Satyendra Nath Bose National Centre for Basic Sciences
Sector-III, Block – JD
Salt Lake, Kolkata – 700098

SNB/60.4/12-13/28   31st January, 2013

Proposals are invited from prospective vendors in sealed envelope to discuss the technical specification [Expression of Interest (EOI)] of a High Performance Computing Cluster to be set up at S. N. Bose National Centre for Basic Sciences, JD Block, Sector III, Salt Lake, Kolkata -700098. The envelope should be superscribed with the words **" Proposal for EOI for HPC."**

Notice No.	
Date & Time of Meeting for EOI	February 18, 2013 at 10.00 am
Contact	Sajeev Chacko S. N. Bose National Centre for Basic Sciences Block JD, Sector-III Salt Lake, Kolkata 700098 India Email: **sajeev.chacko@bose.res.in** Tel.: 033-23355706-8 (ext. 236)

The participating vendors in the EOI meeting are expected to provide benchmarking and scaling (for details see the technical specifications) on a machine whose teraflop rating should be at least 70% of the final configuration to be supplied. A rough budgetary estimate of the proposed solution should be provided to the Technical Committee.

Technical Specifications:

1.	System Architecture	Tightly integrated cluster with QDR/FDR Infiniband or Torus/Tree or Gemini interconnect. Both blade and rack based architectures are acceptable. There should be provision to use few nodes of the machine for running serial jobs and/or for high throughput visualization.
2.	Compute Power	A base system of at least 50 TFLOPS of sustained compute power on HPL (turbo off). Vendor should provide an indicative budget of the proposed solution. The incremental cost along with all necessary hardware, licenses and software components with technical details for enhancing the system in a step of size 5 TFLOPS sustained HPL to scale the base system up to 100 TFLOPS should be provided.
3.	Processor	64 bit PowerPC (A2 core) at 1.6 GHz or Intel Xeon E5-4600 series at 2.6 GHz or AMD Opteron (Abu Dhabi) at 2.5 GHz or Power7 at 3.55 GHz or higher or equivalent.
4.	Interconnect Topology	QDR/FDR Infiniband or 5D-Torus or Gemini interconnect or equivalent

5.	Operating System	64-bit Linux server version with support.
6.	Compute Nodes	The compute nodes should be either blade based with blade enclosure or chassis based with chassis enclosure designed for HPC solution. Node should be hot pluggable with RAS features.
7.	Memory	At least 2 GB per core DDR3 at 1333 MHz or better (1600 MHz would be preferred). Option may be provided for a few fat nodes with at least 4 GB per core DDR3 at 1333 MHz or better (1600 MHz would be preferred).
8.	Application Benchmarking	The vendors should run the following application benchmarks: 　1. VASP　　2. NAMD　　3. LAMMPS Benchmarking should be carried out based on the input obtained from **sajeev.chacko@bose.res.in** on a system of size at least 70% (seventy percent) of the base system proposed. This defines the "Benchmark System". The vendor should provide benchmark output as described in the benchmarking instruction given below: Benchmarking should have at least 4 data points. Benchmarking should also provide the heating and power rating, plotted as function of TFLOPS. Benchmarking should be completed in all respects as entailed in instructions (provided by **sajeev.chacko@bose.res.in**) for each benchmark case. Any deviations in this will not be considered.
9.	High Performance Linpack (HPL) Benchmarking	The vendor should report the best HPL performance and efficiency on the base system proposed with turbo mode off.
10.	Compilers	PGI or Intel or XL compiler consisting of C, C++ and FORTRAN 77, FORTRAN 90, and FORTRAN 95 with at least 10 user floating license for each.
11.	Software tools	Software tools namely MPI OpenMP, SHMEM and other libraries/development kit required to run jobs should be quoted with minimum of 10 user licenses, wherever applicable.
12.	Management software	Management software stack consisting of cluster management/ system management etc should be quoted. All software must be supported by OEM/ISV.
13.	Job/Workload Management tool	The solution must include job scheduler as a separate line item with appropriate no of tokens/licenses for the entire system.

