



FIRST Cluster



Fig.1 - 16 node model of the FIRST cluster (2.4TFLOPS).

Node: 2U-server with *Blade-GRAPE*

- ▶ A special GRAPE board for full size PCI slot, Blade-GRAPE (see Fig 2), is newly developed. It is embedded in a 2U-size of 19-inch rack mountable server PC which has dual CPUs in SMP configuration (see Fig 3). The Blade-GRAPE is directly connected to the board via two PCI-X bus slots. The Blade-GRAPE's electric power supply is from the PCI-X bus (3.3V) as well as from the cluster server board, +12V (54W) and +5V(2.2W). The board's theoretical peak performance is 136.8GFLOPS. Each server PC is also equipped with multi-port Gigabit Ethernet NIC to be connected to a special interconnection network with commodity Ethernet switches.

The Blade-GRAPE boards were manufactured by Hamamatsu Metrics and the 2U servers were procured from Nihon HP. Business Search Technology Co., and Sumi-Sho Computer Systems Co., also joined in the development of the first model.

Network: 2D Hyper Crossbar

- ▶ 256 of server PCs (nodes) with 512 CPUs are configured in 16x16 array where all nodes are connected by 2-dimensional Hyper Crossbar Network with commodity switches. Each node is connected to both X and Y dimensions of Ethernet switch, and the message is routed by software at any junction node if necessary. In order to provide high communication bandwidth, each link between a node and a single dimension is doubled by a Gigabit Ethernet trunk connection.

The FIRST cluster is a heterogeneous PC cluster, which is designed for effective calculations of astrophysical radiation hydrodynamics. Each node possesses 2 CPUs and a newly-developed GRAVity PipE (GRAPE) processor, Blade- GRAPE, for gravity calculations. Fig. 1 shows the first model of the FIRST cluster, which consists of 16 nodes. The peak speed is 2.4TFLOPS. In two years, 256 (16x16) node PC cluster system will be constructed. The total theoretical speed will be 38.5TFLOPS.



Fig.2 - Blade-GRAPE board (136.8GFLOPS)

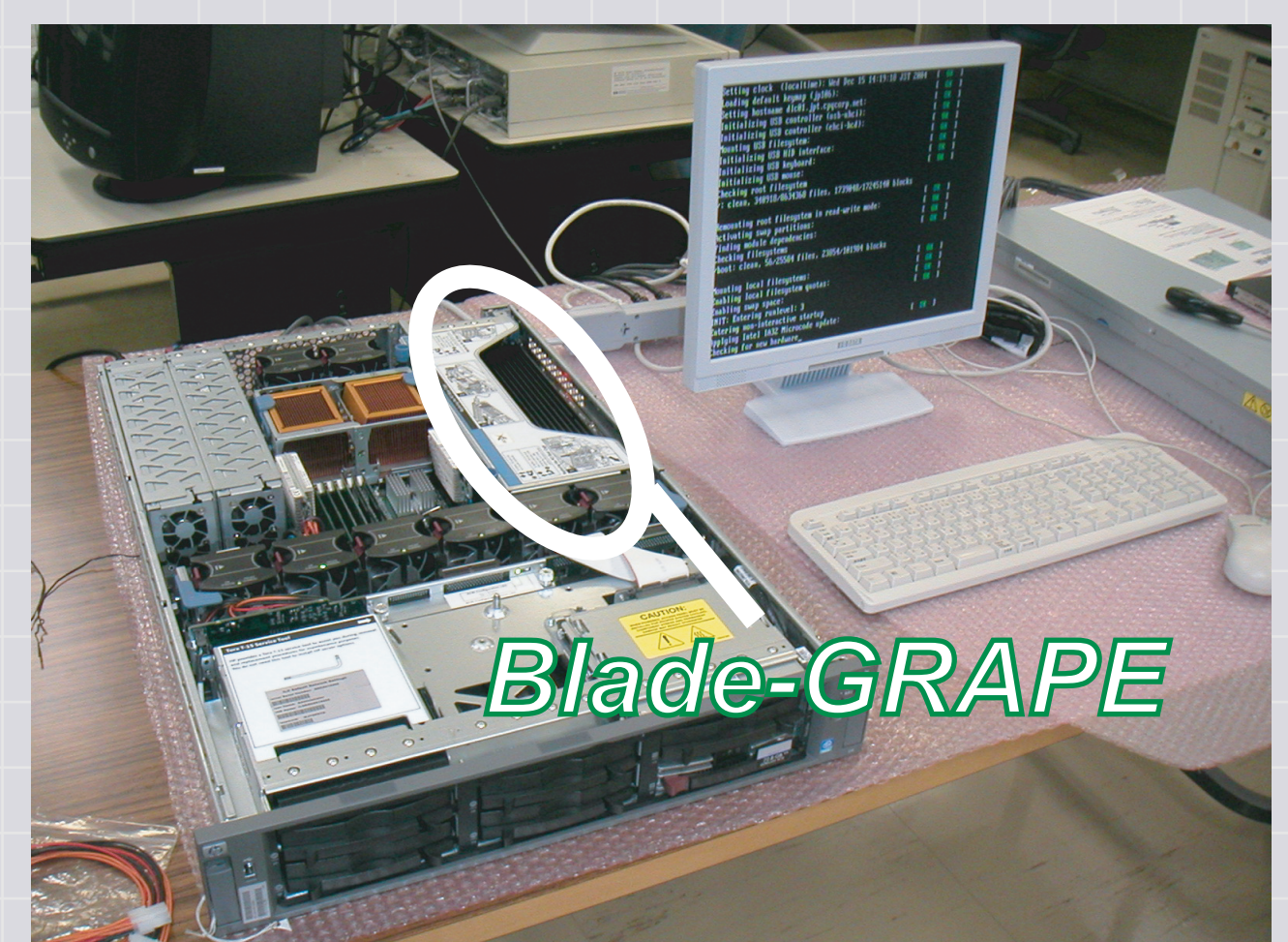


Fig.3 - 2U server with Blade-GRAPE