

जीवाजी विश्वविद्यालय, ग्वालियर

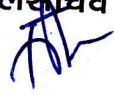
क्रमांक/स्टोर/2020/1015

दिनांक :- 28/10/20

// शुद्धि पत्र //

जीवाजी विश्वविद्यालय द्वारा S.No./Store/2020/988/3 दिनांक 28.09.2020 एवं टेण्डर आईडी 2020\_JIWAJ\_111881\_1 पर निकाले गये ई-टेण्डर नोटिस में Equipment HPC, SEM-EDAX, PPMS का टेण्डर अपलोड किया गया है। जिसमें अब HPC, SEM-EDAX, PPMS के Specification निम्नानुसार पढ़े जावें।



3-10-20  
कुलसचिव  


**1. Technical Specifications for High Performance Computing (HPC) Cluster**

Site preparation, supply, installation and commissioning of HPC for JIWAJI UNIVERSITY GWALIOR for 540 CPU Cores and 44TF (Peak) or higher based Computational Facility with the following technical specifications.

**1. Master Node**

Quantity		1 unit
Sr. No.	Specification	Description
1.	Processor	Latest generation 2xCPU (x86 Architecture scalable CPU) each with minimum 28 Cores or higher/latest with minimum frequency of 2.9GHz or more. Must have Native support of AVX2 instruction, And peak performance@1.46 TF/Socket or more. The socket to communication should be atleast 3 x 16 GT/s.
2.	Memory	RAM: 128GB ECC DDR4-3200 MHz or better RAM. At least 12 DIMMs available in total. In 100% balanced Configuration.
3.	Hard Disk Drives & SSDs	2TB SAS×6 Numbers      SPEED = 7.2K rpm      TYPE = SAS 2 x 480GB SATA Enterprise GRADE SSD (3 DWPD)
4.	HDD bays	HDD bays supporting 8 or more SAS/SATA Hard drives and Solid State Drives. On board NVMe controller and at least 2 dedicated NVMe drive bays or more out of total bays available.
5.	I/O slots ( <i>Peripheral Component Interconnect Express,PCIe</i> )	Minimum 4 × PCIe 3.0 slots must be vacant after populating all Add on controllers.
6.	RAID Level support	SAS 12GBPS controller with provision to support up to 40+ HDDs , and supports RAID 0, 1, 10, 5 ,50 ,60 & 6 with dedicated cache memory. RAID card must support all HDD bays w/o any additional item to be added. with supported backplane for drive bays and JBOD. System must provide array configuration and management utilities, Independent of port auto-negotiation, optional battery back up unit for future upgrade. Must Support SSP, SMP, STP protocols or more
7.	Graphics controller	Integrated Graphics with on board controller.
8.	Network interface	At least 2 number of Gigabit ports on board.
9.	Ethernet ports	2×1 GBPS Ethernet ports with Preboot Execution Environment (PXE) boot capability (including CAT6 cable for connecting to switch)
10.	Ports	Minimum 2 USB 3.0 or higher and 1 graphics port
11.	Cluster Interconnect	56 GBPS (or higher) Infiniband OR INTEL OPA Single Port with cable (same make as the IB switch OR OPA SWITCH).
12.	Chipset	Intel C620 SERIES CHIPSET or equivalent AMD SOC or higher/latest
13.	Server management(Intelligent Platform Management Interface, IPMI)	IPMI 2.0 Support with KVM and Media over LAN features. Must include any licenses, if required for using these features. It should be able to automate mgmt. tasks and automated firmware updates.
14.	Power supplies	Dual Redundant (N+1) 80 Plus Platinum or better Certified efficient power supplies
15.	Cooling	Optimum no. of Cooling fans.
16.	Operating System	Should support latest version of 64-bit CentOS or better for server /