Login Nodes (2 units dedicated)

14.	Configuration	2 dedicated units of configuration: 64 bit PowerPC (A2 core) 1.6 GHz or Intel Xeon E5-4600 series or equivalent at 2.6 GHz or AMD Opteron at 2.2 GHz or Power7 at 3.55 GHz or higher
15.	Other Nodes (Managing, head, monitoring)	Vendor must design and quote appropriate number of nodes to integrate the cluster solution to meet their proposed design of HPC system.

Storage and Backup:

16.	Storage and Backup	Storage sub-system with active-active at least one controller hardware RAID array. Minimum of usable 200 TB capacity of storage in RAID 5 layout. Native IB attached storage (FDR preferred / QDR acceptable). For Gemini or Torus it is not applicable. Separate data and metadata storage. Redundant power supplies and fans. No single point of failure in entire storage solution. There should be a provision for backup.
17.	RAID Support	1, 4, 5, 6
18.	Individual Disk	3 TB or higher capacity enterprise class SATA at 7200 RPM or better
19.	Parallel Filesystem	Luster 1.8.6 or newer based Parallel file system, or General parallel file system.
20.	IO nodes	One number of OSS servers with dual socket (64 bit PowerPC (A2 core) 1.6 GHz or Intel Xeon E5-4600 series or equivalent at 2.6 GHz or AMD Opteron at 2.2 GHz or Power7 at 3.55 GHz or higher), 64-bit Linux server version with support, High Availability features, 128 GB DDR3 RAM, dual redundant disks (2x300 GB) for OS boot (mirror), 2 x dual port QDR Infiniband or Gemini, Gigabit Ethernet port for cluster administration network. One number of MDS servers with dual sockets (64 bit PowerPC (A2 core) 1.6 GHz or Intel Xeon E5-4600 series or equivalent at 2.6 GHz or AMD Opteron at 2.2 GHz or Power7 at 3.55 GHz or higher), 64 bit Linux server version with support, High Availability features, 128 GB DDR3 RAM, dual redundant disk (2x300 GB) for OS boot (mirror), dual port 8 Gbps FC for connectivity to metadata storage, dual port QDR Infiniband or Gemini, Gigabit Ethernet port for cluster administration network. Configuration specified for IO nodes is a minimum requirement and to be configured as appropriate. Vendor should provision them adequately to demonstrate 20 GB/s performance on IOR/IOZONE benchmark with 1 MB block size on luster or GPFS filesystem. Metadata performance of at least 20,000 file creates per second.

Warranty and Support, Site and Power Requirements:

21.	Warranty	5 years of comprehensive replacement on-site warranty from the date of installation and commissioning.
22.	Training	Two weeks of on site training on system administration, storage management and usage of the HPC server must be provided to SNBNCBS team.
23.	Site requirements	Detailed site preparation document should be given. Details of power consumption, heat dissipation and cooling requirements should be specified. Space requirement should be specified. Details of noise generation by the system should be given.

24.	Power rating and Heat dissipation	The power rating of the compute machine is expected to be less than 120 kW approximately with around 200 kBTU/hr cooling requirement.

Additional Softwares:

Apart from what is mentioned under no. 11, installation and porting of softwares and libraries such as VASP, CHARMM, GAUSSIAN, LAMMPS, GROMACS, OCTOPUS, CPMD, ABINIT, QUANTUM EXPRESSO, BLAS, LAPACK, ScaLAPACK, FFTW is required

Vendor Eligibility:

The participating vendors must be OEMs or OEM supported single vendors only with original authorization certificates from the OEMs. The service provider should be OEM. Vendors should have proven experience in setting up a minimum of three HPCC with at least one at 20 TFLOPS (peak) in India and at two others at 100 TFLOPS (peak) elsewhere. A brief proof for such experience (copies of orders/installation certificate) should be provided during the meeting. The technical committee's decision regarding the suitability of the technical specification will be judged on the basis of benchmarking, power efficiency, heat generation etc.

For any clarification regarding technical specifications, etc. please send your queries to Dr. Sajeev Chacko (**sajeev.chacko@bose.res.in**).

REGISTRAR

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