Tender notification for the procurement of a "512 core High Performance Computing Cluster" (Last date: <mark>5th October</mark> 2020 by 5:00 pm)

<mark>**Corrigendum-1**</mark>, Dated 07/09/2020
A minor correction has been made in the specification of the Rack Enclosure. The correction is highlighted in <mark>yellow</mark>. The original tender draft was made available on 04/09/2020.

<mark>Corrigendum-2, Dated 13/09/2020</mark>
Corrections have been made in the minimum number of cores required for the master node and the USB ports required on the master and compute nodes. The correction is highlighted in <mark>cyan</mark>. The original tender draft was made available on 04/09/2020.

<mark>Corrigendum-3, Dated 24/09/2020</mark>
The deadline for submission of bids has been extended by one week due to COVID-related delays. The new deadline is 5pm, 5th October 2020, as highlighted in <mark>green</mark>. The original tender draft was made available on 04/09/2020.

Dear Sir/Madam,

In order to establish the "Simulations and Informatics of Materials" research group, we plan to acquire a high performance computing (HPC) cluster solution with a minimum of 512 cores from the compute nodes, allowing for large-scale simulations. In the following, we list the minimum specifications that we insist upon in the solution.

Master Node

#	Heading	Specifications
1	Form factor	2U or 4U Rack Mountable Chassis
2	Processor	Latest server-model processor. Minimum clock speed: 2.2 GHz, Minimum number of cores: <mark>28C/56T</mark> per socket. Minimum performance: 16 Flops/cycle for 64-bit operations.
3	Motherboard	Dual socket
3	Memory	4 x 32 GB DDR4 ECC RDIMMS in balanced mode, 2933 MHz or better
4	USB ports per node	Minimum 2 USB <mark>2.0</mark> or better
5	Video o/p per node	1 onboard VGA port or better
6	Storage	i) Minimum 48 TB of usable space in RAID 6 configuration with minimum 6 TB space per disk, 6 Gbps SATA Enterprise HDD @7200 ii) 1 RAID controller, 8 internal SAS/SATA ports, RAID levels 0,1,5,6,10,50,60 with minimum 2 GB cache, BBU iii) 3 SSD/NVME enterprise-class disks, 2 in RAID 1 configuration and 1 as

#	Heading	Specifications
		hot spare, for OS+code storage, minimum 480 GB per disk
7	High speed interconnects	Dual port 100 Gbps EDR Infiniband
8	Power Supply	i) Redundant power supply of 80 Plus Platinum level or better ii) The minimum PSU Wattages should be suitable for the provided solution iii) A supporting calculation of the power utilization and PSU efficiency must be provided
9	OS Support	The system should support recent versions of CentOS, SUSE, and UBUNTU

Compute Node

#	Heading	Specifications
1	Form factor	2U, Rack Mountable Chassis. Note: Dense solutions that satisfy other requirements are acceptable.
2	Processor	Latest server-model processor. Minimum clock speed: 2.2 GHz, Minimum number of cores: 32C/64T per socket. Minimum performance: 16 Flops/cycle for 64-bit operations. Total number of cores in all the compute nodes combined should be a minimum of 512.
3	Mother board	Dual socket
4	Memory	Minimum 8 GB/core. Solution should use 32 GB (or higher) DDR4 ECC RDIMM modules, at 2933 MHz or better, in balanced mode. Thus, net memory across all compute nodes should be a minimum of 8 GB/core*512 cores = 4096 GB Additional DIMM slots for future expansion must be available.
5	USB ports per node	Minimum 2 USB 2.0 or better
6	Video o/p per node	1 onboard VGA port or better
7	Storage	Minimum 512 GB SSD Enterprise-class
8	High speed interconnects	Dual port 100 Gbps EDR Infiniband
9	Power Supply	iv) Redundant power supply of 80 Plus Platinum level or better v) The minimum PSU Wattages should be suitable for the provided solution vi) A supporting calculation of the power utilization and PSU efficiency must be provided
10	OS Support	The system should support recent versions of CentOS, SUSE, and UBUNTU

Primary interconnect

#	Heading	Specifications
1	Primary interconnect switch	Mellanox Infiniband® EDR 100 Gbps 36 SFP port switch with Dual power supply to be provided corresponding to the High speed connectivity adapter used in the compute nodes. All drivers of the switch be provided to setup the cluster on the latest version of Linux.
2	Infiniband cables	Passive Copper Cable EDR up to 100 Gbps – number of cables as required by the solution

Management interconnect

#	Heading	Specifications
1	Management interconnect switch	48 port 1 GbE BaseT managed switch with low latency and SFP uplink port of popular brand. Include any infiniband cables for this switch as needed by the solution.

Rack Enclosure

#	Heading	Specifications
1	Size	42 U x 1000 mm x 600 mm
2	Material	1 mm mild steel
3	Sides	Louvered ventilated side cover with locks
4	Front	Honeycomb perforated single door with lock and handle
5	Rear	Honeycomb perforated single door with lock and handle
6	Mobility	4 Castor wheel with two having breaking locks
7	Locator	2 levelling feet to adjust floor errors and station rack in place
8	PDU	30 C-14/C-13 socket PDU, distributed on both sides, in 3-phase with single MCB no-cable. Provide power cables in accordance with the sockets provided in PDU.

