





PanFS explicitly separates the “control plane” from the “data plane” with the Director Nodes functioning as the control plane of the ActiveStor Ultra system, managing metadata services (e.g., directories, file attributes, etc.) instead of storing user data. In addition, the Director Nodes facilitate scalability and virtualizes data objects across all available storage nodes enabling the system to be viewed as a single, easily managed global namespace. Director Nodes can be scaled independently to scale metadata performance.

The Storage Nodes are the core of the data plane. For more capacity or more storage performance, more Storage Nodes can be added. In scale-out storage systems like PanFS, there simply is no maximum performance or maximum capacity and PanFS has been architected to provide linear scale-out; adding performance and capacity scale linearly as storage nodes are added.

The PanFS DirectFlow parallel data access protocol eliminates traditional scale-out NAS bottlenecks and hot spots by allowing compute clients to access all the Storage Nodes directly. As a result, hundreds of application clients have simultaneous and incredibly fast direct parallel access to very large financial

data sets. Direct parallel data access is important because while market data is generated in single streams, backtesting and analysis can be done in parallel with many clients reading and writing directly to storage.

PanFS also uses Network-Distributed Erasure Coding to ensure the highest levels of data integrity and reliability.

### Framework for Unfettered Modeling

Technology infrastructure improvements can provide an improved framework allowing re-examination of constraints that necessitated model order reduction (MOR) including model truncation. With new storage architectures like ActiveStor Ultra with PanFS designed for parallel workloads, approaches for comprehensive, optimal higher order modeling and combinations of models become more viable, enabling increased accuracy and precision, more resilience to unanticipated market movements, and even decreased time to convergence.

### Dynamic Data Acceleration

Pricing, market and credit risk management, fraud detection, operation risk and compliance, portfolio optimization and backtesting are key financial services applications that are computationally and data access intensive and can strain storage resources. Along with streaming large historical datasets for Monte Carlo simulations, backtesting can also be performed in combination with artificial intelligence (AI) including machine and deep learning or other neural network approaches and with Big Data analytics. These shared access mixed file size workloads require parallel infrastructure that is fast and extremely scalable, but adaptable to changing file sizes and mixed workloads without the need for tuning or manual intervention.

ActiveStor Ultra introduces the key to adapting to mixed workloads is a unique feature of PanFS called Dynamic Data Acceleration that eliminates the complexity, fragility, and manual intervention of tiered HPC storage. It maximizes the efficiency of all storage media in a seamless, all-hot system with a carefully balanced orchestration of DRAM for caching, extremely low-latency persistent memory, low-latency NVMe SSDs to store metadata, cost-effective SATA SSDs to store small files, and bulk high-bandwidth HDDs to store large files to provide a combination of excellent performance and low cost.

### Built for Price/Performance, Engineered for Manageability

You can take PanFS from your dock to serving data in a day with a plug-and-play solution that is easy to install, manage and grow, and maintains the industry’s highest reliability and lowest total-cost-of-ownership (TCO) at any scale. With its modular architecture and building-block design, investment banks, trading firms, and exchanges, along with government financial agencies, departments, and services deploying ActiveStor Ultra can start small and scale linearly by adding metadata performance, or bandwidth and capacity, easing the strain on quantitative analyses backtesting and allowing improved modeling.