Chelsio
Communications
Accelerate

High Performance
Unified Wire Networking Solutions

- **TCP/IP**
- **iSCSI**
- **RDMA**

iSCSI
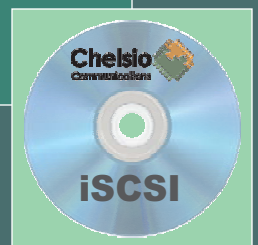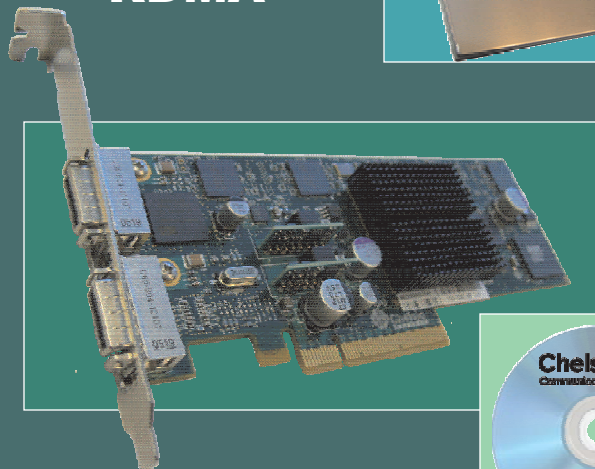
The global leader in 10Gb Ethernet

CHELSIO COMMUNICATIONS is leading the convergence of networking, storage and clustering interconnects to a unified Ethernet fabric with its robust, high-performance and proven Unified Wire technology. Featuring a highly scalable and programmable architecture, Chelsio's 10-Gigabit Ethernet and multi-port Gigabit Ethernet adapter cards deliver the low latency and superior throughput required for I/O-intensive applications.

At the core of Chelsio's technology leadership is the proprietary Terminator 3 (T3) protocol offload engine. A third-generation design, T3 builds upon the stability and robustness of the previous designs, adding support for additional protocols and integrating virtualization and unique traffic management capabilities. Unburdened of protocol and data processing overhead, host servers and storage systems benefit from dramatic increases in both applications performance and communications bandwidth.

Chelsio's products accelerate application performance in high-performance environments, such as enterprise data centers, high performance cluster computing (HPCC) and storage area networks (SAN).
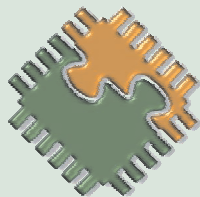
Table of Contents
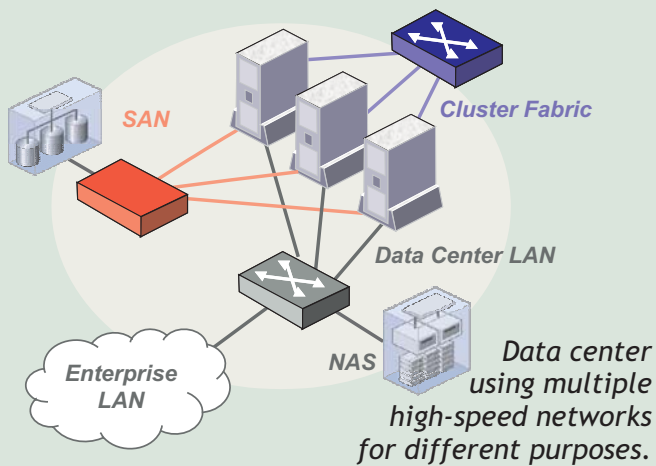
Chelsio provides the most comprehensive selection of 10Gb Ethernet adapters in the industry.

Unified Wire

Chelsio's Unified Wire architecture simultaneously supports networked applications which traditionally required different fabrics such as Fibre Channel, InfiniBand, and Ethernet over a single Ethernet network, while individually matching the performance and capabilities of each specialized interconnects.

The T3 engine transforms Ethernet into a reliable, high-speed, traffic-managed fabric. It provides the required support for handling the different applications, as well as the critical pieces needed to preserve their performance levels while sharing the same infrastructure.

SAN

Cluster Fabric

Data Center LAN

Enterprise LAN

NAS

Data center using multiple high-speed networks for different purposes.

