Domestic Tender Notification for the Procurement of a High-Performance Computing (HPC) Cluster in the Department of Chemical Engineering

Last date/time for submission of bids: Monday, 11th January 2021 by 5:00 pm

Initially issued on: Monday, 14th December 2020
Updated on: Monday, 21st December 2020 (corrections highlighted in yellow)
Updated again on: Monday, 28th December 2020 (changes highlighted in green)
Updated again on: Thursday, 31st December 2020 (changes highlighted in blue)

This is an open domestic tender for the purchase of a computing cluster with a sustained high-performance Linpack (HPL) benchmark of 30 teraflops using multiple cores distributed over several compute nodes, apart from a master node, thereby allowing for multi-scale simulations. This HPC cluster is required for the research groups of Profs. Ananth Govind Rajan and Sudeep Punnathanam in the Department of Chemical Engineering at the Indian Institute of Science (IISc).

With respect to this tender, the rules laid out by the Government of India in order No. P-45021/2/2017-PP (BE-II) issued by the Public Procurement Section, Department of Promotion of Industry and Internal Trade, Ministry of Commerce and Industry, dated 04th June 2020, will be followed. Per this order, the government has defined a 'Class-I local supplier' as "a supplier or service provider, whose goods, services or works offered for procurement, has local content equal to or more than 50%". A 'Class-II local supplier' is "a supplier or service provider, whose goods, services or works offered for procurement, has local content more than 20% but less than 50%". Only 'Class-I' and 'Class-II' local suppliers are eligible to participate in this open domestic tender. Any 'Non-local supplier', i.e., "a supplier or service provider, whose goods, services or works offered for procurement, has local content less than 20%" is ineligible to participate in this tender.

Below, we list the minimum specifications that we require for the HPC cluster:

Master node

Item #	Item heading	Item specification
1	Form factor	1U or 2U rack-mountable chassis
2	Processor	• Latest server-model processors (2nd generation AMD EPYC or Intel Cascade Lake Refresh) or better • Minimum clock speed of 2.5 GHz • Two CPUs per node • Minimum 36 cores (**not** threads) per node
3	Memory	• Minimum 4 GB DDR4 RAM per core • ECC registered DRAM, 2933 MHz or better • Homogenous and balanced memory configuration of the memory modules
4	Video output per node	1 onboard VGA port or 1 onboard DVI port, or better

5	Storage	• SSD with minimum 950 GB storage in mirrored configuration • Minimum 48 TB of usable space in a RAID 6 configuration, with a minimum of 4 TB space per disk, using 12 Gbps Enterprise SATA HDDs @ 7200 RPM
6	Storage controller	1 RAID controller with 8 internal SAS/SATA ports; support for RAID levels 0, 1, 5, 6, 10, 50, 60; with minimum 2 GB cache and a battery backup unit
7	High-speed interconnects	100 Gbps EDR Mellanox Infiniband
8	Power supply	• Redundant power supply of 80 Plus Platinum level or better • The minimum power supply unit (PSU) wattages should be suitable for the provided solution • A supporting calculation of the power utilization must be provided
9	Operating system	• CentOS should be installed • The system should support recent versions of CentOS and Ubuntu

Compute nodes

Item #	Item heading	Item specifications
1	Form factor	1U, 2U or 4U rack-mountable chassis
2	Processor	• Latest server-model processors (2nd generation AMD EPYC or Intel Cascade Lake Refresh) or better • Minimum clock speed of 2.5 GHz • Minimum two CPUs per node • Minimum 48 cores (**not** threads) per node
3	Memory	• Minimum 4 GB DDR4 RAM per core • ECC registered DRAM, 2933 MHz or better • Homogenous and balanced memory configuration of the memory modules • ~~Additional DIMM slots for future RAM expansion must be available~~
4	Video output per node	1 onboard VGA port or 1 onboard DVI port, or better
5	Storage	2 TB Enterprise SATA HDD @ 7200 RPM ~~in mirrored configuration~~
6	High-speed interconnects	100 Gbps EDR Mellanox Infiniband

7	Power supply	• Redundant power supply of 80 Plus Platinum level or better • The minimum power supply unit (PSU) wattages should be suitable for the provided solution • A supporting calculation of the power utilization must be provided
8	Operating system	• CentOS should be installed • The system should support recent versions ofCentOS and Ubuntu

Primary interconnect

Item #	Item heading	Item specifications
1	Primary interconnect switch	• Mellanox Infiniband® EDR 100 Gbps switch having appropriate number of ports with dual power supply to be provided corresponding to the high-speed connectivity adapter used in the compute nodes • Appropriate number of cables must be provided • All drivers of the switch should be provided to setup the cluster on the latest version of Linux

Management interconnect

Item #	Item heading	Item specifications
1	Management interconnect switch	• 1 GigE BaseT-managed switch having appropriate number of ports with low latency and SFP uplink port • Appropriate number of cables must be provided

Software installation

#	Item heading	Item specifications
1	Operating system	CentOS
2	Cluster management software	Rocks with Ganglia or equivalent
3	Job scheduling software	Torque or equivalent
4	Compilers	C/C++/Fortran and any others required by the simulation packages outlined in point 6
5	Libraries	BLAS, SCALAPACK, LAPACK, MPI, performance profiler, debugger, MPI tuning and analysis, and any others required by the simulation packages outlined in point 6
6	Simulation packages	• Latest versions of open-source packages: GROMACS, LAMMPS, cp2k, Quantum Espresso, psi4 • Latest versions of commercial packages (licenses will be provided): VASP, MATLAB

Other requirements

1. Annual maintenance contract (AMC) and warranty on all components, and complete software support, all for a minimum of 3 years, should be included in the quoted cost.
2. A quotation for the AMC, warranty, and software support for the 4th and 5th years after purchase also should be included as a separate line item. This cost will not affect the selection of the L1 bidder.
3. Detailed instructions on installing additional nodes, replacing failed nodes, operating the system, and powering up/down the system should be provided during installation.

