Compliance

NOTE: KINDLY USE THE RIGHT BOX IN EACH ROW TO INDICATE COMPLIANCE, DOCUMENT/LINK SUBMITTED FOR THE SAME.

## 1.1 General Specs

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| --- | --- | --- |
| 1.1.1 | Server and storage should be from same OEM |  |
| 1.1.2 | Management of administration should be simple and GUI |  |
| 1.1.3 | Solution should have single GUI for all management operation of HPC including monitoring, job submission, parallel file system monitoring etc. |  |
| 1.1.4 | OEM supported/certified solution |  |
| 1.1.5 | Training at Admin Level – Minimum 2 days  Training for End Users – Gromacs, GATK – Minimum 2 days  Bidder has to submit details of the training in the Bid. Preferred training is by the OEM |  |
| 1.1.6 | Hardware Warranty for 3 Yrs. Support 9x5, NBD  Software Support for 3 Yrs. |  |

## 1.2 Cluster Manager

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| --- | --- | --- |
| 1.2.1 | Should be able to check cluster health and report any error in configuration file. |  |
| 1.2.2 | Should be able to run diskless node |  |
| 1.2.3 | Should have capability to monitor network switches |  |
| 1.2.4 | Should provide system utilization through GUI |  |
| 1.2.5 | Should support various OS images |  |

## 1.3 Job Scheduler

|  |  |  |
| --- | --- | --- |
| 1.3.1 | Should provide job profiles |  |
| 1.3.2 | Should provide usage of memory and CPUs for optimized utilization of system |  |
| 1.3.3 | Should able to run heterogeneous environment like Linux, windows, Unix etc. |  |
| 1.3.4 | Should be able to add on like job profiling, web portal |  |
| 1.3.5 | Should support various policy like First come - First Server, Fairshair scheduling, Preemption, Backfill etc. |  |
| 1.3.6 | Should able to provide separate queue for high memory nodes and GPU nodes |  |
| 1.3.7 | Should provide open source and processor optimized MPI |  |
| 1.3.8 | Should provide optimized GPU Compilers |  |

## 1.4 Parallel File System (PFS)

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| --- | --- | --- |
| 1.4.1 | Luster or GPFS parallel File system |  |
| 1.4.2 | For Luster 2 nodes for ODS and 2 separate nodes for MDS are required and Metadata should be on separate storage with no single point of failure (ODS – Operational Data Store, MDS – Meta Data Store) |  |
| 1.4.3 | PFS should have no single point of failure |  |
| 1.4.4 | Proposed disk system shall be provided with 250TB usable capacity on raid 6 with NL SAS drives. The proposed disk solution shall ensure that in case of disk failure, the rebuild time for the spare disk shall not be more than an hour. |  |
| 1.4.5 | Metadata should be 3% of usable data |  |
| 1.4.6 | GUI for PFS should be available to view the PFS detail info |  |
| 1.4.7 | The proposed file system should support HSM functionality - It should be possible to define policies for movement of files between different disk tiers (Flash and SAS) and to Backup disk storage. Policies could be based on: • Age of file • Type of file • Disk Space utilization • Last Access date • File Size • User ID |  |
| 1.4.8 | PFS should be linear scalable with addition of cluster nodes |  |
| 1.4.9 | PFS should be scalable to petabytes with single global namespace |  |
| 1.4.10 | The proposed file system shall support CIFS, NFS and object storage |  |
| 1.4.11 | The proposed file system should support the following: Ø Support greater than two billion files in a single file system Ø Support greater than 8PB as a single file system Ø Should support creation of at least 256 file systems Ø A single file system should support greater than 3000 nodes Ø Should support data replication at the file system level in future, if required. Ø Any license required for the above functionality should be provided for the complete proposed solution |  |
| 1.4.12 | PFS Software should be Latest version |  |
| 1.4.13 | PFS Monitoring   1. Monitor the performance of the system based on various aspects 2. Monitor system health 3. Manage file systems 4. Create and manage file sets 5. Create, manage, and schedule snapshots 6. Create rules and policies for information lifecycle management |  |

## 1.6 Storage

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| --- | --- | --- |
| 1.6.1 | Disk storage proposed shall have at least 64 GB of cache scalable to 128GB. |  |
| 1.6.2 | Minimum 250TB storage to be provided in RAID 6 configuration. |  |
| 1.6.3 | Disk storage proposed shall have scalability of at least 500 disk drives. |  |
| 1.6.4 | Read throughput performance should be 5GBps and write should be 2GBps |  |
| 1.6.5 | IOR benchmark should be run to show the performance. Provide proof of the same. |  |
| 1.6.6 | Proposed disk system shall have real time compression capability built in and all licenses required shall be included. |  |
| 1.6.7 | proposed disk system shall have the external virtualization capability to integrate third party storage systems from different OEM, to have single integrated system image. The storage solution shall be scalable to 32PB with external virtualization. |  |