Chelsio-powered 10Gb Ethernet provides the performance boost and protocol support to enable converging all traffic onto Ethernet, significantly reducing costs for equipment, installation, maintenance, and network management.

SAN

Data Center LAN

Enterprise LAN

NAS

4

TOE
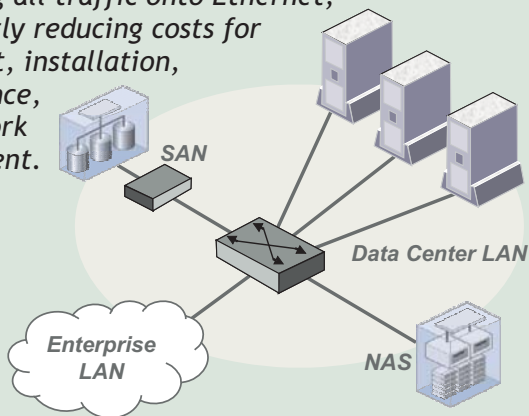
TCP Offload Engine

At multi-Gigabit Ethernet speeds, TCP/IP protocol processing consumes a large fraction of a host system's CPU and memory subsystem, resulting in little or no resources left for useful applications to run on the system.

Chelsio's TCP offload engine (TOE) offloads the processing of the entire TCP/IP stack to the network interface card. In addition, unlike state-less offload approaches, Chelsio's full TCP offload supports direct data placement (DDP) which eliminates the expensive copies between operating system and application buffers required in software stacks. The result is a dramatic reduction in host system CPU and memory subsystem utilization, and a corresponding increase in application performance.

Chelsio's TCP implementation rivals popular operating systems' stacks in RFC compliance. Each connection is fully processed in hardware, including establishment, teardown, and exception handling. In addition, unique support for high-speed operation is designed into the hardware engine, allowing very fast loss recovery times and robust performance in the presence of packet loss in the network. Furthermore, the offload core is tightly integrated with the following for optimal performance:

- Traffic management and engineering
- Virtualization
- Packet filtering and steering

RDMA/iWARP

Remote Direct Memory Access

Chelsio implements Remote Direct Memory Access (RDMA) in the S-series Storage Accelerators and the R-series iWARP Adapters. RDMA allows data movement directly from the memory of one computer into that of another without involving either one's operating system, permitting high-throughput, low-latency networking, which is highly desirable in parallel computer clusters.

Chelsio's high-performance adapters support zero-copy networking by enabling the network interface card to transfer data directly to or from application memory, eliminating the need to copy data between application and operating system buffers. When an application performs an RDMA Read or Write request, the application data is delivered directly to the network by the network adapter, reducing latency and enabling fast message transfer. Such transfers require no work to be done by CPUs or context switches, and transparently proceed in parallel with other system operations.

RDMA eliminates protocol overhead that can choke the capacity to move data across a network, reduce application performance and restrict the size and scalability of a cluster.

Internet Wide Area RDMA Protocol

Chelsio fully supports the RDMA Consortium's Internet Wide Area RDMA Protocol (iWARP), and the Internet Engineering Task Force's update of the RDMA Consortium's iWARP standard.

Chelsio's iWARP adapters are the first, and currently the only, adapters to be supported by the OpenFabrics Alliance Enterprise Distribution (OFED) for the Linux operating system.

OPENFABRICS
ALLIANCE
iol TESTED
www.iol.unh.edu

iSCSI

SCSI over IP

Internet SCSI (iSCSI) is a transport layer protocol that allows the use of the SCSI protocol over IP networks.

iSCSI-based storage area networks (SANs) in enterprise networks are gaining wide acceptance, thanks to simplified management and reduced cost. iSCSI is even more appealing with 10Gb Ethernet, which supports higher speeds than Fibre Channel. Tests with Chelsio's iSCSI Storage Accelerators have shown excellent performance for iSCSI SANs, matching or exceeding Fibre Channel numbers.

Chelsio's high-performance Storage Accelerators significantly speed up the iSCSI protocol for block-level storage traffic between servers and storage systems. The adapters offload the expensive byte-touching iSCSI operations and payload placement to greatly improve SAN performance and reduce CPU and memory utilization on storage servers.

