SKIF

Russian Federation and Republic of Belarus Union Program

Development and Production of High-Performance Parallel-Architecture Computer (Supercomputers) Family and Supercomputer-Based Applications

The SKIF K-1000 Supercomputer 2.5 Tflops

The SKIF K-1000 Supercomputer

The SKIF K-1000 Supercomputer was designed and produced within the framework of the Russian Federation and Republic of Belarus Union Program.

The SKIF K-1000 Supercomputer is a flagship high-performance computer built within the framework of the Program. Most technical solutions employed in the SKIF K-1000 Supercomputer are currently cuttingedge not only for the SKIF Program but also for the entire super-computer industry; specifically:

- 64-bit AMD Opteron TM 248 (2200 MHz);
- the system network is based on the Infiniband 4x technology for interconnect.

Infiniband ensures high performance of MPI applications: bandwidth of MPI reaches 830 MB/s, latency amounts to 5 usec.

The SKIF K-1000 Supercomputer was built in record time. Assembly and setup of SKIF K-1000 were accomplished in the T-Platforms Cluster Technology Center, Moscow; then, oved and reinstalled in UIIP NAS, Minsk, Belarus.

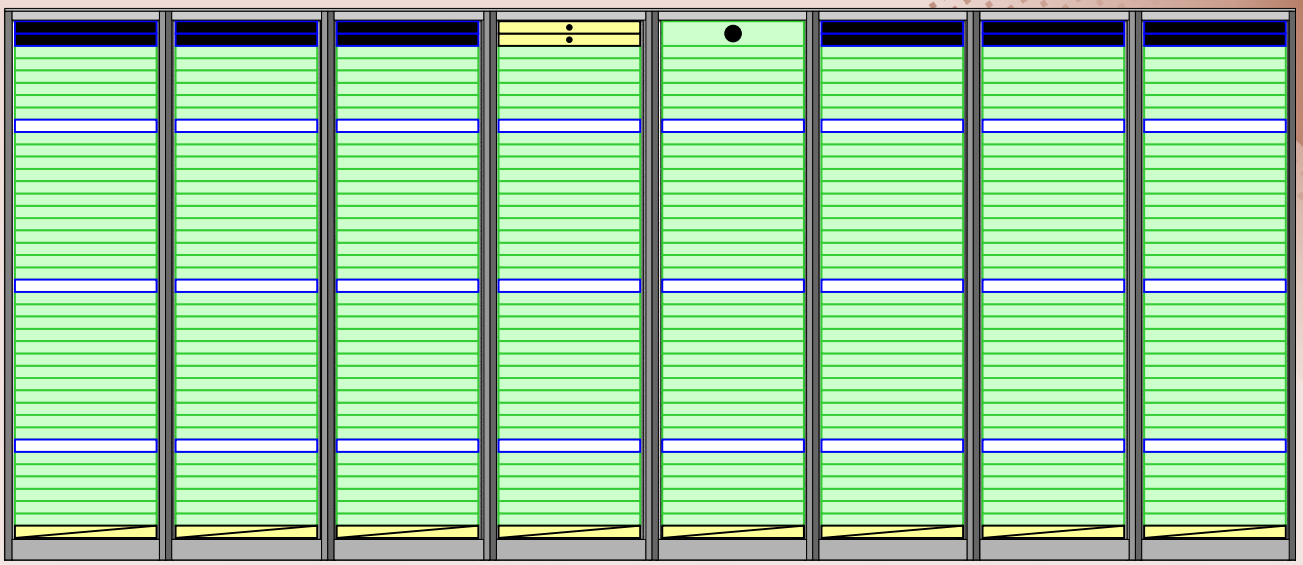
In November 2004, the SKIF K-1000 Supercomputer was ranked 98th among the world's TOP500 Supercomputers with the 2.5 Tflops peak performance. Moreover, SKIF K-1000 has one of the best price/quality ratios in the industry.

