

# NVMe-oF Storage for High Frequency Trading

Low latency, high transaction rates, no-compromises

## Time is money

Traders are increasingly reliant on accelerated compute infrastructure to accelerate algorithmic trading, high-frequency trading (HFT), and analytics of tick data to achieve faster outcomes and higher revenues. Trading system architects need storage that matches the performance of these accelerated server environments.

Using NVMe SSDs that are locally attached to the server to hold trading data will result in the overprovisioning of this data by 2-3X, increasing TCO. Employing legacy NVMe-based all-flash arrays will bottle neck the I/O due to failing to fully utilize the highly parallel NVMe SSDs.

## The Pavilion Hyperparallel Flash Array

The Pavilion Hyperparallel Flash Array delivers never before seen NVMe performance (90 GB/s throughput, 40µs of latency, and 20M IOPS) and density (1.1 Petabyte) in a compact 4U storage array. It gives trading applications the performance of locally attached NVMe SSDs enabling trading organizations to reduce their time to results and move to a Composable, Disaggregated Infrastructure (CDI) infrastructure, where application resources are readily available.

The Pavilion HFA requires no proprietary software to be installed on a server farm and uses standard NVMe, Ethernet and InfiniBand drivers, freeing up host resources for processing, reducing deployment risk and increasing density.

As regulatory oversight and compliance rigors are layered on, take instant consistent snapshots of trades, clone these to a separate volume with higher capacity and less expensive NVMe drives and never miss an opportunity again. Use our built-in encryption at rest to assure immutability, protect your intellectual property, and maintain compliance.

## Pavilion HFA with NVMe SSDs



## Benefits

- Increases trading density 2X
- Cuts storage costs in half
- Petabyte scalability, high-performance, low-latency, and linear scaling speeds trading operations
- Protect your data and your business. Meet evolving requirements for data security and compliance
- Deployments are flexible with concurrent protocols
- Enterprise design and data integrity validation ensures reliable access to data
- Management via Web GUI, vCenter, Kubernetes, RESTful API, OpenStack, DTMF/Redfish, and Swordfish

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## Benefits of Disaggregation

The Pavilion HFA provides high performance and low latency to HFT applications.

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### Scalable & Flexible



The Pavilion HFA provides up to 1.1 Petabytes and simultaneously uses the NVMe/RDMA(Ethernet, IB), NVMe/TCP, iSCSI or NFS interfaces to accelerate trading applications. Grow performance and capacity linearly without impacting on-going operations.

Pavilion reduces the amount of raw flash storage deployed for applications by up to 3X, and is 50% less expensive than DAS in terms of \$/GB/sec, the Pavilion HFA is the one platform for all your environments. No wasted capacity, no time spent messing with volume managers or file systems. Just set and forget.

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### Fast & Dense



Shaving milliseconds in transaction times can have a high impact on high-frequency trades. Now take that to microseconds. Extreme low latency (40µs) and ultra-high performance (20M IOPS with 90 GB/sec. throughput) accelerate trades. Multiple storage controllers make it ideal for the high-parallelism of NVMe SSDs. Access data 20 times quicker than a DAS NVMe SSD, couple this with a compact 4U footprint for colocation near the exchange and you have a profit maker designed perfectly for disruption.

The value that a Pavilion HFA provides to kdb+ was proven through independent certification by the Securities Technology Analysis Center (STAC®). They analyzed the results of running the STAC-M3™ benchmarks with a solution comprised of kdb+ and the Pavilion HFA. The solution set records for four of the 17 benchmarks in the Antuco suite, beating all DAS and AFA solutions tested by STAC, and was the best of all flash arrays they tested in another four benchmarks.

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### Safe & Secure



Protect the SSDs with Pavilion's RAID-6 erasure coding and its 12% overhead. Its "Swarm Recovery" rebuilds a failed SSD twelve-times quicker than a DAS or an AFA. The Pavilion Data Assurance feature works with the RAID feature to provide self-healing bit-rot support for data, assuring every process gets uncorrupted data. Its zero-footprint snapshot with its consistency group features speed backup and disaster recovery operations.

Security is a top priority for FinTek firms. The Pavilion HFA uses FIPS-compliant data at rest encryption and ensures its always-on encryption does not impact performance. Meeting compliance is a fundamental part of the system design. Use encryption at rest to secure transactions for compliance and assure trading algorithms are kept private and off local area networks.

Your data is always safe with Pavilion.

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## Enterprise Strength & Flexible Management



Get 24/7 proactive support, end-to-end data integrity, a modular chassis, and redundancy throughout the storage array to protect your trading applications as the infrastructure grows. All Pavilion HFA features are included at no extra charge, such as thin provisioning, snapshots, clones, data at rest encryption and more.

Use NVMe SSDs for all trading systems and boost operations. Access the Pavilion HFA with its Web GUI or integrate with various management frameworks including: vCenter, Kubernetes, RESTful API, OpenStack, DTMF/Redfish, Swordfish, and more.

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## Economical



HFT applications (like kdb+) perform computing in memory across nodes to reduce the execution times of tasks, and most use local NVMe SSDs to boost I/O operations. Flash and RAM are some of the most expensive components of an application cluster, why not reduce them? The Pavilion HFA disaggregates the NVMe SSDs from nodes and requires less memory, letting DevOps eliminate the DAS SSDs and remove RAM from every server, saving TCO.

Pavilion's OpenChoice Storage™ does not lock you in to a vendor. Use NVMe SSDs that have the performance, endurance, capacity, and technology you need for all your applications, leveraging existing suppliers or purchasing new NVMe SSDs from Pavilion. With the Pavilion HFA you won't waste SSD space. It only allocates physical space to a trading application when it is needed. Save TCO by having no wasted capacity and no time spent messing with volume managers or file systems. Just set and forget. So why would you use local NVMe SSDs for your trades?

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## Find Out More

Pavilion is defining the future of disaggregated NVMe-oF and redefining high frequency trading. Whether it is a streaming Big Data business application that uses kdb+, a logical evolution of Greenplum Data Lakes to improve storage utilization, shattering backup windows, or a wholesale replacement of the customer experience with MongoDB, MariaDB, Cassandra or AeroSpike, the Pavilion HFA provides unprecedented availability, performance and versatility to future-proof the storage infrastructure as you leapfrog the competition.

Our expertise is in simplifying and optimizing NVMe to make the impossible, possible. When storage is business-critical, there's no substitute for the guaranteed performance, functionality, high availability, and OpenChoice Storage™ support of a Pavilion NVMe-oF storage array. Use the Pavilion Hyperparallel Flash Array with its NVMe over fabrics support and make better decisions, faster! Contact us to learn more.