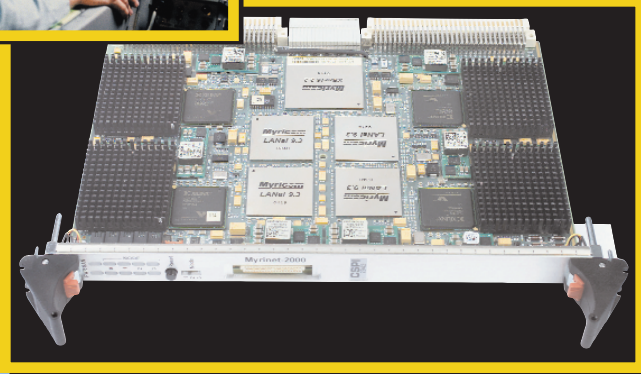


FastCluster 2942 Blade



Incorporating the fastest processor available for embedded applications, a large memory subsystem and the latest in network communication standards for high performance computing the *FastCluster 2942 blade* delivers over 32 GFLOPS of peak computational power for a variety of applications, including medical imaging, radar, sonar and simulation.

Packaged in an industry standard 6U VME form factor the *FastCluster 2942 blade* is designed with a low latency,

cut-through crossbar switch to interconnect the four processing nodes on the board and allows for additional off-board communication. Each processing node consists of two levels: a first level for managing network communications, and a second level for compute processing. The 64-bit Local Area Network Application Interface (LANai) includes a 32-bit RISC processor, a dedicated 4 MB fast buffer memory (SRAM), the Myrinet-2000™ high-speed network interface and DMA engines for packet control. The second level, for compute processing, consists of a processor interface, a PowerPC™ MPC7457 microprocessor with AltiVec™ technology with an integrated on-chip 512 KB L2 Cache, 2 MB of L3 Cache, 256 MB of SDRAM and 32 MB of flash memory for fast boot-up and self-test. This implementation delivers maximum performance for concurrent I/O and compute processing operations.

FastCluster 2942 blades offer many high availability features to meet the stringent demands of our defense customers. Standard features include fast booting from a cold start, error-correcting memory, hot-swappable hardware, and built-in self test. Ruggedization options are also available for systems intended for use under extreme environmental conditions.

Powerful, scalable MultiComputer systems are easily implemented with *FastCluster 2942 blades* and Backplane Overlay Switch Modules, Chassis Switch Modules and Serial Line Cards to scale the Myrinet cluster interconnect to meet the application requirements. These systems are specifically designed to require minimum space and power and are based upon open and standard hardware and software components.

Quad PowerPC per 6U Slot

PowerPC 7457 with AltiVec @ 1 GHz
1K Complex FFT 11 Microseconds
L2 Cache @ 1 GHz (512 KB)
L3 Cache @ 333 MHz data rate (2 MB)

Myrinet On VME (ANSI/VITA 26-1998)

Myrinet-2000 16 Port Switch @ 500 MB/sec per port

Linux & VxWorks/Tornado Development Environment

Fast Boot & Live Insertion

Power On Self Test

6U VME64 Extension Form Factor (ANSI/VITA 1.1-1997)