Chelsio's T3 iSCSI support includes:

- Header and data digest (CRC) generation and checking
- PDU recovery
- Direct data placement (DDP) of payload

In addition, Chelsio's iSCSI offerings include:

- iSCSI Boot
- Full iSCSI initiator and target mode software stack

Chelsio's iSCSI stack is especially tuned to take advantage of Chelsio's Storage Accelerator features to provide the best possible performance for critical storage applications.

Internet2 Land Speed Records

Chelsio established as the fastest 10Gb Ethernet adapter for IPv4 and IPv6

Internet2, the foremost advanced networking consortium, announced on April 24, 2007 that an international team lead by the University of Tokyo has set two consecutive Internet2 Land Speed Records (I2 LSR). The records were achieved using Chelsio's latest high-performance Ethernet adapters.

With these two records, Chelsio completed its domination of the LSR competition by holding all the titles for both IPv4 and IPv6. Per the I2 LSR rules, the records can no longer be broken for 10Gb speeds.

To set the records, a team from the University of Tokyo, WIDE Project, NTT Communications, JGN2, SURFnet, CANARIE, Pacific Northwest Gigapop, and other institutions collaborated to create a network path over 30,00 km in distance, crossing six international networks – over ¾ the circumference of the Earth. Using this network, the team achieved a new record throughput of 9.08 Gbps, which is equal to 272,400 Tb-m/s.

Dr. Kei Hiraki, professor at the University of Tokyo and LSR team leader, said, "Chelsio has been an integral part of the team for the last 2½ years. Chelsio's 10Gb network accelerators are fast, flexible adapters that enable us to finely tune the output rate of the end-systems to adapt to the characteristics of the network path."

Routing point

A L1 or L2 switch

Source and destination

10Gb/1Gb Ethernet Adapters

CHELSIO is proud to present its third-generation line of 10Gb Ethernet adapters, powered by the T3 unified wire engine. The T3-based line provides the highest 10Gb Ethernet performance available today, setting new benchmarks to which all other Ethernet adapters will be compared.

Chelsio's unique data-flow hardware architecture maximizes bandwidth, reduces latency, and dramatically lowers host CPU and memory utilization.

Applications

Chelsio's line of high-performance adapters offers a broad selection for all types of network applications including:

- Network Attached Storage (NAS)
- IP-based Storage Area Networking (SAN)
- Server Networking
- IP-based Cluster Computing
- IPTV, Video Streaming
- Video Post-production
- Traffic Management
- Traffic Classification
- Security Applications
- WAN Optimization
- Server Virtualization

Adapters

Chelsio offers three lines of adapters to satisfy all your network connectivity requirements:

- Server Adapters
- iWARP Adapters
- Storage Accelerators

SERVER ADAPTERS

Price/Performance Leader for 10GbE Networking Applications

- Stateless offload
- Best price/performance
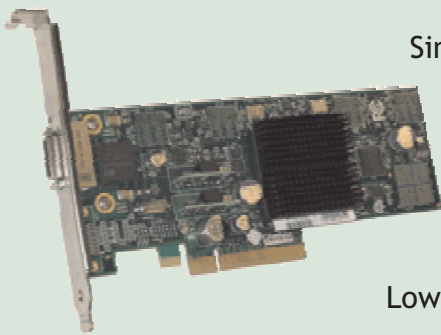
N310E-CXA
Single-port 10G CX4
PCI Express NIC

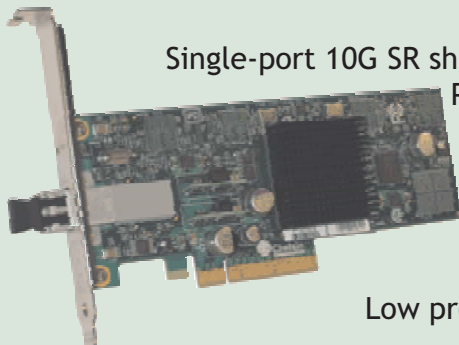Supports active optical cables
with distances up to 100 meters.