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		HPC
17.	Warranty	<ul style="list-style-type: none"> <li>❖ The instrument including UPS (if any) quoted for it should be under on-site Comprehensive warranty for three (3) years from the date of installation by the OEM or its representative. Comprehensive warranty should explicitly include all spare parts and system consumable parts. Any repair work or replacement of spares needs to be done on-site, the manufacturer must confirm this in their quotation.</li> <li>❖ Comprehensive Maintenance Contract (CMC) : After the completion of 3 years OEM warranty, two years extended CMC must be quoted without which the tender will be rejected, i.e., the system should be covered for comprehensive warranty for 5 years from the tenderer. All parts including spares should be covered under the warranty and this fact should be clearly and explicitly specified in the tender document. The comprehensive Warranty should cover: (1) All parts including accessories, spares and labour on-site. (2) Free maintenance and service on-site or at factory (if needed) with no cost, and (3) Regular free up-gradation of software if any.</li> <li>❖ Physical on-site (JIWAJI UNIVERSITY GWALIOR) visit by technical experts of Bidder or OEM for maintenance and technical support whenever needed.</li> </ul>
18.	Software Suites	NAMD, MATLAB,LAMMPS,NWCHEM, GROMACS and more research codes/ software suites to be loaded as part of installation process by bidder.
19.	Form Factor	Rack Mount up to 2U or lesser
20.	All required cables	

## 2. Compute Node

Quantity		14 nodes
Technical specifications of each computational nodes as below:		
Sr. No.	Specification	Description
1.	Processor	Latest generation 2xCPU (x86 Architecture scalable CPU) each with minimum 28 Cores or higher/latest with minimum frequency of 2.9GHz or more. Must have Native support of AVX2 instruction, And peak performance@1.46 TF/Socket or more. The socket to communication should be atleast 3 x 16 GT/s.
2.	Memory	RAM: 128GB ECC DDR4-3200 MHz or better RAM. At least 12 DIMMs available in total. In 100% balanced Configuration.
3.	Hard Disk Drives and SSDs	1 x 480GB SATA Enterprise GRADE SSD (3 DWPD Endurance)
4.	HDD bays	6 HDD bays supporting HDDs or SSDs.(Large Form Factor based drive bays)
5.	GPU Accelerator Support	None
6.	I/O slots ( <i>Peripheral Component Interconnect Express, PCIe</i> )	Minimum 2 x PCIe 3.0 slots vacant after populating all Add on Cards
7.	RAID Level support	RAID 0,1,10 level supported with RAID controller






8.	Graphics controller	Integrated Graphics Controller
9.	Network interface	At least 2 number of Gigabit ports on board.
10.	Ethernet ports	2×1 GBPS Ethernet ports with pre-boot Execution Environment (PXE) boot capability (including CAT6 cable for connecting to switch)
11.	Ports	Minimum 2 or more USB 3.0 or higher/latest and one port for graphics.
12.	Cluster Interconnect	56 GBPS (or higher) Infiniband OR INTEL OPA Single Port with cable (same make as the IB switch OR OPA SWITCH).
13.	Chipset	Intel C620 SERIES CHIPSET or equivalent AMD SOC or higher/latest
14.	Server management (Intelligent Platform Management, Interface, IPMI)	<ul style="list-style-type: none"> <li>❖ IPMI 2.0 or equivalent Support with KVM and Media over LAN features. Must include any licenses, if required for using these features.</li> <li>❖ It should be able to automate mgmt. tasks and automated firmware updates.</li> </ul>
15.	Power supplies	Dual Redundant N+1 or better 80 Plus platinum rated efficient power supplies. In case of Multi Node Sharing architecture shared power supplies is permitted redundancy at the level of Chassis/Cabinet is acceptable.
16.	Cooling	Optimum no. of Cooling fans.
17.	Operating System	Should support latest version of 64-bit CentOS or better for HPC
18.	Warranty	<ul style="list-style-type: none"> <li>❖ The instrument including UPS (if any) quoted for it should be under on-site Comprehensive warranty for three (3) years from the date of installation by the OEM or its representative. Comprehensive warranty should explicitly include all spare parts and system consumable parts. Any repair work or replacement of spares needs to be done on-site, the manufacturer must confirm this in their quotation.</li> <li>❖ Comprehensive Maintenance Contract (CMC) : After the completion of 3 years OEM warranty, two years extended CMC must be quoted without which the tender will be rejected, i.e., the system should be covered for comprehensive warranty for 5 years from the tenderer. All parts including spares should be covered under the warranty and this fact should be clearly and explicitly specified in the tender document. The comprehensive Warranty should cover: (1) All parts including accessories, spares and labour on-site. (2) Free maintenance and service on-site or at factory (if needed) with no cost, and (3) Regular free up-gradation of software if any.</li> </ul> <p>Physical on-site (JIWAJI UNIVERSITY GWALIOR) visit by technical experts of Bidder or OEM for maintenance and technical support whenever needed.</p> <ul style="list-style-type: none"> <li>❖ Physical on-site (JIWAJI UNIVERSITY GWALIOR) visit by technical experts of Bidder or OEM for maintenance and technical support whenever needed.</li> </ul>
19.	Software Suites	NAMD, MATLAB, LAMMPS, NWCHEM, GROMACS and more open source software suites to be loaded as part of installation process by bidder. No commercial Codes
20.	Form Factor	- 2U Rack Mount or lesser per node.
21.	All required cables	