Designed to UL, CSA, TUV, CE & FCC Class B, part 15 Regulatory Standards

CSPI

MultiComputer Division

2942 Specifications & Software Environment

2000 SERIES	2942 Blade
Floating Point Compute Power	32 GFLOPS
1K Complex FFT	11 Microseconds per processor
Processor (MPC7457)	1 per Processing Node/4 per Board
COMPUTE PROCESSOR	
Processor	
Processor Model	MPC7457 w/Altivec™
Internal Processor Clock	1 GHz
System Clock	100 MHz
L2 Cache	Integrated 512 KB on-chip @ 1 GHz
L3 Cache	4 @ 2 MB (64-bit @ 333 MHz data rate)
SDRAM (ECC)	
Memory Size	4 @ 256/128 MB (up to 1 GB per Board)
Data Transfer Rate	64 bit @ 100 MHz Reads 640 MB/s, Writes 800 MB/s
FLASH	
Memory Size	32 MB per processor, standard
NETWORK COMMUNICATIONS	
Network Standard	Myrinet on VME (ANSI/VITA 26-1998)
Network Interface Controller	
Network Processor	Myrinet LANai9
RISC Memory	4 @ 4 MB SRAM (64 bit)
RISC Clock Rate	132 MHz, Processor @ 264 MIPS
Network Switch	
Myrinet Internal Ports	1 16 port (4 internal/4 external)
Myrinet External Ports	4 SAN Ports, 500 MBs per port (250 MB/s in & 250 MB/s out)
Myrinet External Ports	4 SAN Ports, 500 MBs per port (250 MB/s in & 250 MB/s out)
ELECTRICAL/MECHANICAL	
Electrical Power*	
5.0 Volts	37.4 Watts @ 5V (7.50A), typical
3.3 Volts	21.2 Watts @ 3.3V (6.43A), typical
12.0 Volts	0.3 Watts @ 12V (0.02A), typical
Packaging Standard	6U VME64 Ext. (ANSI/VITA 1.1-1997)
Height x Depth x Width	233.4 mm x 160.0 mm x 19.8 mm (9.2 in x 6.3 in x 0.8 in)
Weight	1.43 lbs.

*actual power consumption will vary with application

Choice of Operating System Software

FastCluster 2942 blades with VxWorks provide a total system software solution so users may quickly develop and run complex real-time applications. The foundation for this software is the industry standard VxWorks™ Real-Time Operating System (RTOS). This efficient RTOS incorporates such features as a scalable run-time kernel to conserve code space and support for many different Application Programming Interfaces (API's). Integrated communication routines support data transmission over the Myrinet fabric. TCP/IP is supported throughout the Myrinet network as well. This protocol permits interoperability between heterogeneous processors.

FastCluster 2942L blades with Linux provide an open source UNIX like operating system environment with a POSIX implementation including true multitasking, virtual memory, shared libraries, demand loading, work load balancing, and support for TCP/IP networking. The Linux operating system is easily integrated with clustering software such as MPI and includes a full suite of GNU compiler tools to facilitate development.

MPI Development Environment

Message Passing Interface (MPI) is a standard for multicomputer and cluster message passing. The MPI parallel programming library provides multiprocessor control. The MPI library offers an easy way for the programmer to associate specific data with specific processes. The MPI library facilitates the creation of dynamically scalable applications. An application may be written for a few processing nodes for simplicity, and then easily expanded to invoke additional nodes for faster execution.