## 1.7 Management Node (Minimum Quantity 2)

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| --- | --- | --- |
| 1.7.1 | **CPU** |  |
| 1.7.1.1 | The system shall be 64 Bit RISC/x86-64 Processor based System |  |
| 1.7.1.2 | Minimum Intel Platinum or Power 8 based Processor |  |
| 1.7.1.3 | The clock speed of the processor should be at a minimum of 2.5 GHz base frequency |  |
| 1.7.1.4 | It should provide minimum 104 threads in the system |  |
| 1.7.2 | **MEMORY** |  |
| 1.7.2.1 | Each physical server should be configured with minimum 128 GB memory. |  |
| 1.7.2.2 | Server should have scalability unto 1TB |  |
| 1.7.3 | **CACHE** |  |
| 1.7.3.1 | The system shall be with minimum 77MB L3 Cache available with OEM for the quoted model at the time of bid. |  |
| 1.7.4 | **MEMORY and IO BANDWIDTH** |  |
| 1.7.4.1 | The system shall offer aggregate memory bandwidth of at least 230 GBps per server. |  |
| 1.7.5 | **Disk Drives** |  |
| 1.7.5.1 | 2 x 1TB 2.5" SATA HDD |  |
| 1.7.6 | **Network Interface and other requirement** |  |
| 1.7.6.1 | Each Server should have minimum 4 number of 1 GbE Ethernet ports for LAN |  |
| 1.7.6.2 | Each Server should have minimum 2 number of 10 GbE Ethernet ports for LAN |  |
| 1.7.6.3 | Each Server should have minimum 1 number of 16Gb dual port FCAL |  |
| 1.7.6.4 | Each Server should have minimum 1 number of 100G Infiniband adaptor |  |
| 1.7.6.5 | Graphics display port for Monitor |  |
| 1.7.6.6 | Form Factor: 2U or lower |  |
| 1.7.7 | **RAS Features:** |  |
| 1.7.7.1 | (a)  Pre-failure Alert capabilities shall be available. |  |
| 1.7.7.2 | (b)  All the following components shall be hot pluggable – Disks, Power Supplies and Fans etc. |  |
| 1.7.7.3 | (c)  Shall have N+N redundant Power Supplies and provision for input from at least two sources. |  |
| 1.7.7.4 | (d)  Shall have N+1 redundant Cooling Fans. |  |
| 1.7.7.5 | (e)  All the Network and FC ports/cards shall be field replaceable units (FRU). |  |
| 1.7.8 | **Operating System** |  |
| 1.7.8.1 | RHEL |  |
| 1.7.8.2 | Advance Warranty support for 3 years |  |