PCI EXPRESS

Low profile, ½ length
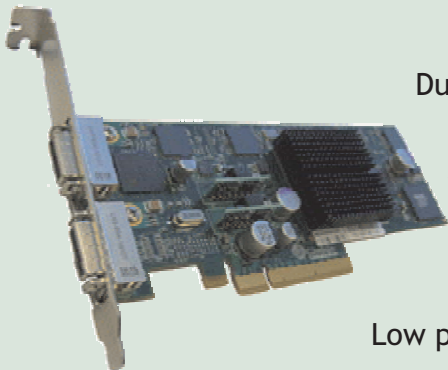
N320E-CXA
Dual-port 10G CX4
PCI Express NIC

Supports active optical cables
with distances up to 100 meters.

PCI EXPRESS

Low profile, ½ length

N310E-SR
Single-port 10G SR short-reach fiber
PCI Express NIC

PCI EXPRESS

Low profile, ½ length

iWARP ADAPTERS

RDMA Over 10GbE for High-Performance Cluster Computing

- Standards-compliant iWARP solution
- Run existing InfiniBand RDMA applications unmodified
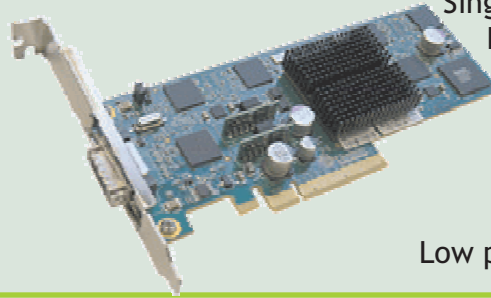
R310E-CXA
Single-port 10G CX4
PCI Express RNIC

Supports active optical cables
with distances up to 100 meters.

PCI EXPRESS

Low profile, ½ length

For individual product briefs or more information, please visit our website at www.chelsio.com.
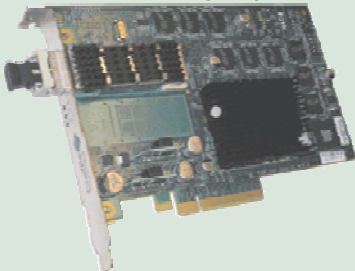
STORAGE ACCELERATORS

Highest Performance 10GbE Adapters for Storage, Server and Cluster Networking

- Unified Wire solution
- TCP/IP, iSCSI, and RDMA
- Zero-copy DDP support
- Complete IP SAN (iSCSI) hardware and software solution
- Run existing Fibre Channel and InfiniBand applications unmodified
- Server Virtualization
- Advanced Traffic Management
- Line-rate Classification Engine

S310E-SR • S310E-SR-C
Single-port 10G SR short-reach fiber
PCI Express
Storage Accelerator

PCI EXPRESS

Low profile, ½ length
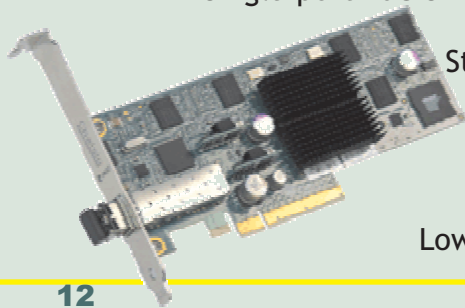
S310E-SR+
Single-port 10G SR+ short-reach fiber
PCI Express
Storage Accelerator

PCI EXPRESS

Low profile, ½ length

STORAGE ACCELERATORS
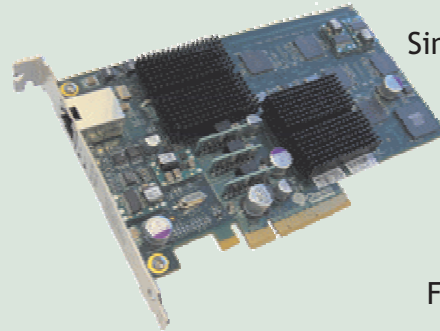
S310E-BT

Single-port 10GBASE-T
PCI Express
Storage Accelerator

PCI EXPRESS

Full height, ½ length
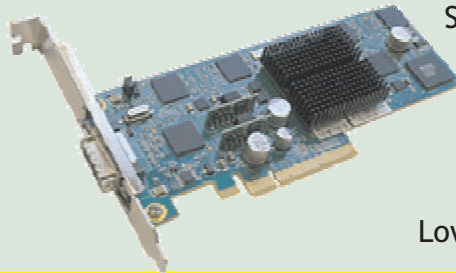
S310E-CXA

Single-port 10G CX4 PCI Express
Storage Accelerator

Supports active optical cables
with distances up to 100 meters.

