

DEPARTMENT OF PLANT MOLECULAR BIOLOGY
UNIVERSITY OF DELHI SOUTH CAMPUS
NEW DELHI-110021

Department of Plant Molecular Biology, University of Delhi South Campus invites bids from reputed & eligible agencies for the **Supply, installation and commissioning of High Performance Computing System (HPCS) Facility** at Delhi University as listed below:

1. Item. Master Node (Qty -1) with following features			Yes/No
Processor(s)	x86 Architecture based processor(s) to be offered Total core count per node– 64 or more , with clock speed of at least 2.3 GHz base frequency. Supports DDR4 2933 or better memory. 1.35MB cache per core or higher		
No of Processors	Minimum two or more per node		
Performance Benchmark	Spec fp rate 2017 benchmark report for offered configuration must be submitted along with the bid. Log files may also be required to be submitted by bidders at the time of evaluation. Report with Spec_fp_2017_rate_base- score must be >=330 High Performance Linpack peak performance score per socket/processor must be >=1.18TFlops		
Memory	256GB or more using 32GB memory modules. Memory modules/slots with advanced ECC or Chip-Kill or an equivalent technology. If bidders desire to supply optimized & balanced memory configuraton they can do so but that is not a mandatory condition for master node. Per node scalability (after populating offered no. of memory modules system must be scalable up to 768 GB per node or more using same capacity based memory modules)		
RAID Controller	SAS 12Gbps controller that supports RAID 0, 1, 10, 5 ,50 ,60 & 6 with dedicated 2GB cache memory.		
Hard Disk Drives & SSDs	12TB SAS×3 Numbers SPEED = 7.2K rpm TYPE = SAS 2 x 480GB SATA Enterprise GRADE SSD (3 DWPD)		
HDD bays	HDD bays- supporting 12 or more SAS/SATA Hard drives/ Solid State Drives. At least 2 of them must support NVMe/M.2/U.2 drives (required controller , if any, must be supplied from day one). A secondary storage enclosure is allowed to be offered to meet the requirement		
I/O slots (Peripheral Component Interconnect Express,PCIe)	2 × PCIe (must be the latest generation supported with the CPU model offered) (x16) slot slots		
Graphics controller	Integrated/Addon Graphics . A dedicated video port available		
Ethernet ports	2 × 1 Gbps Ethernet port with Preboot Execution Environment (PXE) boot capability required number of cables connecting node with switch must be supplied (2 x 2m CAT6 or higher/compatible cable must be supplied)		
Ports	Minimum 2 USB ports , 1 VGA/ graphics port		

Primary Interconnect Port	HDR (or higher)Infiniband Single Port Controller (100G or better) with cable (2m copper) must be supplied.	
Chipset	Compatible CHIPSET	
Server managment	IPMI 2.0 Support with KVM and Media over LAN features. Must include all required licenses, if required for using these features. It should be able to automate mgmt. tasks and automated firmware updates. Email Alerting methodology, User management functionality with SSL based security , Multi User Permission Levels, Multi User Profiles USB 2.0 or 3.0 -based drive redirection with support for USB Key , VLAN functionality supports Reading Log Events,	
Power supplies	Redundant (N+1) 80 Plus Titanium Certified efficient power supplies. Secondary enclosures , if offered any, not necessarily to have 80 Plus certified power supply.	
Cooling	Required no. of Cooling fans.	
Operating System	Should support latest version of 64-bit CentOS.	
Security features	Automated BIOS/System level encryption to authenticate input and output data passing thru. System information including, keys, passwords and digital certificates stored/created must be secured from external software attacks and physical theft. Cryptographic functions offered for system security	
Warranty	5 years onsite warranty by OEM / Bidder. Physical on-site warranty services including visits by technical experts of Bidder or OEM for maintenance and technical support whenever needed.	
Software Suites	List of research codes/ software suites to be loaded as part of installation process by bidder shall be provided at the time of installation	
Form Factor	Rack Mount up to 2U or lesser per node	