Software installation

#	Heading	Specifications
1	The software listed in the specifications column should be installed on the Master node as part of the installation services provided.	i) OS installation (e.g., CentOS) in master node and all compute nodes ii) Queue management system (e.g., PBS) iii) Software to manage compute nodes (e.g., xCAT from IBM)

		iv)	Gfortran (from OS installation) and Intel Fortran/C/C++ compilers and libraries (files provided by IISc)
		v)	IntelMPI and OpenMPI (as provided by IISc) – IntelMPI (mpiicc, mpiicpc, mpiifort, libraries) will be provided as part of the Intel compiler suite (cluster edition) by IISc
		vi)	Node monitoring system (e.g., Zabbix)
		vii)	Anaconda (to manage python libraries)
		viii)	Compilation of major Density functional theory packages (source codes and licenses provided by Prof. Sai Gautam Gopalakrishnan)
		ix)	Configuration of Firewall

Other requirements
1. Minimum three years warranty on all components should be included in the quoted cost.
2. Include a quotation on AMC costs for fourth and fifth year after purchase. Note that the AMC costs will not affect the selection of the L1-bidder.
3. OS, clustering, and software installation support.
4. Detailed instructions on installing nodes (including reinstallation in case of node failure), operating the system, and powering up/down the system.

Scope of work
- Delivery of all physical equipment at the Department of Materials Engineering, IISc Campus
- Physical installation of the compute and master nodes, powering the machine on
- Software installation, starting from operating system to density functional theory software packages
- Testing to ensure that all installed software work as intended
- Testing and verification of Infiniband state and rate of data transfer

In case of a price conflict, the vendor with the following options will be preferred in the following order of priority:
1. More computational cores
2. Higher clock speed CPUs
3. Higher memory at a minimum of 2933 MHz
4. Newer generation CPUs
5. Extra SSD storage

Terms and conditions

1. The vendors quoting should be registered with IISc. The quote should carry your vendor Registration number in the Technical bid.
2. Two-bid system (separate technical and financial bids) in two sealed envelopes. Unpriced BOM should be included in the technical bid.
3. The technical bid must clearly specify the prescribed technical specifications without including the prices. Please provide in detail the specifications, namely full details of the chassis, motherboard, raid card, Infiniband switches and cards, under each subhead and bullet point. Unique characteristics may be highlighted.
4. Technical bid should be page numbered with a table of contents.
5. Vendors who include price information in the technical bids will be automatically disqualified.
6. At least 3 independent reference letters/completion certificates from completed installations within academic institutions in India with a minimum number of 400 cores in the recent past, i.e., 2018-19 and 2019-20 financial years or later. IISc may contact more users for obtaining independent references. The committee will have right to reject a bid based on reference letters.
7. Indicate tentative delivery period in the technical bid.
8. Technical bids will be opened first. IISc may seek clarifications after opening of technical bids and may ask vendors to provide some performance benchmarks, such as LINPACK 100, LINPACK 1000, and LAPACK for the CPUs and performance tests for the Infiniband adapters. Vendors may be required to give presentations detailing technical specifications and demonstrating performance. A satisfactory presentation will be required if a vendor is asked for a demonstration.
9. Financial bids from vendors will be considered only if they qualify the technical bid. Order will be placed from the L1-bidder who is technically qualified.
10. Please mention per node cost in the bill of materials in the financial bid. Indicate the Infiniband and related components as a separate line item.
11. Additional nodes may be procured from the winning bidder at the same cost per node mentioned in the original financial bid.
12. Prices should be quoted in adequate detail with relation to packing details to cover insurance compensation in case of damage to any specific modules.
13. Delivery and installation of the supply shall be complete responsibility of the vendor.
14. Prices may be quoted in US Dollars on a DDP basis, IISc is eligible for custom duty exemption/concession. Please note that IISc will not be involved in custom duty/airport charges payment, custom clearance, forwarding and transportation/shipment of import items; IISc will only provide relevant documents for availing concession/exemption in Custom duty/IGST subject to submission of documents (viz. Invoice, Bill of Entry, Bill of Lading, airway Bill, etc.) by the vendor. Bill of Entry must be in the name of IISc. Customs duty must be paid by the vendor. Before release of final payment, all original documents with regards to import must be handed over to IISc, failing which final payment may not be released.
15. In case of an INR offer, which should be inclusive of delivery to IISc campus, the component of GST/VAT/CST, E.D. and any other statutory levies if applicable should be shown separately and not included in the total amount, to enable us to avail exemption. IISc is eligible for 5% GST under concessional certificate.
16. The total solution as per the agreed bill of materials has to be supplied within 6-8 weeks after receiving a firm PO from IISc and the installation to be complete within a week after supply of the equipment.

17. Payment will be processed only after successful installation of the machine (both hardware and software).

18. IISc also reserves the right to cancel the tender at any time without assigning any reason whatsoever.

19. The tender documents can be sent at the following address not later than 5th October 2020, 5:00 pm:

> The Chairman
> Department of Materials Engineering
> Indian Institute of Science
> Bangalore 560012
> Karnataka, India
> Attn: Prof. Sai Gautam Gopalakrishnan