PCI EXPRESS

Low profile, ½ length
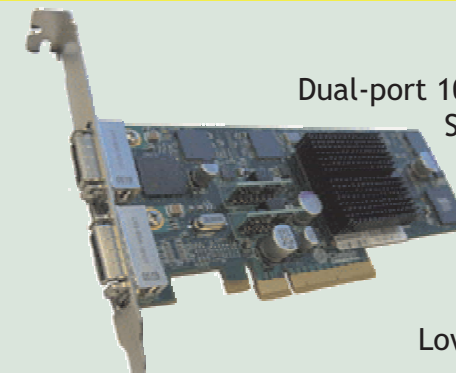
S320E-CXA

Dual-port 10G CX4 PCI Express
Storage Accelerator

Supports active optical cables
with distances up to 100 meters.

PCI EXPRESS

Low profile, ½ length

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*For individual product briefs or more
information, please visit our website at
www.chelsio.com.*

S310E-SR-XFP

Single-port 10G XFP short-reach fiber
PCI Express
Storage Accelerator
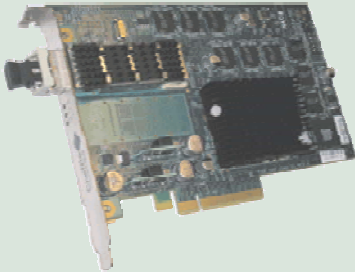
PCI EXPRESS

Full height, ½ length

S310E-LR-XFP

Single-port 10G XFP long-reach fiber
PCI Express
Storage Accelerator

PCI EXPRESS

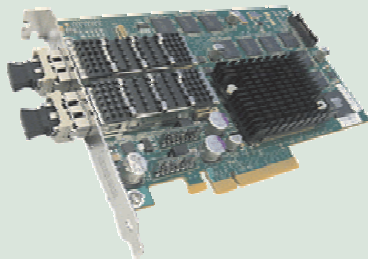Full height, ½ length

S320E-SR-XFP

Dual-port 10G XFP short-reach fiber
PCI Express
Storage Accelerator
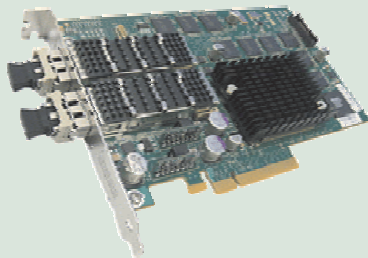
PCI EXPRESS

Full height, ½ length

S320E-LR-XFP
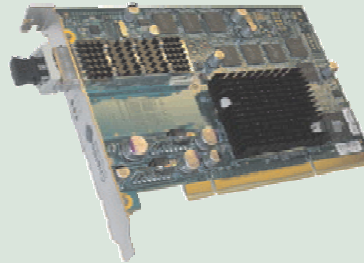
Dual-port 10G XFP long-reach fiber
PCI Express
Storage Accelerator

PCI EXPRESS
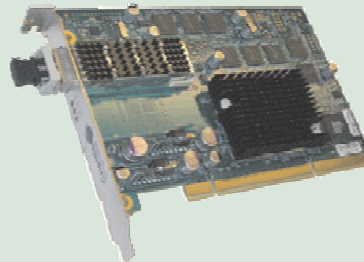
Full height, ½ length

S310X-SR-XFP

Single-port 10G SR short-reach fiber
PCI-X
Storage Accelerator

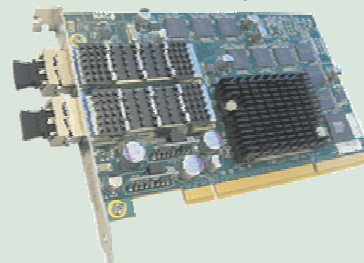Full height, ½ length

S310X-LR-XFP

Single-port 10G XFP long-reach fiber
PCI-X
Storage Accelerator
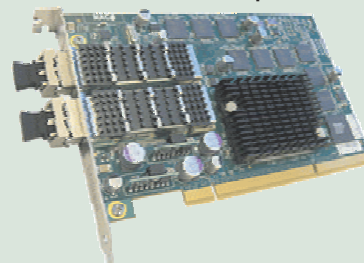
Full height, ½ length

