The Honourable Prime Minister of India, Dr Manmohan Singh, inaugurated a new Supercomputing Facility at Bhabha Atomic Research Centre, Mumbai, on November 15, 2005.

BARC’s Supercomputing facility consists of TeraFlop class 512-node ANUPAM Supercomputer, High Resolution Tiled Display Cluster; Terabyte Storage Clusters and many other powerful Computing Clusters integrated seamlessly, using ultra-fast network technology via Computing Grid. The Computing Grid helps to aggregate distributed computing resources such as computing power, storage capacity, network bandwidth, graphics capability, etc. in a manner similar to electric power being tapped from an electric Grid. Grid technology presents a single, unified resource for solving large-scale computational and data-intensive computing applications.

The Supercomputing environment has been fully designed and developed by a highly dedicated team of computer scientists & engineers of BARC, harnessing capabilities of Free & Open Source Software (FOSS) and deploying a number of commodity components available from indigenous sources. Use of sound software engineering practices, reusable component technology and plug and play hardware design has not only provided very robust, highly scalable and easily upgradeable supercomputing infrastructure but has also resulted in drastic reduction in costs.
BARC had achieved a significant milestone in 2003 by developing ANUPAM parallel processing system, attaining highest computing performance of 365 Gigaflops for High Performance Linpack (HPL) benchmark on 128 node system. The availability of such enormous computing power has given tremendous boost to deployment of high-end scientific and engineering applications in BARC by enabling users to solve complex 3-D computation intensive problems in a reasonable time frame, which were impossible to be solved even on the fastest available conventional computer.

BARC recently installed 64 Node ANUPAM-PIV parallel cluster at Institute of Plasma Research, Gandhinagar. ANUPAM-ALPHA supercomputer installed at National Centre for Medium Range Weather Forecasting, Noida, in 1999 by BARC is in regular use and continue to provide them regular operational weather forecasts. ANUPAM systems are also in regular use at Aeronautical Development Agency, Bangalore, and Vikram Sarabhai Space Centre, Thiruvananthapuram. So far BARC has developed 16 different ANUPAM models and about 36 ANUPAM systems are in regular use in many leading Educational and Research institutes in India.

Another successful development at BARC is that of a high-resolution (5120x4096) wall-size tiled display system using commercially available multiple LCDs (4x4) interfaced with a parallel cluster, providing advanced data visualization capability, which is the first of its kind in the country. A high-end post processor software package, ANU-View, has also been developed to facilitate users to visualize their voluminous data graphically.

As a part of DAE-CERN collaboration programme, BARC has also developed many Grid middleware tools namely SHIVA - a problem tracking system, Grid-View - a Grid operations and monitoring system, Fabric monitoring, etc., which are deployed in LCG grid at CERN, Geneva, and are in regular use. European Organization for Nuclear Research (CERN) is building Large Hadron Collider (LHC), the largest accelerator in the world, for searching Higgs particle leading to the understanding of the origin of masses of fundamental particles and unification of fundamental forces of nature. The LHC represents a leap forward in particle beam energy, density and collision frequency. The extraction of results from the LHC experiments will present a number of challenges in terms of computing, due to the unprecedented complexity and rates of the data, the length of time of the programme and the large (presently 1800 physicists, 150 institutes, 32 countries) geographically, distributed scientific communities that will coherently need to operate on these data. CERN is meeting the computing challenge of LHC by using Grid Computing technology with the objective of exploiting widely dispersed Large National Computing facilities located in various countries.
Although the probability of a beyond design base accident at nuclear power plant is very very low (~ 1 event in 1 million reactor year operations), BARC has developed an Indian Real time Online Decision Support System “IRODOS”, for handling off-site nuclear emergency in the event of an accident at Nuclear Power Plant, following the defence in depth practices of BARC. This is an online system, which senses a nuclear accident and communicates to the round the clock monitoring emergency response centre. It estimates the likely release of contaminant into the environment and suggests the counter measures to be taken, along with the availability of logistics, to assist the emergency response team handling the crisis. The online system has to be taken at affected places to minimise the radiological exposure to the public and to the environment.
BARC has set up a real time seismic monitoring and tsunami alert system at Mumbai. The system comprises a seismic sensor network, real time data acquisition system, a VSAT based data communication system and a data center. The data from Mumbai, Gauribidanur and Delhi seismic arrays are collated and processed in real time at this centre to obtain source parameters within a short duration and provide necessary alert to various facilities of the DAE.

Whether an earthquake is tsunamigenic or not, depends on various parameters such as the location of the earthquake, the source depth at which the fault slip occurred, the event magnitude, water depth above the hypocenter and the focal mechanism. BARC has developed a novel method to determine focal mechanism solution, using artificial neural networks (ANNs), particularly for the earthquakes of Sumatra region. The ANN based method, which relies on the amplitudes of P and later seismic phases, will be significant when data are available from only one or a few stations. The online estimated source location can be quickly refined interactively using conventional and genetic algorithm based location software developed in-house. For quick estimation of the source depth, a method based on the difference of body wave and surface wave magnitude is used. Once all the relevant parameters are estimated, together it will be possible to indicate whether an earthquake would be tsunamigenic or not.