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### 3. Compute Node (CPU-GPU)

Quantity		1 unit
Technical specifications of each computational nodes as below:		
Sr. No.	Specification	Description
1.	Processor	Latest generation 2xCPU (x86 Architecture) each with minimum 28 Cores and minimum frequency of 2.9GHz., Must have Native support of AVX2 instruction. And Peak Performance@1.46 TF/Socket. The socket to communication should be atleast 3 x 16 GT/s
2.	Memory	RAM: 128GB ECC DDR4-3200 MHz or better RAM. At least 12 DIMMs available in total. In 100% balanced Configuration.
3.	Hard Disk Drives and SSDs	1 x 480GB SATA Enterprise GRADE SSD (3 DWPD Endurance )
4.	HDD bays	2 HDD bays supporting HDDs or SSDs.(Large or Small Form Factor based drive bays)
5.	GPU Accelerator Support	1 x Nvidia Tesla V100 32GB-PCIe or SXM2 (NVLink) based. System must be scalable to 3 GPUs per node from day one
6.	I/O slots ( <i>Periperal Component Interconnect Express, PCIe</i> )	Minimum 1 × PCIe 3.0 slots vacant available to populate add on cards after populating all 3 GPU cards
7.	RAID Level support	RAID 0,1,10 level supported with RAID controller
8.	Graphics controller	Integrated Graphics Controller
9.	Network interface	At least 2 number of Gigabit ports on board.
10.	Ethernet ports	2×1 GBPS Ethernet ports with Pre-boot Execution Environment (PXE) boot capability (including CAT6 cable for connecting to switch)
11.	Ports	Minimum 2 or more USB 3.0 or higher/latest and one port for graphics.
12.	Cluster Interconnect	56 GBPS (or higher) Infiniband OR INTEL OPA Single Port with cable (same make as the IB switch OR OPA SWITCH).
13.	Chipset	Intel C620 SERIES CHIPSET or equivalent AMD SOC or higher/latest
14.	Server management (Intelligent Platform Management, Interface, IPMI)	<ul style="list-style-type: none"> <li>❖ IPMI 2.0 or equivalent Support with KVM and Media over LAN features. Must include any licenses, if required for using these features.</li> <li>❖ It should be able to automate mgmt. tasks and automated firmware updates.</li> </ul>
15.	Power supplies	Dual Redundant N+1 or better 80 Plus platinum rated efficient power supplies.
16.	Cooling	Optimum no. of Cooling fans.
17.	Operating System	Should support latest version of 64-bit CentOS
18.	Warranty	<ul style="list-style-type: none"> <li>❖ The instrument including UPS quoted for it should be under on-site Comprehensive warranty for three (3) years from the date of installation by the OEM or its representative. Comprehensive warranty should explicitly include all spare parts and system consumable parts. Any repair work or replacement of spares needs to be done on-site, the manufacturer must confirm this in their quotation.</li> <li>❖ Comprehensive Maintenance Contract (CMC) : After the completion of 3 years OEM warranty, two years extended CMC must be quoted without which the tender will be rejected, i.e., the system should be covered for comprehensive warranty for 5 years</li> </ul>