## 1.8 Compute Nodes with High Memory (Quantity - 02 or higher based on GATK Benchmark Results)

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| --- | --- | --- |
| 1.8.1 | **CPU** |  |
| 1.8.1.1 | The system shall be 64 Bit RISC/x86-64 Processor based System |  |
| 1.8.1.2 | Minimum Intel Platinum or Power 8 based Processor |  |
| 1.8.1.3 | The clock speed of the processor should be at a minimum of 2.5 GHz base frequency |  |
| 1.8.1.4 | It should provide minimum 104 threads in the system |  |
| 1.8.2 | **MEMORY** |  |
| 1.8.2.1 | Each physical server should be configured with minimum 1 TB memory. |  |
| 1.8.2.2 | Memory DIMM should be installed for maximum memory bandwidth of processor. All the memory of same size should be used. |  |
| 1.8.3 | **CACHE** |  |
| 1.8.3.1 | The system shall be with minimum 77MB L3 Cache available with OEM for the quoted model at the time of bid. |  |
| 1.8.4 | **MEMORY and IO BANDWIDTH** |  |
| 1.8.4.1 | The system shall offer aggregate memory bandwidth of at least 230 Gap’s per server. |  |
| 1.8.4.2 | Server should be configured with 1TB memory |  |
| 1.8.5 | **Disk Drives** |  |
| 1.8.5.1 | 2 x 1TB 2.5" SATA HDD |  |
| 1.8.6 | **Network Interface and another requirement** |  |
| 1.8.6.1 | Each Server should have minimum 4 number of 1 GbE Ethernet ports for LAN |  |
| 1.8.6.2 | Each Server should have minimum 1 number of 100G Infiniband adaptor |  |
| 1.8.6.3 | Graphics display port for Monitor |  |
| 1.8.6.4 | Form Factor: 2U or lower |  |
| 1.8.7 | **RAS Features:** |  |
| 1.8.7.1 | (a)  Pre-failure Alert capabilities shall be available. |  |
| 1.8.7.2 | (b)  All the following components shall be hot pluggable – Disks, Power Supplies and Fans etc. |  |
| 1.8.7.3 | (c)  Shall have N+N redundant Power Supplies and provision for input from at least two sources. |  |
| 1.8.7.4 | (d)  Shall have N+1 redundant Cooling Fans. |  |
| 1.8.7.5 | (e)  All the Network and FC ports/cards shall be field replaceable units (FRU). |  |
| 1.8.8 | **Operating System** |  |
| 1.8.8.1 | RHEL |  |
| 1.8.8.2 | Advance Warranty support for 3 years |  |
| 1.8.9 | **Benchmark** |  |
| 1.8.9.1 | Benchmark GATK 3.8 |  |
| 1.8.9.2 | Source: https://software.broadinstitute.org/gatk/download/archive |  |
| 1.8.9.3 | Input File: https://console.cloud.google.com/storage/browser/genomics-public-data/resources/broad/hg38/v0/?pli=1 |  |
| 1.8.9.4 | Bidder must show the best timing result. |  |
| 1.8.9.5 | Benchmark should finish in 10 hours’ timeframe for 2 jobs running on 2 servers. Incase of benchmark is taking more time a prorata based 1TB memory system will increase. |  |
| 1.8.9.6 | Example:  i} 2 servers each taking max 10 hrs.  Ii) 3 servers each taking max 15 hours.  Iii) 4 servers each taking max 20 hours.  Iv) 5 servers each taking 25 hours. Etc. |  |

## 1.9 GPU Nodes (Quantity - 02 or higher with total eight V100 GPUs with NVlink)

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| --- | --- | --- |
| 1.9.1+A75:B111 | **CPU** |  |
| 1.9.1.1 | The system shall be 64 Bit RISC/x86-64 Processor based System |  |
| 1.9.1.2 | Minimum Intel Platinum or Power 8 based Processor |  |
| 1.9.1.3 | The clock speed of the processor should be at a minimum of 2.5 GHz base frequency |  |
| 1.9.1.4 | It should provide minimum 104 threads in the system |  |
| 1.9.2 | **MEMORY** |  |
| 1.9.2.1 | Each physical server should be configured with minimum 256 GB memory. |  |
| 1.9.2.2 | Server should have scalability unto 1TB |  |
| 1.9.2.3 | Memory DIMM should be installed for maximum memory bandwidth of processor. All the memory of same size should be used. |  |
| 1.9.3 | **CACHE** |  |
| 1.9.3.1 | The system shall be with minimum 77MB L3 Cache available with OEM for the quoted model at the time of bid. |  |
| 1.9.4 | **MEMORY and IO BANDWIDTH** |  |
| 1.9.4.1 | The system shall offer aggregate memory bandwidth of at least 230 GBps per server. |  |
| 1.9.5 | **Nvidia GPU** |  |
| 1.9.5.1 | 8 x V100 16GB GPU with Nvlink Spread over all nodes. |  |
| 1.9.6 | **Disk Drives** |  |
| 1.9.6.1 | 2 x 1TB 2.5" SATA HDD |  |
| 1.9.7 | **Network Interface and other requirement** |  |
| 1.9.7.1 | Each Server should have minimum 4 number of 1 GbE Ethernet ports for LAN |  |
| 1.9.7.2 | Each Server should have minimum 1 number of 100G Infiniband adaptor |  |
| 1.9.7.3 | Graphics display port for Monitor |  |
| 1.9.7.4 | Form Factor: 2U or lower |  |
| 1.9.8 | **RAS Features:** |  |
| 1.9.8.1 | (a)  Pre-failure Alert capabilities shall be available. |  |
| 1.9.8.2 | (b)  All the following components shall be hot pluggable – Disks, Power Supplies and Fans etc. |  |
| 1.9.8.3 | (c)  Shall have N+N redundant Power Supplies and provision for input from at least two sources. |  |
| 1.9.8.4 | (d)  Shall have N+1 redundant Cooling Fans. |  |
| 1.9.8.5 | (e)  All the Network and FC ports/cards shall be field replaceable units (FRU). |  |
| 1.9.9 | **Operating System** |  |
| 1.9.9.1 | RHEL |  |
| 1.9.9.2 | Advance Warranty support for 3 years |  |
| 1.9.10 | **Benchmark** |  |
| 1.9.10.1 | Benchmark Gromacs 2018 |  |
| 1.9.10.2 | Source: ftp://ftp.gromacs.org/pub/gromacs/gromacs-2018.tar.gz |  |
| 1.9.10.3 | Input File: GROMACS 2018 PME on the 3M water test case (ftp://ftp.gromacs.org/pub/benchmarks/water\_GMX50\_bare.tar.gz ) |  |
| 1.9.10.4 | Best performance benchmark will be preferred. |  |
| 1.9.10.5 | Bidder has to submit the results in media along with bid and tenderer can ask for system access to check the result on the actual system. |  |

