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(The Pleiades star cluster)

Myrinet Overview

*Stars cluster beautifully.
So do computers.*

Myrinet is a cost-effective, high-performance, packet-communication and switching technology that is widely used to interconnect **clusters** of workstations, PCs, servers, or single-board computers. Clusters provide an economical way of achieving:

- **high performance**, by distributing demanding computations across an array of cost-effective hosts. For "tightly coupled" distributed computations, the interconnect must provide high-data-rate and low-latency communication between host processes.
- **high availability**, by allowing a computation to proceed with a subset of the hosts. The interconnect should be capable of detecting and isolating faults, and of using alternative communication paths.

Conventional networks such as Ethernet can be used to build clusters, but do not provide the performance or features required for high-performance or high-availability clustering. Characteristics that distinguish Myrinet from other networks include:

- Full-duplex 2+2 Gigabit/second data rate links, switch ports, and interface ports.
- Flow control, error control, and "heartbeat" continuity monitoring on every link.
- Low-latency, cut-through switches, with monitoring for high-availability applications.
- Switch networks that can scale to tens of thousands of hosts, and that can also provide alternative communication paths between hosts.
- Host interfaces that execute a control program to interact directly with host processes ("OS bypass") for low-latency communication, and directly with the network to send, receive, and buffer packets.

Myrinet is an American National Standard -- ANSI/VITA 26-1998. The [link and routing specifications](#) are public, published, and open.

Myrinet Components and Software

Myricom supplies:

- **Myrinet interfaces**, such as Myrinet/PCI and Myrinet/PCI-X interfaces.
- **Myrinet switches**, up to 16-port crossbar switches, and **Myrinet "Network in a Box"** components that can interconnect up to 128 hosts with a single, full-bisection, network component, and up to tens of thousands of hosts by combining these components.
- **Myrinet-link fiber or cables**.
- **Myrinet software support** for most common hosts and operating systems. The software is supplied "open source," and other Myrinet software is available from third parties.



You or an integrator install the interfaces and software in the hosts, and connect the network with cables and switches. The software maps the network, and uses whatever communication paths are available from host to host. No switch programming or routing-table configuration is necessary.

Software Interfaces and End-to-End Performance

Myrinet packets may be of any length, and thus can encapsulate other types of packets, including IP packets, without an adaptation layer. Each packet is identified by type, so that a Myrinet, like an Ethernet, may carry packets of many types or protocols concurrently. Thus, Myrinet supports several software interfaces.

Specialized software packages developed by Myrinet customers for cluster-computing applications achieve short-message latencies between UNIX user processes less than 4 μ s, and sustained, one-way, data rates approaching 2 Gbits/s.

[Benchmarks of Myricom's GM message-passing system](#) and application-programming interface (API) show sustained, one-way, data rates of ~1.98 Gbits/s between UNIX user processes in different hosts, summed-bidirectional data rates of ~3.9 Gbits/s, short-message latencies as low as 6 μ s, and very low host-CPU utilization. The GM system provides protected user-level access to the Myrinet (secure in multi-user, multiprogramming environments); reliable, ordered delivery of messages; network mapping and route computation; and other features that support robust and error-free communication. Other software interfaces such as MPI, VI, Sockets, and TCP/IP are layered efficiently over GM, and are available from Myricom and from third parties.

The [Software and Customer Support page](#) provides a complete outline of Myrinet software, with links to documentation.

Technology and Reliability

Myrinet components are implemented with the same advanced technology -- full-custom-VLSI CMOS chips -- as today's workstations, servers, PCs, and single-board computers. This use of CMOS technology is one reason why Myrinet performance has advanced and will continue to advance in step with advances in the hosts, without changes to the network architecture and software interfaces.

These CMOS-based Myrinet components are also extremely reliable. Based on field experience accumulated for all Myrinet components shipped during the past four years, the MTBF of Myrinet switches exceeds one-million hours, and the MTBF of Myrinet interfaces is in the range of several million hours. Myrinet exhibits a very low bit-error rate, and is highly robust with respect to host, switch, and cable faults. Myrinet can map itself continuously, and use alternate routes to circumvent faults (e.g., disconnections and powering-down). The hardware computes and checks a CRC for each packet on each link. The interfaces provide parity checking both in their memory and on the PCI bus.

Reality

Myrinet is the market leader in high-performance, high-availability, cluster interconnect. Myricom shipped its first Myrinet products in August 1994. Including the installations supplied by Myricom's OEM customers and by Myrinet resellers and integrators, there are now thousands of Myrinet installations, ranging in size up to more than 1,000 hosts. These sites include many of the world's premier cluster-computing systems.

[Software & Customer Support](#) | [Performance Measurements](#)
[Product List, Prices, & Links to Product Specifications](#) | [Sales Channels](#)

Myricom

Last updated: 9 May 2003



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