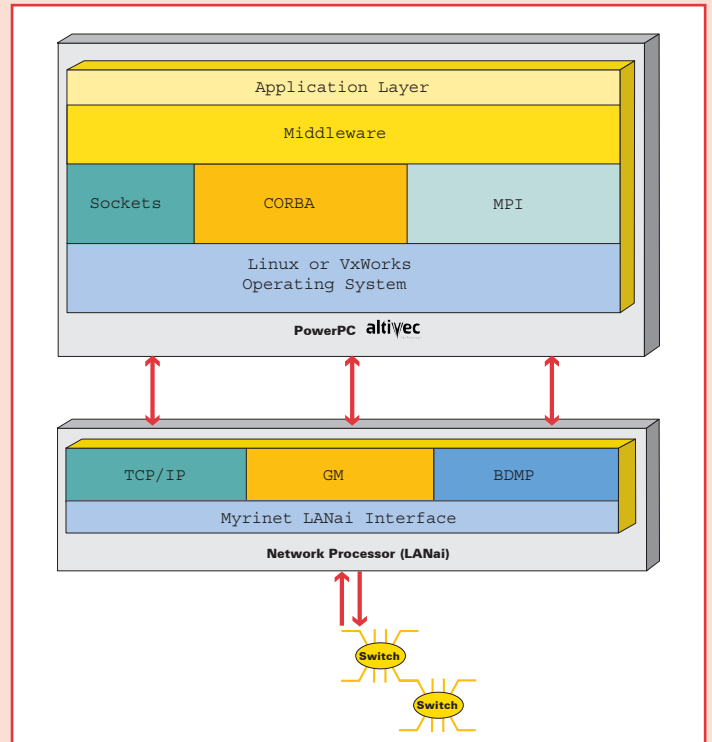
2942 Software & Block Diagram

ISSPL & VSIPL Lite Signal Processing Libraries

The **Industry Standard Signal Processing Library (ISSPL-ALT)** is a library of approximately 250 functions for signal and image processing applications that is highly optimized for use on the AltiVec. Compute-intensive functions are hand-coded to speed up execution time. The remainder of the functions use C compiled code optimized for speed. The ISSPL-ALT reduces programming complexity by providing a single calling function for complex mathematical and signal processing routines. Both development and execution times are significantly improved. The ISSPL-ALT provides a full complement of routines to take advantage of the floating-point arithmetic capabilities of the AltiVec. All routines are callable from C and C++ compiled programs to achieve rapid and efficient program development.

The **Vector Signal and Image Processing Library (VSIPL)** is the result of a DARPA sponsored effort to define an open, industry standard API for vector, signal, and image processing primitives targeted at embedded real-time signal processing systems.

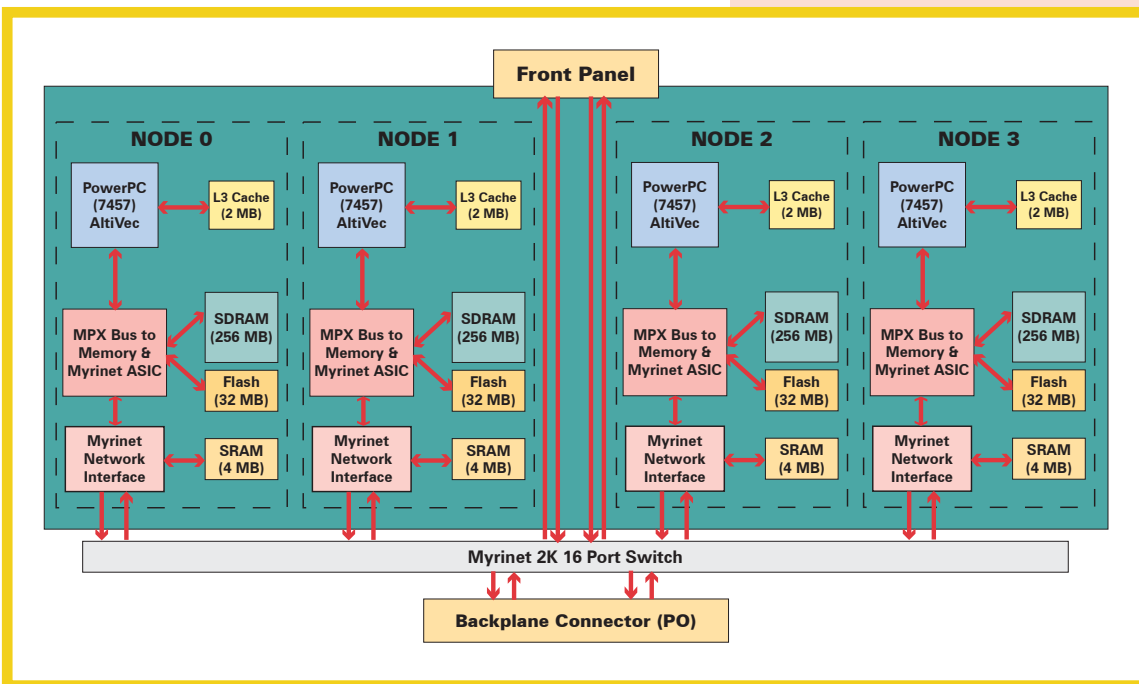
Implemented according to the 'Core Lite' profile, VSIPL is a library of 125 functions for vector-based signal processing applications. The function calls are organized into four primary categories: support functions, basic scalar operations, basic