S320X-SR-XFP

Dual-port 10G XFP short-reach fiber
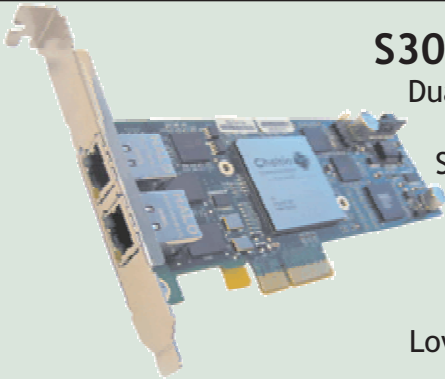PCI-X
Storage Accelerator

Full height, ½ length

S320X-LR-XFP

Dual-port 10G XFP long-reach fiber
PCI-X
Storage Accelerator

Full height, ½ length
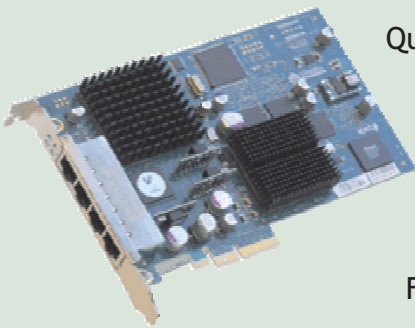
STORAGE ACCELERATORS

S302E • S302E-C

Dual-port 1000BASE-T
PCI Express
Storage Accelerator

PCI EXPRESS
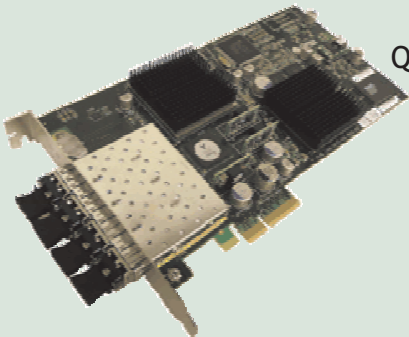
Low profile, ½ length

S304E

Quad-port 1000BASE-T
PCI Express
Storage Accelerator
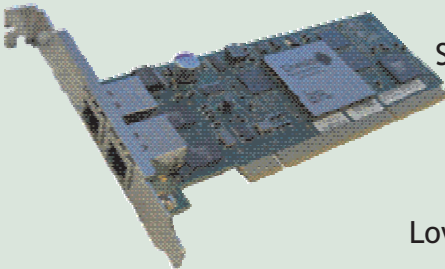
PCI EXPRESS

Full height, ½ length

S304E-SR

Quad-port 1000BASE-X
PCI-E
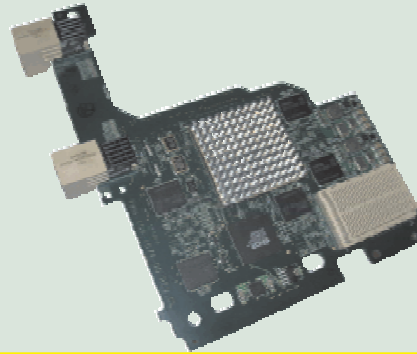Storage Accelerator

PCI EXPRESS

Full height, ½ length

S302X

Dual-port 1000BASE-T
PCI-X
Storage Accelerator
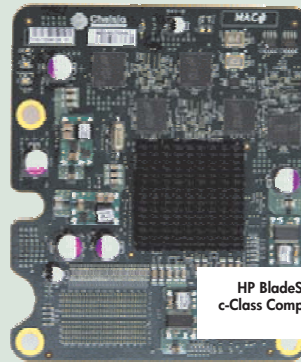
PCI-X

Low profile, ½ length

S320EM-BCH

Dual-port 10G
PCI Express
Storage Accelerator
*Mezz Card for
IBM BladeCenter H*

PCI EXPRESS

8.5 in. x 5.4 in.

S320EM-BS

Dual-port 10G
PCI Express
Storage Accelerator
*Mezz Card for
HP BladeSystem c-Class*

PCI EXPRESS

HP BladeSystem
c-Class Compatible *hp*

4.5 in. x 5.3 in.

For individual product briefs or more information, please visit our website at www.chelsio.com.