2. Item. Compute Nodes- type- 1 (Qty -2) with following features		Yes/No
Processor(s)	x86 Architecture based processor(s) to be offered Total core count per node– 96 or more , with clock speed of at least 2.0 GHz base frequency. Supports DDR4 2933 or better memory. 1.35MB cache per core or higher	
No of Processors	Minimum two or more per node	
Performance Benchmark	Spec fp rate 2017 benchmark report for offered configuration must be submitted along with the bid. Log files may also be required to be submitted by bidders at the time of evaluation Report with Spec_fp_2017_rate_base- score must be >=500 High Performance Linpack peak performance score per socket must be >=2TFlops	
Memory	1024GB or more using 64GB(or higher capacity) memory modules. Memory modules/slots with advanced ECC or Chip-Kill or an equivalent technology. optimized & balanced memory configuraton to be offered. Per node scalability (after populating offered no. of memory modules system	

		must be scalable up to 1536 GB per node or more)	
	RAID Controller	RAID controller that supports RAID 0, 1,& 10	
	Hard Disk Drives & SSDs	4TB SAS×4 Numbers SPEED = 7.2K rpm TYPE = SAS 1 x 960GB SATA Enterprise GRADE SSD (3 DWPD)	
	HDD bays	HDD bays- supporting 12 or more SAS/SATA Hard drives/ Solid State Drives. At least 2 of them must support NVMe/M.2/U.2 drives (required controller , if any, must be supplied from day one). A secondary storage enclosure is allowed to be offered to meet the requirement	
	I/O slots (Peripheral Component Interconnect Express,PCIe)	2 × PCIe (must be the latest generation supported with the CPU model offered) (x16) slots	
	Graphics controller	Integrated/Addon Graphics . A dedicated video port available	
	Ethernet ports	2 × 1 Gbps Ethernet port with Preboot Execution Environment (PXE) boot capability required number of cables connecting node with switch must be supplied (2 x 2m CAT6 or higher/compatible cable must be supplied)	
	Ports	Minimum 2 USB ports , 1 VGA/ graphics port	
	Primary Interconnect Port	HDR (or higher)Infiniband Single Port Controller (100G or better) with cable (2m copper) must be supplied.	
	Chipset	Compatible CHIPSET	
	Server management	IPMI 2.0 Support with KVM and Media over LAN features. Must include all required licenses, if required for using these features. It should be able to automate mgmt. tasks and automated firmware updates. Email Alerting methodology, User management functionality with SSL based security , Multi User Permission Levels, Multi User Profiles USB 2.0 or 3.0 -based drive redirection with support for USB Key , VLAN functionality supports Reading Log Events,	
	Power supplies	Redundant (N+1) 80 Plus Titanium Certified efficient power supplies. Secondary enclosures , if offered any, not necessarily to have 80 Plus certified power supply.	
	Cooling	Required no. of Cooling fans.	
	Operating System	Should support latest version of 64-bit CentOS.	
	Security features	Automated BIOS/System level encryption to authenticate input and output data .System information including, keys, passwords and digital certificates stored/created must be secured from external software attacks and physical theft. Cryptographic functions offered for system security	
	Warranty	5 years onsite warranty by OEM / Bidder. Physical on-site warranty services including visits by technical experts of Bidder or OEM for maintenance and technical support whenever needed.	

Software Suites	List of research codes/ software suites to be loaded as part of installation process by bidder and provide day to day support for infrastructure	
Form Factor	Rack Mount up to 2U or lesser per node	