Scope of the work

1. Delivery of all physical equipment to the Department of Chemical Engineering, Indian Institute of Science.
2. Installation and startup of the master and compute nodes at the desired place.
3. Software installation as mentioned in the table above, including testing to ensure that all installed software work as intended.
4. Testing and verification of Infiniband state and rate of data transfer.

Handling of price conflicts

In case of a price conflict, the vendor with the options quoted below will be preferred in the following order of priority:

1. Higher computational speed measured in terms of teraflops.
2. Higher RAM at a minimum speed of 2933 MHz.

Terms and conditions

1. A two-bid system will be followed, requiring separate technical and financial bids in two sealed envelopes. The technical bid envelope should state on the cover "Chemical Engineering Cluster Technical Bid" and the financial bid envelope should state on the cover "Chemical Engineering Cluster Financial Bid". The sealed technical and financial bids should be placed and sealed inside a third, larger envelope circumscribed "Chemical Engineering Cluster Bid".
2. The vendors quoting should be registered with IISc. The quote should carry the vendor registration number in the technical bid.
3. The technical bid must clearly mention all the prescribed specifications without including the prices; vendors who include price information in the technical bids will be automatically disqualified.
4. The covering letter in the technical bid should clearly mention whether the vendor is a 'Class I' local supplier or a 'Class II' local supplier, failing which the vendor will be automatically disqualified.
5. The vendor should indicate the percentage of the local content and provide self-certification in the financial bid that the items offered meet the minimum local content requirement. They should also give details of the location(s) at which the local value addition is made.
6. Vendors must supply at least 3 independent reference letters from completed cluster installations in India with a minimum of 400 cores in the last two years. IISc may contact other users for obtaining independent references. The committee will have the right to reject a bid based on unsatisfactory reference letters.
7. Technical bid should contain sustained Linpack (HPL) benchmark results for at least one node and an extrapolated calculation for the cluster showing the stated sustained 30 teraflop requirement for the proposed solution, taking into account the efficiency of the

nodes. The successful bidder may be asked to demonstrate sustained 30 teraflop performance of the cluster before payment.

8. Technical bids will be opened first. IISc may seek clarifications after opening of technical bids and may ask vendors to provide performance benchmarks for LAMMPS/VASP/cp2k/other package codes that will be provided. Vendors may be required to give presentations detailing technical specifications and demonstrating requisite performance. IISc reserves right to ask for product demonstration / technical presentation / documents verification, etc.
9. Financial bids from vendors will be considered only if they qualify the technical evaluation. The final order will be placed with technically qualified and financially competitive vendor(s) as determined by the rules mentioned in order P-45021/2/2017-PP (BE-II).
10. Successful bidder must submit Performance Security @ 3% of the total contract value within one week of the issue of the Purchase Order.
11. Additional nodes may be procured from the winning bidder at the same cost per node mentioned in the original financial bid.
12. The vendors should provide a per piece cost for each item in the financial bid.
13. Delivery and installation of the cluster shall be the complete responsibility of the vendor. Any damaged items will be returned without payment, with the vendor having to replace them at no extra cost. Payment will only be made after replacement and reinstallation of damaged items.
14. The price shall be quoted in INR only. The cost should be inclusive of delivery till the IISc campus. Price offer must be on FOR-IISc Bangalore basis.
15. IISc is eligible for GST exemption (i.e., 5% concessional GST) as it is registered with DSIR and the items are required for research purposes only. GST exemption certificate will be issued subject to submission of order acknowledgement and proforma invoice. GST or other statutory levies if applicable should be shown separately and not included in the total amount.
16. Since this will be a domestic PO, hence import will not be involved.
17. The HPC system as per the agreed bill of materials must be supplied within 6-8 weeks after receiving a purchase order from IISc. The hardware/software installation must be complete within two weeks after the supply of the equipment. The vendors should indicate the tentative delivery and installation date in the technical bid.
18. The payment will be processed only after successful installation of the machine (both hardware and software). Any payment will be released only after complete supply and satisfactory installation.
19. IISc reserves right to accept or reject any bid or cancel the tendering process or extend / curtail dates or modify the tender conditions / documents at any stage.
20. If any information is found false or misleading, then the bidder may be debarred.
21. Tender documents that do not satisfy the “Terms and Conditions” listed herein will be disqualified.
22. The tender documents must be sent to the following address no later than 5:00 pm on 11th January 2021:

The Chair, Department of Chemical Engineering
Indian Institute of Science
CV Raman Avenue, Bengaluru
Karnataka 560012, India
Attn: Profs. Ananth Govind Rajan and Sudeep Punnathanam