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		<p>from the tenderer. All parts including spares should be covered under the warranty and this fact should be clearly and explicitly specified in the tender document. The comprehensive Warranty should cover: (1) All parts including accessories, spares and labour on-site. (2) Free maintenance and service on-site or at factory (if needed) with no cost, and (3) Regular free up-gradation of software if any.</p> <p>❖ Physical on-site (JIWAJI UNIVERSITY GWALIOR) visit by technical experts of Bidder or OEM for maintenance and technical support whenever needed.</p>
19.	Software Suites	NAMD, MATLAB, LAMMPS, NWCHEM, GROMACS and more open source software suites to be loaded as part of installation process by bidder. No commercial Codes. <b>Commercial codes if any will be provided by the user but loaded as part of installation process by bidder.</b>
20.	Form Factor	2U Rack Mount or lesser. Multi Node systems not allowed for GPU nodes
21.	All required cables and connectors, etc.	

#### 4. PFS Storage System Qty -1 Set (Comprising of at least 2 x IO Nodes)

S.No.	Description
1.	Parallel File System
	Technical Specification
	Luster based PFS with following specification :-
	Metadata Storage: more than or equal to 2% of the Usable Storage space offered (using 1.2TB SAS 10K PM SAS HDDs configured as RAID10 or Similar with one hot-spare. A dedicated unit for MDT (Meta Data Storage to be offered)
	Usable Storage(OST) : > 120TB usable with RAID6 or similar (using up to 4TB, 7.2K RPM SAS HDDs.
	Configured as RAID6 volumes with two Global hot-spare disks. Each individual volume to be ≤ 40TB
	Throughput : > sustained 2GB/s read/write (50:50) performance
	120 TB (usable in RAID 6 configuration or similar) Parallel File System based storage with 2GBps throughput with 1MB block size for the PFS. At least 2 I/O Nodes in fail over configuration to be quoted.
	Each I/O Node to be offered with below listed specifications: Latest generation 2 x CPU (x86 Architecture based Intel Scalable CPU) each with minimum 14 Cores or more and minimum frequency of 2.2GHz (or better / latest / higher), Must have Native support of AVX2 instruction. And HPL Peak Perf @490F/socket
	Dual Redundant Power Supply with at least 80 Plus Platinum efficiency
	128GB DDR4 3200 (or better / latest / higher) MHz memory with ECC
	At least 2 no. of PCI-E x16 expansion slots
	2 x 480GB Data centre grade SSD in RAID1 (for OS)
	With Hi Speed Interconnect ports–minimum 100Gbps
	The PFS solution must be capable of handling the loss of the following without interruption: -One Power Supply -One Fan - One HDD for MDT and Two HDDs for OST - Two I/O Server Nodes The I/O server must have redundant paths to the storage.
	Benchmark report and Performance demonstration for PFS Throughput . Open-source IOR/IO Zone benchmarks running on compute nodes with 1MB block size. Storage Performance to be measured from compute node using IOR benchmark for 2GBps throughput