3. Item. Fat Node- type- 1 (Qty -4) with following features		Yes/No
Processor(s)	x86 Architecture based processor(s) to be offered Total core count per node– 96 or more , with clock speed of at least 2.0 GHz base frequency. Supports DDR4 2933 or better memory. 1.35MB cache per core or higher	
No of Processors	Minimum two or more per node	
Performance Benchmark	Spec fp rate 2017 benchmark report for offered configuration must be submitted along with the bid. Log files may also be required to be submitted by bidders at the time of evaluation Report with Spec_fp_2017_rate_base- score must be >=500 High Performance Linpack peak performance score per socket must be >=2TFlops	
Memory	2048GB or more using 64GB (or higher capacity) memory modules. Memory modules/slots with advanced ECC or Chip-Kill or an equivalent technology. optimized & balanced memory configuraton to be offered.	
RAID Controller	SAS 12Gbps controller that supports RAID 0, 1, 10, 5 ,50 ,60 & 6 with dedicated 2GB cache memory.	
Hard Disk Drives & SSDs	12TB SAS×4 Numbers SPEED = 7.2K rpm TYPE = SAS 2 x 3.84TB SATA Enterprise GRADE SSD (3 DWPD)	
HDD bays	HDD bays- supporting 12 or more SAS/SATA Hard drives/ Solid State Drives. At least 2 of them must support NVMe/M.2/U.2 drives (required controller , if any, must be supplied from day one). A secondary storage enclosure is allowed to be offered to meet the requirement	
I/O slots (Peripheral Component Interconnect Express,PCIe)	2 × PCIe (must be the latest generation supported with the CPU model offered) (x16) slots	
Graphics controller	Integrated/Addon Graphics . A dedicated video port available	
Ethernet ports	2 × 1 Gbps Ethernet port with Preboot Execution Environment (PXE) boot capability required number of cables connecting node with switch must be supplied (2 x 2m CAT6 or higher/compatible cable must be supplied)	
Ports	Minimum 2 USB ports , 1 VGA/ graphics port	
Primary Interconnect Port	HDR (or higher)Infiniband Single Port Controller (100G or better) with cable (2m copper) must be supplied.	
Chipset	Compatible CHIPSET	
Server management	IPMI 2.0 Support with KVM and Media over LAN features. Must include all required licenses, if required for using these features.	

		It should be able to automate mgmt. tasks and automated firmware updates. Email Alerting methodology, User management functionality with SSL based security , Multi User Permission Levels, Multi User Profiles USB 2.0 or 3.0 -based drive redirection with support for USB Key , VLAN functionality supports Reading Log Events	
	Power supplies	Redundant (N+1) 80 Plus Titanium Certified efficient power supplies. Secondary enclosures , if offered any, not necessarily to have 80 Plus certified power supply.	
	Cooling	Required no. of Cooling fans.	
	Operating System	Should support latest version of 64-bit CentOS.	
	Security features	Automated BIOS/System level encryption to authenticate input and output data passing thru. System information including, keys, passwords and digital certificates stored/created must be secured from external software attacks and physical theft. Cryptographic functions offered for system security	
	Warranty	5 years onsite warranty by OEM / Bidder. Physical on-site warranty services including visits by technical experts of Bidder or OEM for maintenance and technical support whenever needed.	
	Software Suites	List of research codes/ software suites to be loaded as part of installation process by bidder and provide day to day support for infrastructure	
	Form Factor	Rack Mount up to 2U or lesser per node	

4. Item. Fat Node- type- 2 (Qty -1) with following features			Yes/No
	Processor(s)	x86 Architecture based processor(s) to be offered Total core count per node– 96 or more , with clock speed of at least 2.0 GHz base frequency. Supports DDR4 2933 or better memory. 1.35MB cache per core or higher	
	No of Processors	Minimum two or more per node	
	Performance Benchmark	Spec fp rate 2017 benchmark report for offered configuration must be submitted along with the bid. Log files may also be required to be submitted by bidders at the time of evaluation Report with Spec_fp_2017_rate_base- score must be >=500 High Performance Linpack peak performance score per socket must be >=2TFlops	
	Memory	2048GB or more using 64GB (or higher capacity) memory modules. Memory modules/slots with advanced ECC or Chip-Kill or an equivalent technology. optimized & balanced memory configuraton to be offered.	
	RAID Controller	RAID 0, 1, 10 must be supported	
	Accelerator	1 x Computational GPU with double precision performance @ 9.5TFlops or more , on board GPU Memory : 40GB, supports creation of multi GPU instances >=7, must support OpenACC,OpenCL & CUDA	