vector operations and signal processing. Support functions facilitate object creation and interaction as well as memory management. The scalar and vector operations allow the programmer to perform numerical computation on dense rectangular arrays. Signal processing functions include FFT operations, filtering, correlation and convolution.

The object-oriented design of the VSIPL API employs the concept of blocks and views to provide a level of abstraction from the memory and processor architecture of the underlying

machine. A block is a contiguous area of memory used for data storage. Views are a method for classifying the data as vectors or matrices. Blocks and views are created, accessed and destroyed via library functions. Manipulating blocks and views via library functions assists the application programmer in writing code that is truly portable and compatible



Environmental (Operating) Conditions*

Environmental Parameter	Level I (Standard)	Level II (Extended Temp)
FastCluster Blade		
Temperature Range	0° C to 40° C @ 12 cfm	0° C to 55° C @ 12 cfm
Relative Humidity	up to 95% + non condensing	up to 95% + non condensing
Maximum Altitude	10,000 ft **	10,000 ft **
Shock	15 gs @ 11 ms, half sine	15 gs @ 11 ms, half sine
Vibration (random)	0.002 G ² /Hz 10-2000 Hz	0.002 G ² /Hz 10-2000 Hz
Vibration (sinusoidal)	2 G 5-500 Hz swept sine	2 G 5-500 Hz swept sine
Storage Temperature	-40° C to 85° C	-40° C to 85° C
FastCluster Chassis		
Inlet Air Temperature Range	0° C to 40° C	0° C to 55° C
Ambient Air Relative Humidity	up to 95% + non condensing	up to 95% + non condensing
Maximum Altitude	10,000 ft **	10,000 ft **
Shock	10g 11 ms half sine	10g, 11 ms half sine
Random Vibration	0.002 G ² /Hz 10 - 2000 Hz	0.002 G ² /Hz 10 - 2000 Hz
Storage Temperature	-50° C to 100° C	-50° C to 100° C

*FastCluster Blades and Chassis are designed to meet these environmental conditions.

**Ambient Temperature, Airflow, Altitude parameters can be traded off among each other. Consult factory for information.

+Conformal Coating is available as an option for relative humidity conditions with condensation.



MultiComputer Division

(800) 325-3110 | www.CSPI.com | Email: info@cspi.com

Product Reliability

CSPI maintains its reputation as a leader in the development and manufacture of quality MultiComputers and signal processing equipment. Our products operate reliably in diverse environments such as truck-mounted systems in the Alaskan wilderness and the Saudi Arabian desert as well as other mission critical defense applications.

The high reliability of CSPI products results from dedicated work in six critical areas: ISO compliance, adherence to standards, manufacturing procedures that meet the guidelines of IPC-A-610/Level III, testing to a wide range of environmental acceptance criteria, maintaining a life history database and performing operational burn-in.

Warranty, Maintenance, & Customer Service

CSPI manufactured hardware products are covered by a return-to-factory warranty for one year from the date of shipment. If an item is found to be defective it will be replaced or repaired. An optional extended warranty can be purchased to increase the warranty period to two years from the date of shipment. Out of Warranty service is available on a time and materials cost basis.

CSPI software products are covered by a 90 day warranty from the date of shipment. Software support includes technical hot-line support, patches, bug fixes and version upgrades. An optional extended warranty can be purchased to increase the warranty period to one year from the date of shipment. Out of Warranty service is available on a time and materials cost basis.

For more information on the warranty programs contact your local Sales Manager or call CSPI MultiComputer at **1-800-325-3110**.