#### 5. Cooling, Rack, UPS and its monitoring/support/services

*(Handwritten signatures)*



Sr. No.	Items
I.	<b>Rack:</b> Vendors should propose optimum solution using at the max two 42U Racks with required PDUs and accessories.
II.	<p><b>UPS:</b> Two UPS Units in Failover / Redundant Configuration (1+1).  Each UPS of 20 KVA/18 KW should have following features : True online double conversions, IGBT Rectifier &amp; inverter based UPS. Three phases Input/ three phase output with SMF batteries Suitable for 30 Min or more backup on Full load at 0.9 Load P.F. using 42 Ah X 40 Battery with Each UPS, Input voltage range 340-478V at 100% load, 220-478 V @ 50% load. Input power factor 0.99.  Battery Flexible design of 32 to 40 battery. Battery type should be Valve regulated lead-acid (VRLA) of make Exide/Panasonic/QUANTA. Inbuilt Input Isolation Transformer is mandatory required, parallel communication port, RS232, USB, EPO and SNMP interface, BMS interface, Dust Filter at Air Inlet point are required. UPS should be provided with environment monitoring probe to measure temperature and humidity of UPS room. LCD Display indicating all important parameters. SNMP software should be compatible to, Window 8 . UPS software should be compatible to google chrome, Mozilla fire fox and Microsoft internet explorer. Battery open rack, battery interlinks battery breaker, battery to UPS cable as required should be provided with UPS systems.</p> <p><i>UPS warranty : 5 Year, Battery warranty – at least 3 Years</i></p> <p><b>Battery Approved Make : Quanta / Exide / Panasonic</b>  <b>UPS Make acceptable:- Schneider, Eaton, GE, Gutor</b></p>
III.	<p><b>Air Conditioning Solution:</b>  University will provide a server room of the size 15 Feet x 15 Feet or bigger (bidders can visit the site to see the space allocated).  Cooling Solution Specifications as below:</p> <ul style="list-style-type: none"> <li>i) The Data Centre room to be provided with the appropriate Inbuilt/self contained cooling system based racks. The inbuilt/self contained intelligent rack based cooling system will able to remove high level of waste heat from server enclosures/rack and to provide uniform,&amp; effective cooling for servers and similar IT equipment (switches etc.) installed with in racks as offered by bidder, it will be provided with appropriate refrigerant.</li> <li>ii) Total IT Load to be taken care of 18KW , Cooling solution must provide redundant solution to take care 18KW IT Load , with redundant cooling units available in the solution offered (N+N) redundant. Each Unit capable to take care of 18KW IT Load.</li> <li>iii) Outdoor Cooling Units will be positioned out side the server room. Bidders can visit the facility for better understanding before supply.</li> <li>iv) Solution must comprise 32 A, Rack mount, vertical PDU with a combination of IEC C-13 and IEC C-19 sockets according to the IT equipment</li> <li>v) Front door with biometric access, rear door lock, smoke detection system with indicators, rodent control system, Environmental Monitoring System , Automatic Front Door Opening System , Fire Suppression System &amp; Detection Sensor, Hooter/Sensor available for alarm purpose in case of any malfunctioning, Touch Screen Front Panel Monitoring, IP Via Modbus enabled, double glass or toughened glass front panel</li> </ul>
V.	Key Board tray, cable manager, cable route, any other required accessories as per requirement of the above mentioned configuration of master and compute node.

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## 6. Cluster Management and other S/W Stack

Operating System	CentOS
HPC Operating System Support	REQUIRED
Resource Manager & Scheduler	<p>Job status reporting</p> <p>Job History Reporting up to 6 months or more</p> <p>Policy-aware workload cum resource manager,</p> <p>Policy aware scheduling</p> <p>Resource-aware scheduling</p> <p>Topology-aware scheduling</p> <p>Dynamic reservation of resource</p> <p>Advance reservation Live support</p> <p>Support of job submission through CLI, Web-services and APIs</p> <p>Load aware power management</p> <p>Fair share support</p> <p>Multiple queues support</p> <p>Multiple partitions support</p> <p>Dynamic partitions support</p> <p>Dynamic queues support</p> <p>Script less job submission</p> <p>Heterogeneous cluster support</p> <p>Multi-cluster support</p> <p>MPI aware scheduling</p> <p>Consumable resources scheduling</p> <p>Pre-emptive and backfill scheduling support</p> <p>Application integration support</p> <p>Live reconfiguration capability</p> <p>SLA/Equivalent</p> <p>GPU and Co Processor Aware scheduling</p> <p>CPU, Multi Core , Multi thread aware scheduling</p> <p>Intuitive web interface to submit and monitor jobs</p>
Resource Management/Job Scheduling Support	REQUIRED
File Systems Supported	Lustre , GPFS FROM DAY ONE
Commercial Licensed Cluster Management S/W (License issued in the name of JIWAJI UNIVERSITY GWALIOR)	<p>Unified system management, monitoring toolset for configuration, diagnosis and management of the system,</p> <p>Cluster manager with provisioning, monitoring and reporting capabilities</p> <p>Support Package and Image based provisioning</p> <p>Support Disk-full and diskless cluster deployment</p> <p>Intuitive web interface to manage and customize the cluster</p> <p>Customizing networks and compute node profiles through GUI</p> <p>Customizing compute nodes (upto changing kernel parameter)</p> <p>Able to Push configuration changes and updates to the compute nodes without reinstalling and rebooting</p> <p>Note : Offered Stack must have been deployed by OEM / Bidder earlier as well as part of HPC Solution – documentary evidence must be provided.</p>
Software Support for both Serial and Parallel Environment	YES
Intel Cluster Studio – for Academic	Intel® Parallel Studio XE Cluster Edition for Linux* - Named User License Academic for 3yrs (ESD)