Hard Disk Drives & SSDs	12TB SAS×4 Numbers SPEED = 7.2K rpm TYPE = SAS 2 x 3.84TB SATA Enterprise GRADE SSD (3 DWPD)	
HDD bays	HDD bays- supporting 36 or more SAS/SATA Hard drives/ Solid State Drives (LFF or SFF). NVMe/M.2/U.2 drives (required controller , if any, must be supplied from day one). A secondary storage enclosure is allowed to be offered to meet the requirement	
I/O slots (Peripheral Component Interconnect Express,PCIe)	2 × PCIe (must be the latest generation supported with the CPU model offered) (x16) slots	
Graphics controller	Integrated/Addon Graphics . A dedicated video port available	
Ethernet ports	2 × 1 Gbps Ethernet port with Preboot Execution Environment (PXE) boot capability required number of cables connecting node with switch must be supplied (2 x 2m CAT6 or higher/compatible cable must be supplied)	
Ports	Minimum 2 USB ports , 1 VGA/ graphics port	
Primary Interconnect Port	HDR (or higher)Infiniband Single Port Controller (100G or better) with cable (2m copper) must be supplied.	
Chipset	Compatible CHIPSET	
Server managment	IPMI 2.0 Support with KVM and Media over LAN features. Must include all required licenses, if required for using these features. It should be able to automate mgmt. tasks and automated firmware updates. Email Alerting methodology, User management functionality with SSL based security , Multi User Permission Levels, Multi User Profiles USB 2.0 or 3.0 -based drive redirection with support for USB Key , VLAN functionality supports Reading Log Events,	
Power supplies	Redundant (N+1) 80 Plus Titanium Certified efficient power supplies. Secondary enclosures , if offered any, not necessarily to have 80 Plus certified power supply.	
Cooling	Required no. of Cooling fans.	
Operating System	Should support latest version of 64-bit CentOS. And Certified for any commercial Linux flavour (RHEL or SUSE. Certificate must be submitted)	
Security features	Automated BIOS/System level encryption to authenticate input and output data passing thru . System information including, keys, passwords and digital certificates stored/created must be secured from external software attacks and physical theft. Cryptographic functions offered for system security	
Warranty	5 years onsite warranty by OEM / Bidder. Physical on-site warranty services including visits by technical experts of Bidder or OEM for maintenance and technical support whenever needed.	
Software Suites	List of research codes/ software suites to be loaded as part of installation process by bidder and provide day to day support for infrastructure	

Form Factor	Rack Mount up to 8U or lesser per node (including all)	
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5. Item. HPL Benchmark Report with following features		Yes/No
	Benchmark Report – High Performance Linpack Report for offered compute nodes with same CPU model as offered with Compute Nodes & FAT Nodes , with 2 x processors must be populated per node , at least 256GB memory each node, using 56G/100G interconnect , must be submitted with bid for 4 nodes. Declared results in the benchmark report must show sustained performance of 65% of peak performance . Same percentage of sustained performance to be produced at the time of installation of nodes at Delhi University.	

6 Item. PFS Storage with following features		Yes/No
	Parallel File System	
	Technical Specification	
	Lustre/GPFS or equivalent/better based PFS with following specifications :-	
	Metadata Storage: more than or equal to 1% of the Usable Storage space offered (using 2.4TB SAS (or capacity as recommended by OEM)10K RPM SAS HDDs configured as RAID10 or Similar with one hot-spare. MDT(Meta Data Storage) must be a dedicated dual controller storage unit , separate from the OST storage unit.	
	Usable Storage(OST) : > 500TB usable with H/W RAID6 (using <= 8TB capacity based , 7.2K RPM SAS HDDs. Dedicated redundant (1+1) H/W RAID Controller	
	Configured as RAID6 volumes with two Global hot-spare disks. Each individual volume to be ≤ 140TB (after parity drives)	
	Throughput : >= sustained 3GB/s read/write (50:50) performance	
	500 TB (usable in RAID 6 configuration or similar) Parallel File System based storage with 3GBps throughput with 1MB block size for the PFS. At least 4 x I/O Nodes in fail over configuration to be quoted.	
	Each I/O Node to be offered with below listed specifications ((i) to (vi)):	
	i. Latest generation 2 x CPU (x86 Architecture based) of latest generation each with minimum 16 Cores and minimum frequency of 2.8GHz., Must have Native support of AVX2 instruction set.	
	ii. Redundant Power Supply with at least 80 Plus Platinum efficiency	
	iii. 128GB DDR4 2400 or higher Mhz memory with ECC	
	iv. At least 2 no. of PCIe (must be the latest generation supported with the CPU model offered) x16 expansion slots	
	v. 2 x 480GB Data centre grade SSD in RAID1 (for OS)	
	vi. With Hi Speed Interconnect ports–minimum 100Gbps (IB)- same as offered with other nodes	
	Parallel File System Storage – Features / Specifications : The PFS solution must be capable of handling the loss of the following without interruption: - One H/W RAID Controller - One Power Supply - One Fan	

