

INTELLIGENT I/O PROCESSOR™ (IIOIP)

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 (IIOIP) provides both performance and scalability as part of the PowerFrame's balanced system design.

IIOIP ENSURES SUSTAINED PERFORMANCE FOR NETWORK APPLICATIONS

The IIOIP 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.

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

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 IIOIP performance advantage. The multiple channel design and use of high-speed, synchronous

SCSI transfers, provide simultaneous access to data for many users. The IIOIP 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

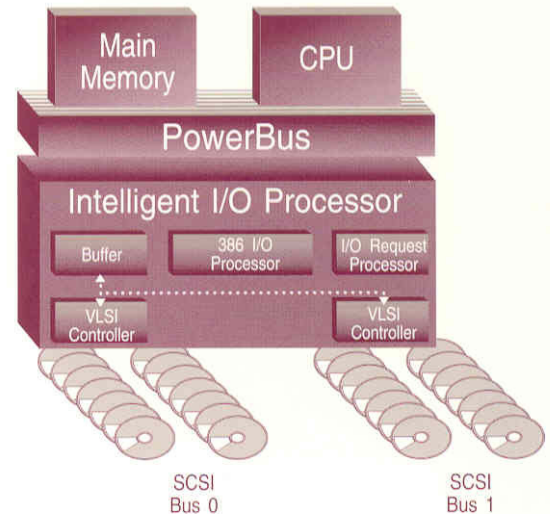
The IIOIP is an intelligent Intel i386-based bus master subsystem supporting dual VLSI SCSI processors to control two SCSI-I or Fast SCSI-II channels and up to seven devices per channel. Using 2 gigabyte drives, each IIOIP supports up to 28 gigabytes of disk storage or a maximum of 56 gigabytes (49 gigabytes formatted) for a dual IIOIP 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 IIOIP provides I/O performance rivaled only by mainframes and high-end minicomputers.

The IIOIP is an independent subsystem designed to handle only disk I/O transactions, off-loading 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 IIOIP 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.



IIOIP 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 micro-processor handles only disk I/O requests ensuring maximum performance and throughput
- ▲ Supports up to 14 SCSI devices (28 devices with two IIOIPs) using SCSI-I or Fast SCSI-II protocol
- ▲ Optional PowerRAID™ feature enhances IIOIP performance and fault tolerance with a choice of data striping, disk mirroring and hot sparing

The IOP is one element of Tricord's innovative super-server design that makes the PowerFrame family the best choice for your networking needs.

MAXIMUM THROUGHPUT ASSURED WITH IOP OPTIMIZATION TECHNIQUES

IOP 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 IOP "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 IOP 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 IOP 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 IOP PERFORMANCE WHILE IMPROVING POWERFRAME FAULT TOLERANCE

PowerRAID, Tricord's implementation of RAID (Redundant Array of Inexpensive Disks) technology is an optional IOP 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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