Chelsio
10Gb Ethernet Adapter
Evaluation Kits
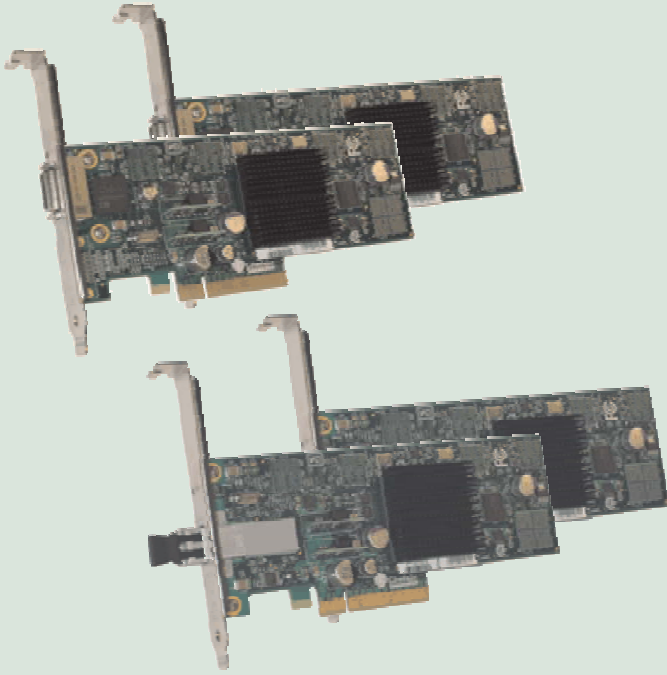
Each evaluation kit comes complete with two 10Gb Ethernet adapters and a 3-meter cable.

- **N310E-CX-EVAL**
  10GbE Copper PCI-E Server Adapters

- **N310E-SR-EVAL**
  10GbE Fiber PCI-E Server Adapters

- **S310E-CX-EVAL**
  10GbE Copper PCI-E Storage Accelerators

- **S310E-SR-EVAL**
  10GbE Fiber PCI-E Storage Accelerators

Limit one evaluation kit per customer.

Software Drivers

Visit www.chelsio.com for latest drivers and utilities.

Support

- 1-year limited hardware warranty – free repair or replacement for faulty hardware due to failure or manufacturing defect.
- Extended warranty to 3 years can be purchased within first year for 20% of adapter list price.
- 30 days free technical support, software maintenance & upgrades with the purchase of any Chelsio adapter or software product.

T3HW10G   10G HW support extended 3-year warranty

Cables

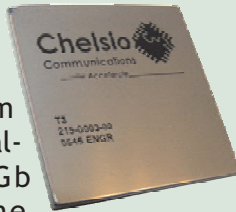CX4CABLE3M   3-meter 10GBASE-CX4 copper cable

CX4ACABLE15M 15-meter CX4 active optical cable

SRCABLE3M   3-meter 10GBASE-SR fiber optic cable

Chelsio will continue to offer new products and product updates. Visit www.chelsio.com for the latest information.

T3 ASIC

The Terminator 3 (T3) ASIC from Chelsio Communications is a scalable, high-performance 10Gb Ethernet unified wire engine, enabling simultaneous support of iSCSI, RDMA, and TCP/IP sockets applications. A third-generation design, it builds upon Chelsio's robust and field-proven Terminator 2 and 1 engines which have been widely deployed in server, storage, and clustering interconnect applications.

The T3 uses an ultra-low latency, high-bandwidth, programmable data-flow processor core, in conjunction with high-bandwidth, fully ECC-protected external memory interfaces, to provide no-compromise wire speed iSCSI, RDMA, and TCP/IP performance. The highly programmable and flexible processor loads instructions at boot time, facilitating field upgrades.

Third-Generation Protocol Offload Engine

Chelsio's performance leading Terminator architecture processes all connections in one data-flow pipeline to deliver line-rate 10Gbps throughput for a single connection, up to thousands of connections. In contrast, competing multi-RISC offload engines require multiple connections to distribute processing among the embedded processors, exhibit poor scaling, and are limited by the performance of each processor, and by memory contention.

The T3 ASIC is available to qualified OEMs.