	<p>- 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.</p>	
	<p>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 4GBps throughput</p>	

7.Item. Scope of Work for Cooling, Power Backup and Electrical work with following features	Yes/No
<p>Supply, installation, testing and commissioning of Compact Data Centre solution with in built In row cooling, UPS, Batteries, Environmental Monitoring, Central monitoring system. Overall height of the equipment provided should be less than 2000 mm with overall depth of not more than 1600mm including Hot and Cold Aisle containment (if any) 100 % Usable space for IT equipment in all the IT racks UPS, Battery and supporting systems should be Rack mounted and must not occupy any IT Rack Space.</p>	
<p><u>7a.Racks & PDUs</u> Max – 2 racks .Server racks with Static Load Capacity of 1600 kgs; Dimension of each rack should be sufficient to manage network cabling and mounting of PDU The Racks should have easily adjustable vertical mounting rails which can be adjusted based on varying equipment depths, Cable manager rings and required numbers of blanking panels to be provided for each rack Interior components of the Server racks should not have proper coating Each Rack should be provided with 2 Nos. Intelligent Zero U Rack mounted 32 A Three Phase PDU with minimum 30 Nos.IEC C 13 and 9 Nos. IEC C 19 outlets. PDU should be VDE & UL or equivalent Indian standards Certified. Rack PDU should have Hydraulic Magnetic Breakers, local LCD Back lit Display which can display Volts, Amps, kVA, kW and should have port to connect minimum 1 number temperature or temperature & humidity sensor</p>	
<p><u>7b.Cooling System</u> Standard Dx Based Horizontal air Cooling unit in N+1 mode with minimum Sensible cooling capacity of not less than 23 kW at 35 degrees return air temperature and ambient conditions of up to 46 degrees. Each cooling unit should deliver minimum air flow of not less than 135 CFM per every kW. i.e., overall CFM of not less than 3200, cooling unit should be able to deliver minimum 3500 CFM in emergency conditions like power changeover to minimize the temperature raise inside the cabinets. The cooling unit should be provided variable speed fans which can vary from 30 % to 100 % based on Heat load The cooling units should be with Refrigerant which is Environmental Friendly The cooling unit should be provided with High efficiency Compressor with varying capacity from 30 % to 100 % loading. Each unit should be provided with One rack inlet temperature sensor to control input based on rack inlet temperature. Each unit should be provided with water leak rope sensor.</p>	

	<p><u>7c.UPS & Battery</u></p> <p>CE certified (or higher standard or equivalent Indian standard) Rack Mounted 40 kVA UPS should be provided along with Battery bank, interlink cabling, battery breakers</p> <p>Overall efficiency of UPS system in double conversion mode : > 95 %</p> <p>Each UPS should be designed to unity power factor at output kVA=kW</p> <p>Input Power factor of UPS > 0.99</p> <p>Input Voltage Window : 304 v - 477 v at Full Load</p> <p>Input Frequency range: 45 - 65 Hz</p> <p>OverLoad Capacity : 125 % for at least 10 Minutes</p> <p>UPS system should be provided with embedded dust filter and conformal coating PCBA; UPS should have EPO and Wave form capturing for fault analysis.</p> <p>UPS system should support common battery bank to improve overall availability for Back up time</p> <p>Each UPS should be provided with minimum 10 minutes back up at full load of 40 kW</p> <p>UPS system should be in N mode</p>	
	<p><u>7d.Electrical System</u></p> <p>Rack Mounted Electrical system should be provided in N+N configuration with Incomer of 125A, 4P with TM trip, Energy Meter with CT for incomer. Panel shall be with Cu busbar and manufactured as per IS Standard.</p> <p>Outgoing breakers as required for UPS, Inrow cooling. UPS output DB with required for outgoing MCB's and atleast 2 Spare MCB's for future expansion.</p> <p>Electrical Cabling: All the cabling shall be done using Cu Flexible / Armoured (in case of outdoor cable) FRLS Cables as per relevant IS Standard.</p>	
	<p><u>7e.Monitoring System</u></p> <p>Each rack should be provided with minimum 1 No. temperature, humidity combo sensor</p> <p>Data Centre Monitoring System with features as required: UPS, Environmental monitoring, PAC, energy meters to be integrated on single dash board and provide central view. Solution should be designed with a top-level 10/100bT Ethernet network, using the SNMP and/or Modbus TCP protocol. Email Server Integration: Monitoring Layer server/VM system should allow integration of email server via SMTP channel. Alarm Status Tracking: Monitoring layer should have Alarm filters in the Monitoring dashboard. The solution provides alert compression and advanced alerting algorithms including deviation from normal and time over threshold to help reduce false positive alarms. Trend Analysis: Should offer Graphical trending analysis for historical data pertaining to day, week, month, year and user defined durations. Auto Timed Reporting Monitoring Layer: should allow for Auto Timed/Scheduled Report Emailing to selected audience on required key performance indicators. These Reports should be mailed to relevant users as CSV format, PDF formats, Word, PPT, excel. Bidder can propose customization in order to generate ppt, pdf and excel formats from software. The system should include data aggregator and required software installed on computer with LCD monitor to access the software.</p>	