SKIF K-1000 is also ranked second-fastest — was first-fastest in November 2004 — among the 50 most powerful computer installations in the territory of the former Soviet Union and Eastern Europe.

The SKIF K-1000 Supercomputer Data Sheet

Peak performance	**2.5 Tflops (2 534 Gflops)**
Linpack performance	**2.0 Tflops (2 032 Gflops)**
Characteristics Linpack	**Performance index=80.1%; N = 274 000; $N_{1/2}$ = 24 950**
Computational nodes/processors	**288 / 576**
CPU	**AMD Opteron™ 248 (2200 Mhz)**
RAM	**288 × (8 × 0.5 GB) = 1 152 GB**
Disk memory	**288 × 80 GB = 23 040 GB**
System network	**InfiniBand, IB 4x (MPI: ~830 MB/s, ~5 μs)**
Management network	**Gigabit Ethernet**
Service network	**СКИФ-ServNet v.2.0**
Form factor	**1U**
Racks	**8 стоек 42U**
Dimension, mass	**4.8m × 1.07m × 2.07m, 10.7 m^3, 5.4 T**
Power consumption per one rack/ the installation	**9 – 11 kW / 73 – 89 kW**
Price/peak performance	**about $700 000 per 1 Tflops**
Price/Linpack performance	**about $800 000 per 1 Tflops**
Heat emission	**about 70 kW**
Air cooling	**16 000 m^3 per hour**
Gigabit Ethernet cable system	**326 cables, about 1,500 m 652 slots**
InfiniBand cable system	**576 cables, about 1,500 m 1152 slots**
Development Stages	
- concept and design	**12/01/2003–05/31/2004 (6 months)**
- manufacturing	**07/15–10/01/2004 (2.5 months)**
- assembly	**09/04–09/17/2004 (2 weeks)**
- testing	**09/18–09/25/2004 (1 week)**

The SKIF K-1000 Supercomputer: Structure



Computational Subsystem

Computational node (8x36=288 pcs.): 1U, 2´AMD Opteron 248 (2.2Ghz), RAM: 4GB, HDD: IDE 80GB, IB 4x Mellanox HCA MHXL-CF128 (connected to the Leaf IB Switch), 2xGbEthernet (one line connected to the Leaf Eth Switch), СКИФ-Servnet v.2

Subcontrol (1 pcs.): 2U, CPU: 2´AMD Opteron 248 (2.2Ghz), RAM: 4GB, HDD: 2´ 36GB, SCSI 10K RPM, HotSwap, DVD/CD, FDD, Moxa CP104UL 4 port RS232 LP Universal card + 4 SKIF Servnet v.2 cards, 2´GbEthernet (one line connected to one of the Core Eth Switch)

The Infiniband System Network4x (MPI: ~830 MB/s, ~5 ms)

the Core IB Switch Mellanox MTS-2400 (2x6=12 pcs.): 1U, 24 ports, one line for each of the 24 Leaf IB Switches

the Leaf Switch Mellanox MTS-2400 (3x8=24 pcs.): 1U, 24 ports, 12 lines for the computational nodes of 12 lines of the Core Switches (one line for each of the nodes)

GbEthernet Managed Network

the Core Eth Switch D-Link DGS-3324SR (2 pcs.): 1U, 24 ports, 2 ports (2 Gbps trunk) per 8 Leaf Eth Switches, 40 Gbps trunk between Core Eth Switches

the Leaf Eth Switch D-Link DGS-1224T (2x8=16 pcs.): 1U (2 pcs. Are installed in 1U), 24 ports, 18 lines for computational nodes, 2 ports (2 Gbps trunk) per Core Eth Switch

The SKIF-Servnet v.2 Service Network

The Servnet boards of computational nodes are linked into the RS-485 line (two cabinets: 2x36=72 pcs. in a line) and connected to one of the four Servnet service cards in a computational node.

The SKIF K-1000 Supercomputer Developers

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