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## 7. Other Items

Sr. No.	Items
I.	1 Unit of – 25-inch Display, Keyboard, Video and Mouse (KVM) Console with All accessories with
II.	1 Unit of - 24 Port KVM over IP Switch (USB based) with all required Cables & Accessories.
III.	1 Unit of - 24 Port ,1 Gbps (RJ-45) Ethernet Switch for Secondary Communication Purpose and 1 unit of 48 Port, 1 Gbps (RJ-45) Ethernet Switch for management.
IV.	36-ports OR MORE based, 56Gbps, 100% Non-blocking, Switching Fabric (Mellanox Infini-band or higher or Intel Omni-Path) with embedded Sub-net Manager for 36 devices (Nodes) or more and with redundant power supply/supplies. All cables (at least 1m in length or more) required for connecting the devices (Nodes) quoted in this tender should be included/bundled.

### Supply, Installation and In-house training for HPC :-

- ❖ Before acceptance and installation of any item, the quality, specification and quantity will be verified by JIWAJI UNIVERSITY GWALIOR.
- ❖ Installation of items part of this tender will have to carried out by the vendor. Any specific requirement of vendor regarding installation of above mentioned items must be mentioned in the technical bid so that JIWAJI UNIVERSITY GWALIOR can provide the resources for the same.
- ❖ **2-3 days (as needed) in-house training** by Certified Professionals at JIWAJI UNIVERSITY GWALIOR including installation of software, bench-marking HPL, monitoring of HPC Cluster for 24 Hours, LINUX commands, HPC Management etc. Scripts for the bench-marking calculations will provide on request.

### Eligibility Criteria

Mandatory requirements for a bidder to qualify as a participant in this tender:

1. The Server OEM should have executed at least 3 HPC Cluster projects either directly or thru system integrators(at least one cluster of the size 100TF CPU-CPU or CPU-GPU) during last 10 years in India using an architecture and technologies similar to this tender in premier Govt Indian academic and research institutions like IISc, TIFR, IISER, IIT, JNCASR or other govt education & research organizations' in India. Details/Proof of the same must be submitted with technical bid. Credential of an OEM will also be considered if supply done by their authorized partner.
2. Storage OEM must have supplied 2 x PFS solutions (50TB or more) earlier in the past along with HPC Solutions during last 10 years in India using an architecture and technologies similar to this tender in premier Govt Indian academic and research institutions like IISc, TIFR, IISER, IIT, JNCASR or other govt education & research organizations' in India. Details/Proof of the same must be submitted with technical bid. Credential of an OEM will also be considered if supply done by their authorized partner.
3. Neither Server OEM nor the bidder be debarred or blacklisted or stopped from supplying equipment to any govt organization in the past.
4. OEM MAF for Server Nodes , Storage and Switches must be attached with the bid .
5. All warranty and support must be provided by the bidder.
6. The bidder should have at least one service Center in India with service engineers in the relevant field of quoted item.
7. The bidder should have valid ISO certification. Please attach a copy of the certificate.
8. The bidder must be authorized partner/system integrator of Server and Switch OEM and a letter of authorization for the tender from the OEMs must be enclosed.
9. The Institute reserves the right to accept or reject any or all of the offers in full/part without assigning any reason whatsoever.
10. The parts supplied should not become obsolete within 3 years of installation.
11. The bidder should clearly specify make and model in both Technical and Financial bid.






12. The bidder must be responsible for complete installation and support the infrastructure.

Commercial Offer as below:

Item	Unit
Master Node with all accessories	1
CPU-CPU Node with all accessories	14
CPU-GPU Node with all accessories	1
PFS Storage	1 Set
Primary Interconnect	1
Secondary Interconnect	1
Management Interconnect	1
Intel Cluster Studio License	1
Cluster Management	1
UPS Solution	1
Cooling Solution	1

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