8. Item Workload Manager with following features	Yes/No
Perpetual & floating license with commercial support for all nodes with warranty upgrade. Fully featured version with no limitation to no of jobs and scalability of nodes	
Integrated advanced scheduling features including cross-system scheduling, peer to peer scheduling with advanced fair share & hierarchical fair share reservations, preemption, access control lists (ACLs), Role based access control and backfilling scheduling, multi-cluster scheduling, Meta-scheduling for job scheduling and management across distinct clusters (earlier supplied clusters (if required to be covered as per user department) are also to be covered)	
Power aware job scheduling to support auto shutdown and auto boot of nodes as per the workload to be supported.	

	Topology-aware scheduling (both inter- and intra-node) to ensure maximum application performance while minimizing cross-job network contention;	
	Preemption and checkpointing (suspend/checkpoint/requeue) allow users to immediately run high-priority work	
	Plugin framework for custom health checking, mitigation, and notification capabilities including off-lining flaky nodes, restarting scheduling cycles and requeuing jobs	
	The Management Suite must offer Web/CLI based Job submission, monitoring, management and 3D remote visualization capability with secure access control which can be integrated with LDAP.	
	The Cluster Management Suite must Web based tool for administration of HPC including real time monitoring, historical repository based on jobs, users, application etc.	
	S/W offered must be commercial support backed S/W. Bidder or the ISV must provide end to end support for the same. Product datasheet must be submitted with bid.	

9 Item. Operating System as below		Yes/No
	CentOS Linux	

10 Item. HPC Operating System Support by bidder		Yes/No
	REQUIRED	

11 Item. Resource Management/Job Scheduling Support		Yes/No
	REQUIRED	

12 Item. File Systems with following features		Yes/No
	Support for Lustre, GPFS FROM DAY ONE (also native support for augmenting PFS Storage in future)	

13 Item. Commercial Licensed Cluster Management S/W with following features		Yes/No
	<p>Unified system management, monitoring toolset for configuration, diagnosis and management of the system, Cluster manager with provisioning, monitoring and reporting capabilities Support Package and Image based provisioning Intuitive web interface to manage and customize the cluster Customizing networks and compute node profiles through GUI Customizing compute nodes (upto changing kernel parameter) Able to Push configuration changes and updates to the compute nodes without reinstalling and rebooting</p> <p>Offered solution must be a commercial licensed s/w stack , issued in the name of Delhi University, with no limitations based on number of users and no. of nodes Offered Stack must have been deployed as part of HPC Solution to govt organisations during last 5 years . Product datasheet must be submitted with bid.</p>	

14 Item. Software Support for both Serial and Parallel Environment		Yes/No
	YES	

15 Item. Interconnect Switches with following features		Yes/No
	1 Unit of - 24 Port Ethernet Switch for Secondary Communication Purpose	
	1 Unit of- 24 Port Ethernet Switch for management network must be supplied	
	1 Unit of 40 port Infiniband based 200Gbps capable or better based Interconnect switch with redundant power supplies and embedded subnet manager for 40 devices. (Non blocking) <ul style="list-style-type: none"> - With performance of 16Tb/s of bandwidth(non blocking) - Inbuilt management enabled from day one Port to port latency of 130ns or better	