Order T3ASIC10G
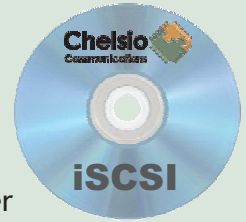
T3 ASIC Reference Design Kit

The Reference Design Kit contains:

- Data sheet
- SPICE model
- IBIS model
- BOM
- PCB file
- Layout guidelines
- Schematic review
- BSDL file

iSCSI Solutions

iSCSI Initiator Software

iSCSI Target Software

Chelsio's iSCSI solutions deliver high-performance iSCSI initiator- and target-mode functionalities. The software applies Chelsio's iSCSI acceleration technology to CPU-intensive iSCSI operations, resulting in exceptional performance at optimum CPU utilization.

Chelsio's suite of iSCSI products are designed for data-intensive applications that require high throughput, such as video streaming, image processing, and backup. Specific applications include SAN edge devices such as storage arrays, storage-aware devices in the SAN cloud such as virtualization engines, and IP-based data centers built with blade servers.

The iSCSI Target and Initiator Software are available for use with most 1Gb and 10Gb NICs in a Linux environment.

Chelsio's iSCSI Initiator and Target Software are available for licensing to qualified OEMs.

The iSCSI Target Software is included with the S-series Storage Accelerators, but not with the R-series iWARP Adapters nor the N-series Server Adapters.

Ordering info

T3SW10G   10G iSCSI Target Software

T3SW2G   1G iSCSI Target Software

T3SW10G-I   10G iSCSI Initiator Software

T3SW2G-I   1G iSCSI Initiator Software

Performance

Chelsio's iSCSI Target Software delivers the highest performance in the industry when used with Chelsio's 10Gb Ethernet Storage Accelerator adapters:

- **Throughput: 2100 MBps**
- **IOps: 940,000**

iSCSI Initiator Specifications

- Simple-to-install loadable software
- Full compliance with RFC3720
- Error Recovery Level 0 (ERL 0)
- CHAP Support, including Mutual Authentication
- Internet Storage Name Service (iSNS) Client
- Multiple Connections per Session
- An intuitive and features-rich management CLI

Interoperability

- iSCSI Targets conforming to RFC 3720

iSCSI Target Specifications

- Simple-to-install loadable software
- Full compliance with RFC3720
- Error Recovery Level 0 (ERL 0)
- CHAP Support, including Mutual Authentication
- Internet Storage Name Service (iSNS) Client
- Target Access Control List (ACL)
- Multiple Connections per Session
- Multiple Targets
- Multiple LUNs per Target
- Multi Path I/O (MPIO)
- Greater than 2 TByte Disk Support
- Microsoft Cluster Support (R/R)
- Dynamic LUN Resizing
- Multiple Target device types
  - Block
  - Linux Storage Management (LVM, Software RAID, EVMS, etc.)
  - Built-in RAM Disk
- Supports iSCSI Boot Initiators
- An intuitive and features-rich management CLI
- An easy-to-use enhanced web-based management graphical user interface (GUI)

Interoperability

- RAID cards

OS Support

- Linux 2.6 kernals
- Support for Red Hat and SuSE

370 SAN ALESO AVENUE

About Chelsio

Chelsio Communications has its headquarters in Sunnyvale, California, in the heart of Silicon Valley. The company also has a R&D design center in Bangalore, India.

Founded in 2000, Chelsio now has over 140 customers in twenty countries.

With our focus on 10Gb Ethernet, Chelsio has designed the industry-leading T3 ASIC, a third-generation protocol offload engine that provides no-compromise wire speed iSCSI RDMA and TCP/IP performance.

ISO Certification

Chelsio received its ISO certification in 2005 and seeks to provide the highest-quality products that consistently meet our customers' requirements. At Chelsio we strive to:

- Do things right the first time.
- Involve all employees in continual development.
- Seek out and eliminate the root causes of problems.

ISO
9001:2000
REGISTERED

CERTIFICATE NO: 164305

Chelsio
goes green!

√
RoHS
Compliant

23
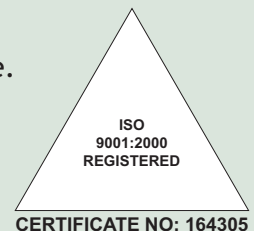
Chelsio Communications
www.chelsio.com
sales@chelsio.com
+1 (408) 962-3600