

**Intelligent I/O Processor™ (IIOP)**

Providing High Performance Disk I/O for Even the Most Demanding Network Applications

**Today's Networks Demand High Performance I/O Processing**

Personal computer networks are serving increasingly larger numbers of users and the network server is becoming the computing platform for I/O intensive client/server databases and mission-critical business applications. Providing the performance these high demand networks need requires a high performance and scalable server disk I/O subsystem.

Tricord's Intelligent I/O Processor (IIOP) provides both performance and scalability as part of the PowerFrame's balanced system design.

**IIOP Ensures Sustained Performance For Network Applications**

The IIOP combines a mainframe I/O architecture with standard operating systems, including Novell NetWare, SCO UNIX and Microsoft LAN Manager, to create a new standard for database and file serving performance.

IIOP performance is specifically optimized for database applications that make frequent random accesses of small data blocks into large database files. For database applications IIOP performance remains high even as you add more drives. IIOP performance is limited only by the average access time for the drives used and the number of drives attached to the IIOP.

For example, if a single drive is capable of 90 I/O transactions per second, two drives will approach a throughput of 180 I/O transactions per second.

File server applications also benefit from the IIOP performance advantage. The multiple channel design and use of high-speed, synchronous SCSI transfers, provide simultaneous access to data for many users. The IIOP easily supplies the necessary data transfer bandwidth to support multiple local area networks from a single PowerFrame superserver.

**Mainframe-Like I/O Designed for the Network**

The IIOP is an intelligent Intel i386-based bus master subsystem supporting dual VLSI SCSI processors to control two SCSI-H or Fast SCSI-II channels and up to seven devices per channel. Using 2 gigabyte drives, each IIOP supports up to 28 gigabytes of disk storage or a maximum of 56 gigabytes (49 gigabytes formatted) for a dual IIOP PowerFrame configuration.

Capable of accessing SCSI devices at a maximum rate of 10 Mbytes per second, per channel using Fast SCSI-II data transfers, the IIOP provides I/O performance rivaled only by mainframes and high-end minicomputers.

The IIOP is an independent subsystem designed to handle only disk I/O transactions, offloading approximately 90% of the I/O processing from the main CPU.

And, unlike other server designs that use an EISA I/O bus to support disk arrays, the IIOP connects directly to the PowerFrame PowerBus™, a special internal system bus. Connecting directly to the high speed PowerBus provides the effective bandwidth necessary to support the SCSI transfer rates.

The benefits of the PowerBus connection include:

- the elimination of bus contention bottlenecks inherent in EISA bus implementations, and
- the assurance of sustained I/O performance as demand increases.

**IIOP Benefits**

- Optimized performance for I/O intensive database and file server applications
- Scalable in performance, capacity and fault tolerance to meet growing network needs
- Performance increases linearly as disk capacity is added
- Dedicated Intel i386-based microprocessor handles only disk I/O requests ensuring maximum performance and throughput
- Supports up to 14 SCSI devices (26 devices with two IIOPs) using SCSI-H or Fast SCSI-II protocol
- Optional PowerRMD™ feature enhances IIOP performance and fault tolerance with a choice of data striping, disk mirroring and hot sparing

Delivering the Future of Enterprise Networking Today
The IIOPTM is one element of Tricord’s innovative superserver design that makes the PowerFrame family the best choice for your networking needs.

**Maximum Throughput Assured with IIOP Optimization Techniques**

IIOP performance is also enhanced by several important optimization techniques, including elevator seeks, disconnect/reconnect and data scatter/gather.

*Elevator Seek Enables Sustained Throughput as System Use Increases*

The “elevator seek” algorithm sorts the disk I/O requests based on the disk cylinder head position minimizing disk head movement and cutting the average seek time in half.

*Disconnect/Reconnect Improves Performance as Disk Capacity Increases*

The disconnect/reconnect feature allows overlapping of multiple I/O operations on a single SCSI channel. Instead of waiting for a drive to complete its request, the IIOP “disconnects” from the drive and issues a request to another drive or “reconnects” to the same drive after its access is complete.

*Data Scatter/Gather Provides Faster Disk Access Times and Minimizes I/O Request Processing*

The IIOP supports “scatter/gather” I/O operations, an advanced I/O request mechanism for demand paging virtual memory systems, such as UNIX and the file system cache under OS/2. This algorithm moves data between contiguous disk memory blocks and non-contiguous system memory blocks, increasing overall I/O performance.

The IIOP can also combine I/O requests that access sequential areas of the disk, reducing the system overhead required to process multiple I/O requests.

**PowerRAID™ Enhances IIOP Performance While Improving PowerFrame Fault Tolerance**

PowerRAID, Tricord’s implementation of RAID (Redundant Array of Inexpensive Disks) technology is an optional IIOP feature that adds support for RAID level 0 (data striping), RAID level 1 (disk mirroring), or a combination of RAID 0 and RAID 1 plus hot sparing. PowerRAID provides unattended, uninterrupted system operation while improving disk I/O performance. Details on the PowerRAID feature are provided in a separate data sheet.

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