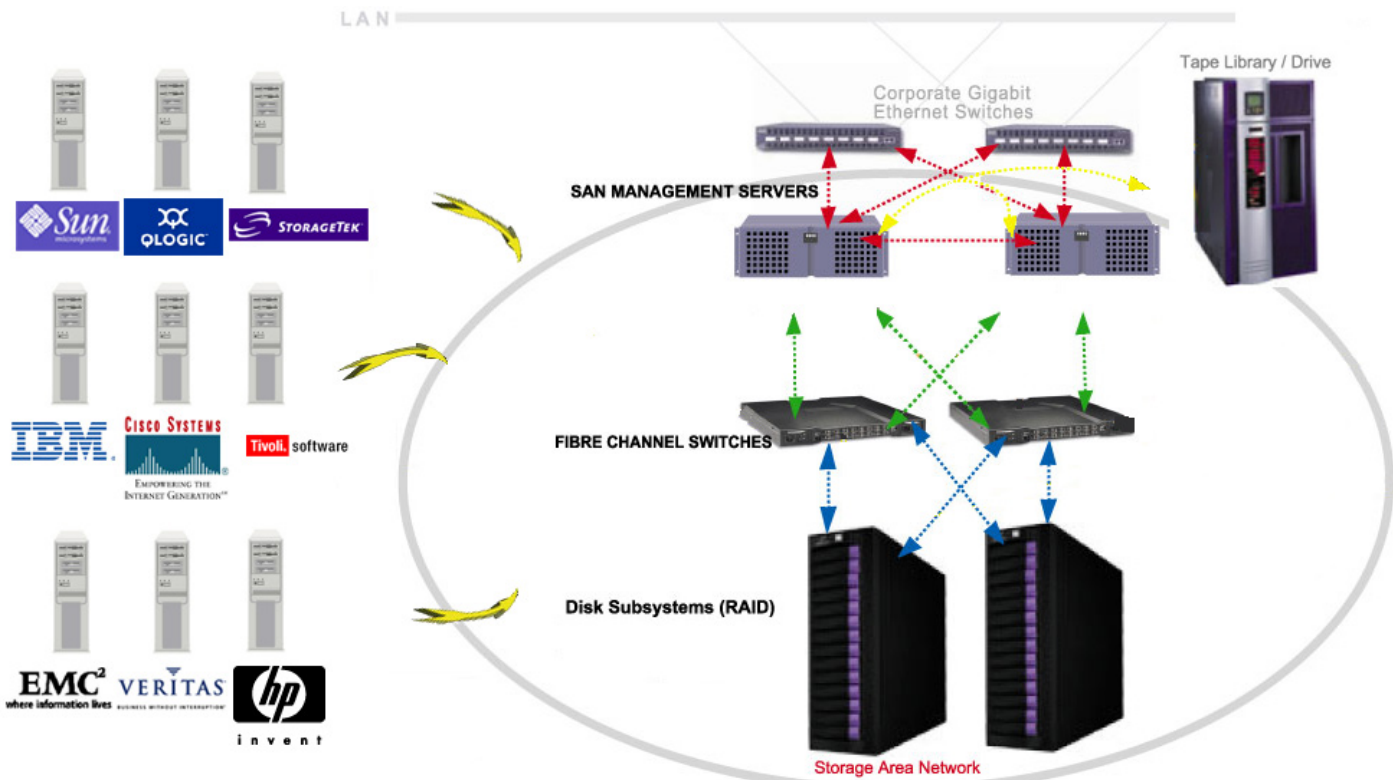


## Storage Area Networks

ASEG is experienced with the design, installation, configuration, and maintenance of hardware and software used to build Storage Area Network solutions for high performance computing applications. These demanding applications require that the hardware infrastructures on which they run be as fast as possible. In these infrastructures, disk access is often viewed as the weakest link. Disk latency is several orders of magnitude slower than that of system memory. Furthermore, if the disks are accessed remotely, disk access can be a major drain on networks, stealing bandwidth from other functional requirements of the application.

A Storage Area Network (SAN) seeks to minimize the performance limitations of disk access by combining multiple high-speed disk devices into a single, high-performance unit. The devices are usually RAID arrays that optimize access times by striping data across multiple disks. SAN performance is further optimized by organizing these devices into large, scalable file systems that stripe data across multiple RAID's; in essence, a RAID of RAID's.



**Figure 1. An example of a Storage Area Network**

The combination of high-speed devices and switches comprise an independent network. Communication is most often through extremely fast Fibre Channel interfaces. Because the SAN is independent of any other network activity, disk access does not interfere with other network requirements throughout the system.

We have worked on SAN systems designed to manage up to several hundred terabytes of disk storage space. Our areas of expertise include:

- Design of storage area networks that support high performance computing needs.
- Configuration and benchmarking of Sun, Hitachi, and StorageTek RAID devices to optimize access patterns within SAN configurations
- Configuration of StorageTek's L700 tape archive robot
- Integration of IBM, Sun, Intel, and SGI client computers
- Configuration and zoning of Fibre Channel switches to support organization of SAN devices as required for a particular application
- Installation, configuration, and optimization of scalable file systems using Sun/LSC's SAM-QFS product (SAM-FS, QFS and Shared QFS)
- Installation, configuration, and support of heterogeneous client access to SAN via IBM's SANergy product.
- Installation and configuration of Veritas volume manager, filesystem, and clustering software