F-StorageNode Series

Software-Defined Storage Server
(Reference Model)

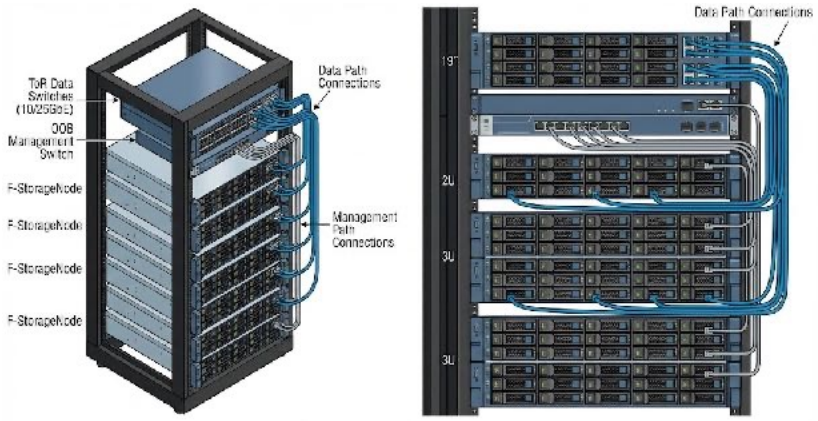

Figure 1. Rack-Scale Storage Aggregation

Key Features

- Optimized for software-defined storage platforms such as Ceph, MinIO, and ZFS
- Hybrid storage architecture combining NVMe tiering with high-capacity HDDs
- Powered by 4th / 5th Gen Intel® Xeon® Scalable processors (Sapphire Rapids)
- Tri-Mode storage controller support (NVMe / SAS / SATA)
- Fully hot-swappable drive bay design for serviceability
- Redundant boot drive architecture (M.2 RAID 1) to enhance system availability

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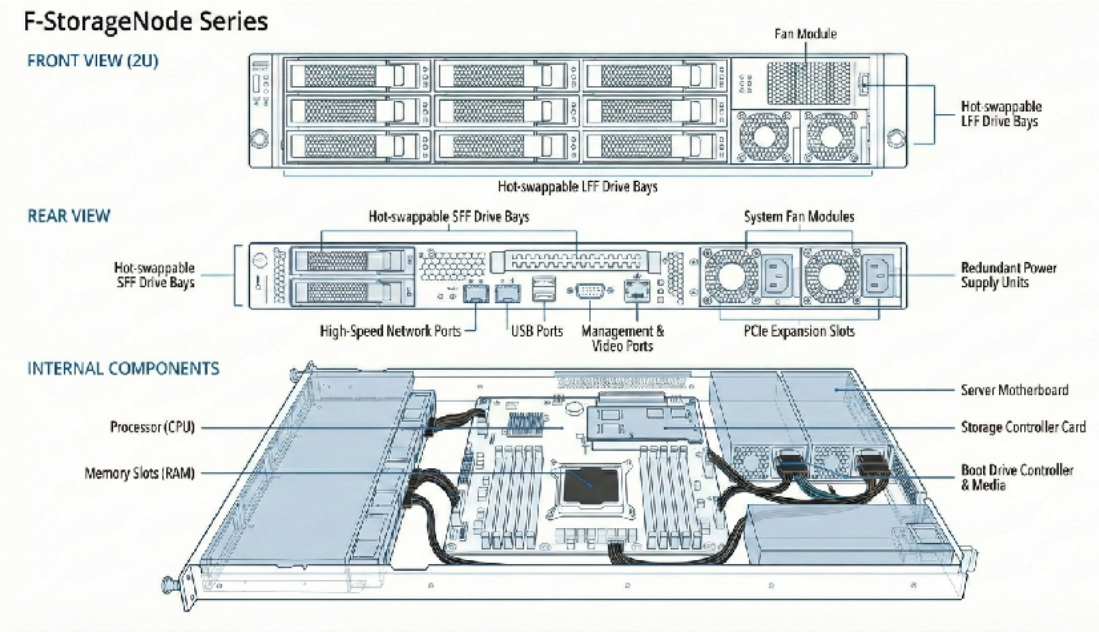

Technical Specifications

Reference Configuration — Scenario B: Hybrid Object Storage Node

Category	Specification
Form Factor	2U rackmount chassisFront: 12 × 3.5” LFF baysRear: 4 × 2.5” SFF bays
Processor	1 × Intel® Xeon® Silver 451012 cores, 2.40 GHz, 30 MB cache
Memory	8 × 32 GB DDR5–4800 ECC RDIMMTotal: 256 GB (cache–optimized configuration)
Storage Controller	Broadcom® 9500–16i Tri–Mode HBAIT Mode for ZFS / Ceph
Drive Configuration	Capacity tier: 12 × 20 TB SAS 12Gb/s Nearline HDDCache / Journal tier: 4 × 3.84 TB U.3 NVMe SSD
Boot Drive	2 × 480 GB M.2 NVMeHardware RAID 1 via BOSS controller
Networking	1 × Dual–Port 25 GbE SFP28(e.g. Mellanox ConnectX–6 Lx)
Interfaces	2 × USB 3.0, 1 × VGA, 1 × RJ45 (IPMI management)
Cooling	3 × hot–swappable fan modules with PWM control
Power Supply	1300 W (1+1) redundant, Platinum efficiency
Software Compatibility	VMware vSANRed Hat Ceph StorageTrueNAS Enterprise

System Characteristics

- Throughput–Oriented Architecture: Balanced PCIe lane allocation to avoid I/O bottlenecks under sustained load.
- Scalability by Design: Supports external JBOD expansion through SAS connectivity for capacity growth.
- Serviceability & Maintainability: Tool–less replacement of drives, fans, and power supply units to minimize downtime.

Reference Model Scope

- Unstructured data storage platforms (object storage)
- Backup, archiving, and cold storage environments
- Content delivery and media origin server deployments

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*Disclaimer: This document describes a reference system architecture. It does not represent an off–the–shelf commercial product. Specifications may vary depending on project requirements, environmental conditions, and regulatory scope. Final system configuration, component selection, and certifications are defined per project.