## 1.10. Windows server

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| --- | --- | --- |
| 1.10.1 | **CPU** |  |
| 1.10.1.1 | The system shall be 64 Bit x86-64 Processor based System |  |
| 1.10.1.2 | Minimum Intel Platinum based Processor |  |
| 1.10.1.3 | The clock speed of the processor should be at a minimum of 2.5 GHz base frequency |  |
| 1.10.1.4 | It should provide minimum 104 threads in the system |  |
| 1.10.2 | **MEMORY** |  |
| 1.10.2.1 | Each physical server should be configured with minimum 128 GB memory. |  |
| 1.10.2.2 | Server should have scalability unto 1TB |  |
| 1.10.3 | **CACHE** |  |
| 1.10.3.1 | The system shall be with minimum 77MB L3 Cache available with OEM for the quoted model at the time of bid. |  |
| 1.10.4 | **MEMORY and IO BANDWIDTH** |  |
| 1.10.4.1 | The system shall offer aggregate memory bandwidth of at least 230 GBps per server. |  |
| 1.10.5 | **Disk Drives** |  |
| 1.10.5.1 | 2 x 1TB 2.5" SATA HDD |  |
| 1.10.6 | Network Interface and other requirement |  |
| 1.10.6.1 | Each Server should have minimum 4 number of 1 GbE Ethernet ports for LAN |  |
| 1.10.6.4 | Each Server should have minimum 1 number of 100G Infiniband adaptor |  |
| 1.10.6.5 | Graphics display port for Monitor |  |
| 1.10.6.6 | Form Factor: 2U or lower |  |
| 1.10.7 | RAS Features: |  |
| 1.10.7.1 | (a)  Pre-failure Alert capabilities shall be available. |  |
| 1.10.7.2 | (b)  All the following components shall be hot pluggable – Disks, Power Supplies and Fans etc. |  |
| 1.10.7.3 | (c)  Shall have N+N redundant Power Supplies and provision for input from at least two sources. |  |
| 1.10.7.4 | (d)  Shall have N+1 redundant Cooling Fans. |  |
| 1.10.7.5 | (e)  All the Network and FC ports/cards shall be field replaceable units (FRU). |  |
| 1.10.8 | Operating System |  |
| 1.10.8.1 | Windows 10 Enterprise |  |
| 1.10.8.2 | Advance Warranty support for 3 years |  |

## 1.11 Network: 1 Infiniband and 2 ethernet switches

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| --- | --- | --- |
| 1.11.1 | 36 port 100Gb infiniband Switch and cables require for solution |  |
| 1.11.2 | 2 x Brocade ICX 7250 24 1GBE, minimum 4 10GBE SFP+ included LC interfaces, 2mtrs LC -LC patch cord - 4, 2mtrs SC-LC patch cord 2 with licences |  |
| 1.11.2.1 | Each access switch should have 4 SFP + 10G Module |  |

## 1.12 Accessories

|  |  |  |
| --- | --- | --- |
| 1.12.1 | 42U Server rack with perforated door for heat dissipation and PDU as erquired for solution |  |
| 1.12.2 | Requisite accessories/software required for HPC |  |
| 1.12.3 | Bidder should provide LCD Monitor, key board, mouse (Macbook?) |  |

# Data Centre Hardware Specifications

To be Submitted during the bid.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Serial Number** | **Type** | **Model ID/number** | **Quantity** | **Total Power Reqd. in Watts** | **Total Heat Diss. In BTU/Hr** | **Total Rack Space in Us** | **Proof - Document or Link** |
| 1 | Storage |  |  |  |  |  |  |
| 2 | Management Nodes |  |  |  |  |  |  |
| 3 | Compute Nodes with High Memory |  |  |  |  |  |  |
| 4 | GPU Nodes |  |  |  |  |  |  |
| 5 | Windows server |  |  |  |  |  |  |
|  |  | **Total** | **0** | **0** | **0** | **0** |  |