



The latest release in the S2A family, the S2A 9900, is the 8th generation product which extends the S2A's already significant performance lead, while providing a much higher level of host and disk interconnect modularity. The flexible S2A architecture continues the distributed multiprocessing paradigm while adding the ability to mix and match a variety of host attach and disk types. The S2A 9900's initial native offering host support is 8 10Gbit/s InfiniBand (often referred to as IB) interfaces, with follow-on connectivity including 8 8Gbit/s Fibre-Channel (FC-8) when FC-8 is available in the market. As other interfaces become attractive for reasons such as performance, reliability, latency, distance, cost or scalability, these could be easily supported. Disk drive support will include Serial-Attached-SCSI (SAS) and Serial-ATA (SATA). Back end connects for the S2A 9900 have been architected as SAS and can easily support additional options in the future. There are several differentiators that DataDirect Networks products include such as performance, data protection, scalability, etc. Outlined below are some key features to the product.

- **Total Performance:** First and foremost the S2A 9900 has a theoretical frontend bandwidth of 6.4GB/sec. It is expected to deliver an industry leading measurable sustained bandwidth of 5.6GB/sec and has been measured at 5.9GB/sec with large sequential block transfers to raw devices and a conservative sustained performance of 4.0GB/sec – 4.4GB/sec with devices driven by a filesystem. Frontend performance is achievable impart due to the backend bandwidth. Each controller (singlet) has ten backend 3Gb 4-lane SAS connections to the media for a total of 20 backend SAS connections to the drives in a dual controller (couplet) active-active configuration.
- **Read and Write performance:** The S2A 9900 achieves it's leading performance during read and/or write operations, a market substantiator as historically raid controllers suffer in write performance.
- **Data Integrity:** The S2A 9900 product calculates parity during write and read operations while other architectures only calculate parity on writes. The S2A 9900 achieves this through the in-band parallel parity processing engine (P3E) calculating not only write but read parity in real time. Sometimes referred to as "on-the-fly data protection", without loss in performance, this significantly increases data integrity.
- **Raid6 – 8+2:** The S2A 9900 provides Dual Redundancy Disk capabilities through Raid6, 8+2 parity, dual parity calculations. This is significant as drives become larger and disk rebuild time frames are of concern. The Raid6 scheme provides data access protection, even in the case of multiple simultaneous disk failures in an individual parity group, such that application I/O may be maintained.
- **Disk Density:** DDN's product line supports up 1200 drives behind a single appliance allowing the user to amortize the cost of the controller while providing tremendous scalability. With this level of disk drive depth or density the S2A family addresses tape augmentation or tape replacement providing for faster access, data protection and reliability while lowering costs. The S2A 9900 may deploy in a 16-slot, 24-slot, or a 60-slot drive chassis configuration. In the 60-slot configuration, in a two floor tile footprint, the raw disk space delivered is 1.2PB.



- **Journaling:** The S2A 9900 deploys a journaling feature that bitmaps data that should have been written to a disk that cannot be accessed during an I/O process. Upon returned access to that disk, data is written to the disk. This feature further aids in the reduction of lun rebuilds and lun rebuild times. The length of time that the targeted drive was offline, the amount of I/O that was targeted for the drive and the drive speed technology will determine the rebuild time. It can be demonstrated whereby different architectures would have to rebuild an entire drive due to loss of drive access over hours/days, whereas the S2A architecture can rebuild a 500GB, 7200RPM drive in minutes/hours.
- **Sleep Mode (Dynamic Maid):** The S2A 9900 provides the ability to spin disks/luns down via policy based scenarios. This provides a deployment the option of power reduction and associated reduction in heat and cooling.
- **Active-Active Connectivity:** The S2A 9900 appliance provides truly symmetric IO characteristics. Each controller has access to all drives. This capability eliminates lun failover necessities at the S2A 9900, eliminates lun failover latencies and associated lun failover data integrity risks.
- **Redundant:** The S2A 9900 architecture does not have a single point of failure.



- **Power Lun:** The S2A has a “PowerLUN” capability which embodies a 2-dimensional distributed multi-processing striping capability. The P3E FPGA set on the motherboard generates the horizontal stripe and generates parity; which is then striped vertically down the segments. PowerLUNs can therefore span multiple parity groups and a large number of disks providing for extremely high performance from the single PowerLUN target.
- **Active – Active:** The S2A architecture is truly an active – active front end architecture. This means any block, any lun, any controller, any host port, anytime. This could eliminate third party failover software depending on the deployed architecture. Additionally it eliminates latencies due to lun movement during a failover scenario. This also eliminates all lun ping-pong scenarios.
- **Lun in Cache:** The S2A is capable of pinning a lun in cache.

DataDirect Networks’ successes have included the deployment of multiple petabytes (a thousand terabytes) of storage behind the World’s fastest supercomputers, including IBM’s Blue Gene/L and the Advanced Simulation and Computing Program (historically known as ASCI, now ASC Purple) at Lawrence Livermore National Laboratories. DataDirect Networks’ S2A family of products are in production in 7 of the Top 10, 35 of the Top 100 and thee fastest supercomputing sites in the world with major installations at Lawrence Livermore National Laboratories, Sandia National Laboratories, PCS, NCSA, HPCMO MSRC’s and DC’s that include ARL, ERDC, ASC, Maui SuperComputing, AHPCR, and NRL, JWAC, NGA, NSA, NASA GSFC NCSA, MODIS, and TRMM, NASA Ames, NOAA, BNL, Indiana University Big Red and Data Capacitor, NERSC, SDSC, ORNL, Argonne National Laboratory, CEA, Dresden TUD, and many others.

DataDirect Networks’ S2A 9900 solution allows HPC and Rich Media organizations to build cost-effective, highly scalable, primary and secondary storage in the smallest footprint available. With the S2A 9900 and its associated 60-slot disk chassis’ and the 600TB in a single 19” rack or 1.2PB in two 19” racks, organizations can create disk-based solutions for parallel file systems and shared SAN file systems, high performance computing clustered file systems and network infrastructures.

DataDirect Networks is the world’s leading provider of networked storage and clusters for HPC and Rich Media. Providing SAN, SAN/NAS convergence, and cluster solutions for Government, Research Labs, Defense, Life Sciences, Broadcasting, Digital Production, Oil and Gas industries. For more information, contact DataDirect Networks at (818) 700-7600 or visit <http://datadirectnet.com/>.