16 Item. Training , Acceptance, Installation and Maintenance of HPC CLuster with following features		Yes/No
	Material supplied shall undergo acceptance tests by user department, only once approved approver's certificate will be issued	
	2 Days training is to be imparted by OEM/ Bidder engineers – agenda shall be HPC , Efficient Usage of HPC Cluster, Linux Commands required to operate / for administration, open source research codes' run in an optimized / efficient manner ascertaining best performance. Engineer(s) must be skilled professional engineer(s) with an experience of at least 10 years Maintenance of HPC Cluster including necessary maintenance / servicing required	
	Open source / commercial codes provided by user committee must be installed by bidder/OEM's engineering team.	
	HPC Support for Delhi University: The bidder must provide at least 1 offsite dedicated engineer with a minimum qualification of diploma/B. E in computer science/IT streams, with a prior experience of at least 3 years in the domain of data centre computing facilities. The person must be available from 9am to 7pm on all working days (of Delhi University) well verse with linux operations/commands and capable to take care of the HPC Data Centre Services Infrastructure facility. In case of trouble shooting, if the off site / remote engineer is not able to address the issue, it is the responsibility of the bidder to arrange personnel to resolve the problem with 8 hours from the time issue is reported .Any cost related to providing dedicated engi-neers must not be borne by Bidder only. However, acceptance of the personnel will be at discretion of Delhi University. Bidder has to provide multiple off site engineers if deputed persons are found to be incapable (as decided by Delhi University) of managing the entire facility.	
	Note: Total Power consumption of Complete infrastructure , total rack space requirement of complete solution , and total tonnage of air conditioning must be provided with the bid	

17 Item. Analysis Terminals with following features		Yes/No
	17a.)- Computational Graphics System- Qty -2 Units Each Unit with – 1 x86 Architecture based processor with 10Cores , 20Threads, 3.7G or higher, 1.35M cache per core , 64GB DDR4 RDIMM/LRDIMM, 2 x 4TB SATA 7200 RPM HDDs , 2 x 480GB SATA SSD Endurance -3DWPD, 1 x Graphics Card Professional Grade with 4GB or higher graphics memory, 1 x 1G (RJ-45) ports, High Definition 7.1 HD Audio (on board thru HD controller) , 3 PCI-E 3.0 x16 slots (support for two or more Grpahic controllers from day one), 1 x 27" or higher 4K Resolution based LED, Wireless Keyboard , Wireless Mouse, Windows 10 Professional 64Bit, Microsoft Office Professional , At least	

	500W Power Supply (80 Plus certified),	
	17b.)- Laptop Qty-1 unit Intel 10 th Gen. i7 (4 Cores,2.3Ghz or higher); 16 GB RAM, 1TB SSD; OS= Microsoft Win 10 Professional; Microsoft Office Professional, :	
	17c.)- Firewall device with below features , Qty -1 Unit <ul style="list-style-type: none"> • Firewall throughput of 5 Gbps • Minimum Users Support- 50 or more • Minimum of 8 x GBE Interfaces. • Should be appliance based and rack mountable • Identity based Firewall • Intrusion Prevention System • Gateway Anti-virus • Web Content & Application Filtering • Bandwidth Management • Inbuilt-on Appliance Reporting • High Availability (Active-Active & Active-Passive) • Network: OSPF, Round Robin load balance, RIPv2, BGP, equal & unequal cost load balance, High Availability, QoS, etc. Round Robin Balance, Server Load Balancing. • Support for user authentication over SMS. • Country Based Blocking, FQDN support and should support MIX mode deployment • CASB • Virus, Worm, Trojan Detection and Removal, Automatic Virus signature database update. 	
	17d.)- LED Computer Monitor Qty-1 Unit 27” 4K Resolution based ,HDMI, Audio Ports, Refresh Rate: 60 Hz, Response Time: 4 ms	
	17e) End Computing Terminals : Qty -3 Units Separate CPU and monitor configuration with following features CPU configuration: Apple M1 chip 8-core CPU with 4 performance cores and 4 efficiency cores 8-core GPU 16-core Neural Engine Memory - 16 GB unified memory , Storage, 1TB SSD Video Support Simultaneously supports up to two displays: One display with up to 6K resolution at 60Hz connected via Thunderbolt and one display with up to 4K resolution at 60Hz connected via HDMI 2.0 . Thunderbolt 3 digital video output supports. Native Display Port output over USB-C. Thunderbolt 2, DVI and VGA output supported using adapters (sold separately) . HDMI 2.0 display video output. Support for one display with up to 4K resolution at 60Hz DVI output using HDMI to DVI Adapter Audio Built-in speaker 3.5mm headphone jack HDMI 2.0 port supports multi-channel audio output Connections and Expansion Two Thunderbolt/ USB 4 ports with support for: Display Port Thunderbolt 3 (up to 40 Gbps) USB 3.1 Gen 2 (up to 10 Gbps) Thunderbolt 2, HDMI, DVI and VGA supported using adapters (sold separately) Two USB-A ports (up to 5 Gbps) HDMI 2.0 port Gigabit Ethernet port 3.5mm headphone jack	

