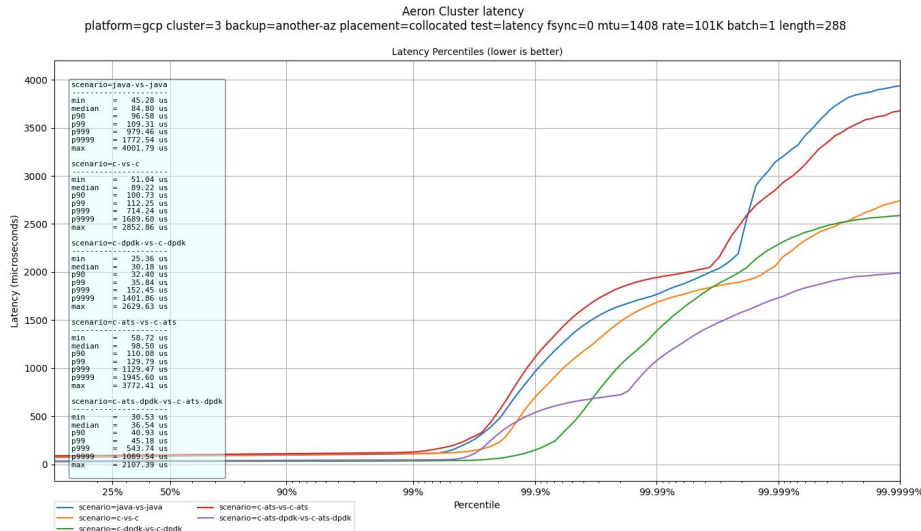
Aeron Cluster ‘ping-pong’ echo benchmark results using C3 instances in the same AZ using Collocated placement policy on Google Cloud Platform and different Aeron Media Driver versions and Kernel Bypass technologies.

Latencies shown are indicative and results will vary depending on selected host hardware, OS tuning and network hardware.

Message size: 288 Bytes
Message rate: 100K messages per second

MD ver & kernel bypass API:	java	c	c-ats	c-dpdk	c-ats-dpdk
Min	45	51	59	25	31
50.000ptile	85	89	99	30	37
90.000ptile	97	101	110	32	41
99.000ptile	109	112	130	36	45
99.900ptile	979	714	1129	152	544
99.990ptile	1773	1690	1946	1402	1090
Max	4002	2853	3772	2630	2107

Latencies are shown in μ sec



SBE, Artio and Agrona

Adaptive Tech Stack

SBE: Simple Binary Encoding

SBE is designed to be efficient by utilising the minimum amount of resources when encoding and decoding data, given that binary is the native machine representation.

Example message from Aeron Cluster:

```
<sbe:message
  name="RequestVote"
  id="51"
  description="Request the vote from another member to become the cluster leader.">
  <field name="logLeadershipTermId" id="1" type="int64"/>
  <field name="logPosition" id="2" type="int64"/>
  <field name="candidateTermId" id="3" type="int64"/>
  <field name="candidateMemberId" id="4" type="int32"/>
  <field name="protocolVersion" id="5" type="version_t" sinceVersion="9"/>
</sbe:message>
```

Trading venues are continually adopting SBE for client facing gateways:

- + CME iLink3 Binary Order Entry
- + B3 Unified Market Data Feed
- + Euronext Optiq OEG



Artio: High-performance FIX Gateway

Artio provides all the building blocks necessary to run a modern FIX gateway in the cloud or on prem, whether you are building an acceptor or an initiator application.

Paired with **Aeron Cluster**, an Artio FIX Gateway can be ran in an Active / Passive HA configurations.



Agrona: High-performance Java Toolbox

Agrona provides a library of data structures and utility methods that are a common need when building high-performance applications in Java, including: **Buffers, Ring/Broadcast Buffers, Lists, Maps, Sets, Caches, Clocks, Queues, and Agent** framework for concurrent services.



Trusted by the industry




🍷 Raspberry Pi Aeron Cluster 🍷




Thanks

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