Russian Academy of Sciences
Program Systems Institute

SKIF-GRID

SKIF Ural Supercomputer

The SKIF Ural supercomputer with peak performance of 16 Tflops is the most powerful Russian computer installation in the Urals, Siberia, and in the Far East.

The SKIF Ural supercomputer has been built by the Russian company of T-Platforms to order from the South Ural State University using funds federally allocated to its innovation educational program within the bounds of the Priority National Education project. The SKIF Ural supercomputer incorporates advanced technical solutions and original engineering developments having been made in the course of implementation of the Union State SKIF-GRID program by the scientific-industrial alliance involving the T-Platforms company, the Program Systems Institute of the Russian Academy of Sciences, MSU, SUSU, and other organizations.

The SKIF Ural has cluster architecture and incorporates over three hundred up-to-date 45nm Hypertown quad-core processors, developed by Intel Corporation.

The supercomputer is equipped with advanced licensed software for research with the help of engineering modeling and analysis including FlowVision bundled software made by the Russian firm of TESIS.

In March 2008 the SKIF Ural supercomputer took the 4th position in the eighth edition of the TOP50 list of the fastest computers in the CIS countries. In June 2008 it was ranked No. 282 in the 31st edition of the world TOP500 list of supercomputers.

Key features of the SKIF Ural supercomputer

Peak/Linpak performance	**15.936 Tflops / 12.2 Tflops**
Number of computing nodes/processors	**166/332**
Formfactor of the node	**blade**
Processor type	**quad-core Intel® Xeon® E5472, 3,0 ГГц**
Total volume of RAM of all computing nodes	**1.3 TB**
Total volume of disk memory of all computing nodes	**26.5 TB**
Type of the system network	**DDR InfiniBand (Mellanox ConnectX)**
Type of managing (auxiliary) network	**Gigabit Ethernet**
Service net	**SKIF ServNet-3 + IPMI**
Number of assembly cabinets of the computing cluster	**6**
Volume of the data storage system	**20 TB**
Type of UPS	**Symmetra PX**
Total occupied area (including cooling subsystem, UPS)	**72 m^2**
Total power consumption (including cooling and UPS)	**135 KW**

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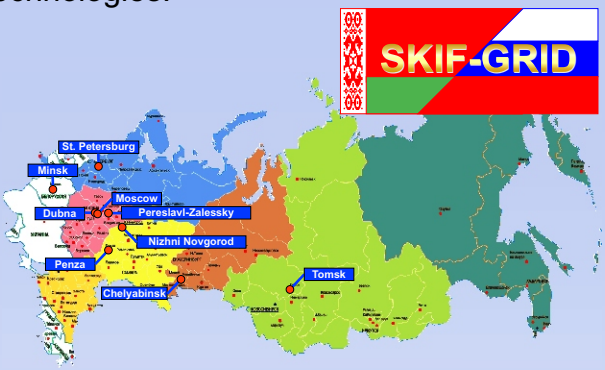
SKIF Ural supercomputer application areas

Application areas: nanotechnologies, flow dynamics, optics and spectroscopy, deformation and fracture mechanics, computational and celestial mechanics, computational engineering, 3D modeling, large data base processing, electrodynamics.

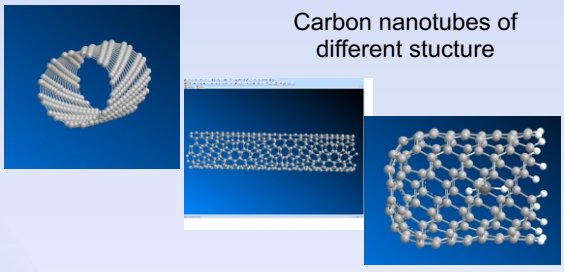
Chelyabinsk-based SKIF Ural supercomputer is intended for research with the purpose of creating innovation technologies to be applied at the largest Ural region enterprises, such as State Rocket Center (the city of Miass), Magnitogorsk Iron and Steel Works (MMK), Chelyabinsk tube-rolling plant (CHTPZ), Chelyabinsk Metallurgical Works, Pervouralsky Novotrubny Works, Uralvagonzavod, Ural Automotive Plant (URALAZ), VSMPO-AVISMA Corporation (the city of Verkhnyaya Salda), and others. New technology application using supercomputing simulation will allow to reduce lead time for new prospective product development more than by half. Anticipated economic benefits for only Chelyabinsk region should amount to over one billion roubles per year.

The SKIF Ural supercomputer along with the SKIF MSU, the SKIF Cyberia (Tomsk), and SKIF K-1000M (Minsk) supercomputers and a number of others is included into the SKIF-Polygon supercomputer network formed by major Russian and Byelorussian supercomputer centers within the bounds of the Union State SKIF-GRID program. Like other SKIF-Polygon supercomputers SKIF Ural is to be used as platform for developments and research in the interests of implementing the SKIF-GRID program activities, which should ensure further development of domestic supercomputer hardware and software technologies.



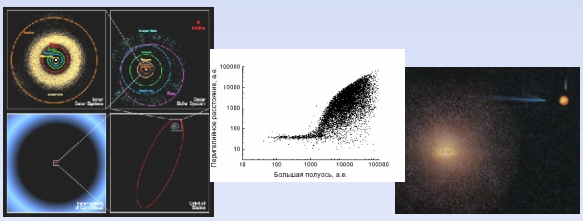
Examples of problems solved with the help of the SKIF Ural supercomputer

Simulation of carbon nanostructure



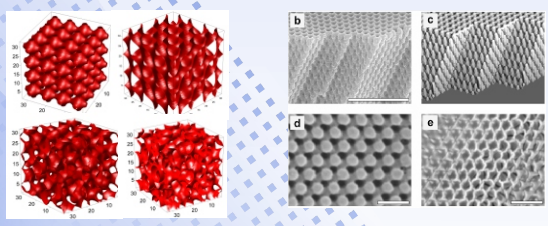
Carbon nanotubes of different stucture

Simulation of the solar system distant regions



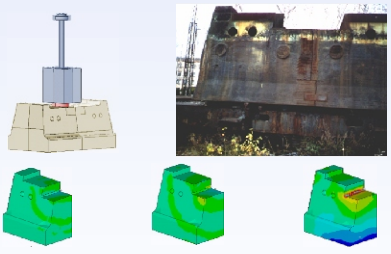
Simulation of the Oort cloud formed during 4.5 billion years

Photonic crystals fabricated using holographic lithography technique



Modeling Experiment

Shock wave propagation and fatigue cracking in the sledge hammer anvil block



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