	<p>Wi-Fi - 802.11ax Wi-Fi 6 wireless networking, IEEE 802.11a/b/g/n/ac compatible Bluetooth- Bluetooth 5.0 wireless technology Ethernet- 10/100/1000BASE-T Gigabit Ethernet (RJ-45 connector) Accessories - Wireless keyboard and mouse Webcam: Full HD (up to 1920 x 1080), USB interface, autofocus upto 10 cm close,360 degree swivel. Operating system: MAC OS (latest Version: 10.11.6 or later) Software: 'Microsoft office' perpetual license, latest version</p> <p>Monitor Configuration: Display size ~ 24 inches, Resolution: 4k (3840x2160 at 60 hz) Response time 5-8 ms USB-C cable for connection to the CPU Display Position Adjustments: Height, pivot (rotation), swivel, tilt Input ports: HDMI, USB-C, DisplayPort</p>	
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18 Item. Pre qualification criteria with following features		Yes/No
	<ol style="list-style-type: none"> 1. The Server OEM should have executed (directly or thru SI partners) at least 2 HPC cluster projects- during last 10 years in india using an architecture and technologies similar to this tender at premier Govt Indian academic and research institutions or other govt PSU organisations in India. Details of the same must be submitted with technical bid. At least one cluster must be of the size 100TF (CPU-CPU) or (CPU-GPU together) or more. 2. PFS Storage OEM must have supplied 2 x PFS solutions (50TB or more) based on Lustre /GPFS 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 or other govt PSU organisations in India. Details/Proof of the same must be submitted with technical bid. Credential of an OEM will also be considered if supplies were done by their authorized partner. 3. The bidder must not be banned or debarred or blacklisted by any govt organization in the past. Notarized declaration must be submitted with bid. 4. OEM MAF for Server Nodes , Storage and Switches must be attached with the bid . MAF for items covered under item 17 is not mandatory 5. The bidder must have supplied at least one HPC or Data Centre Rack mount Servers (Count of nodes/servers must be 10 or more in a single order from Govt organisation) in the past 10 years in India. Documentary proof must be submitted 6. All warranty and support must be provided by the bidder. 7. The bidder and Server OEM should have at least one service Center in India. 8. The bidder should have valid ISO certification. Please attach a copy of the certificate. 9. The bidder should clearly specify make and model in both Technical and Financial bid. 10. The bidder must be responsible for complete installation and support the infrastructure. 	

(ii) Manual/hardcopy bids shall not be accepted.

- Payment will be made by RTGS after installation of instrument.

- The University authorities reserve the right to reject any or all quotation without assigning any reason.
- University of Delhi shall be under no obligation to accept the lowest or any other offer received in response to this tender notice and shall be entitled to reject any or all offers. University of Delhi will not be obliged to meet and have discussions with any vendor, and or to listen to any representations. The price quoted should be F.O.R. destination (Dept. of Plant Molecular Biology, UDSC). IGDY/CDEC will be provided, if needed.
- Payment will be made against successful installation.
- Bidders quoting in INR should note that Delhi University can supply GST exemption certificates. The vendors should therefore quote accordingly. Note: “ 5% GST is applicable for University of Delhi as per the DSIR registration No. TU/V/RG-CDE (14)/2016 dated 16-03-2018, which is in accordance with Govt. Notification No. 47/2017-Integrated tax (Rate) dt. 14-11-2017, and Notfn. No. 45/2017-Central Tax (Rate) dt. 14.11.2017, and Notfn. No. 45/2017-Union Territory Tax (Rate) dt.14-11-2017.”