

## **Minutes of the Meeting of HPC Management cum Advisory Committee held on September 26, 2012**

Members present: A.K. Chaturvedi, A. Chandra, S. Mittal, R. Sankararamakrishnan, S. Aggarwal, K. Muralidhar, M.K. Verma, B. Pande, K.S. Singh, Abhishek.

Special Invitees present: S. Managaran, M. Ranganathan, N. Nair, S.P. Rath, R. Garg

The Chairman welcomed all the Members and Special Invitees to the Meeting. The list of special Invitees to the Meeting included SE, IWD, and also all members of the HPC Group which was formed through an open invitation to acadstaff in April, 2012 (see, [http://web.iitk.ac.in/cc/hpc/hpc\\_group\\_members\\_2012\\_04\\_20.pdf](http://web.iitk.ac.in/cc/hpc/hpc_group_members_2012_04_20.pdf)). Subsequently, the following agenda items of the Meeting were taken up one by one.

### **1. Confirmation of the Minutes of the previous Meeting of HPC Advisory cum Management Committee (HPC-AMC) held on October 28, 2011.**

The Members confirmed the minutes of the previous Meeting held on October 28, 2011.

### **2. Presentation of 'Action taken report' by Head CC on the recommendations made by HPC-AMC in its previous Meeting.**

Head CC submitted a detailed point-by-point report on action taken by CC in response to recommendations made by the HPC Advisory cum Management Committee (HPC-AMC) in its previous Meeting. The report is included in Annexure 1. The effort of CC on this matter was generally appreciated by all members (hence forth, 'members' include Special Invitees also). On the specific issue of providing accounts to external users, it was suggested that Head CC could proactively send e-mails to the external researchers who had contributed to the HPC (DST) proposal informing them about creation of their accounts in HPC. However, they would be required to complete the formalities as described in [http://www.iitk.ac.in/cc/hpc/hpc\\_non\\_iitk\\_users.htm](http://www.iitk.ac.in/cc/hpc/hpc_non_iitk_users.htm) for activation of their accounts.

### **3. Current status of the HPC facility at CC**

Head CC made a power point presentation on the current status of the HPC facility at CC (see Annexure 2). Details of the usage of the HPC cluster over past six months were presented. It was noted that the HPC facility is heavily loaded. The wait-time in various queues has been extremely long (e.g. more than 3 days in the large queue). It was agreed by all that the facility needs an upgradation at the earliest.

### **4. Current status of the ongoing work on Data Centre at CC and its utilization plan.**

SE, IWD, briefed the members about the status of ongoing work on Data Centre at CC. The Data Centre is coming up with three server rooms, named as Server room 1 with a cooling capacity of 15 kW per rack, Server room 2 with a cooling capacity of 10 kW per rack and server room 3 with a cooling capacity of 5 kW per rack. The chiller plants and water tanks of the chilled-water cooling facility have been put in place in the basement and terrace of the CC building, respectively. The Precision Air Conditioning (PAC) units have also been put in place in all the server rooms and work is currently in the advanced state of completion. The work on fire safety including automatic fire suppression and building management system (BMS) is also in the advanced stage of completion. The access control doors are expected in the first week of October'12 and it is generally expected that the Data Centre will be commissioned in 4-6 weeks. Once the Data Centre is commissioned, its operation and maintenance will be looked after by the Vendors for next three years as per Tender terms. In view of this, SE made a request to make a proper utilization plan for all the three server rooms of the Data Centre.

Subsequently the members prepared a utilization plan of the Data Centre after detailed discussion. The utilization plan is included in Annexure 3. As per the plan, all server rooms are expected to be populated to the extent of 50% or above within a few months of commissioning of the Data Centre. Hence, the Members felt that the current plan of operation and maintenance of the Data Centre by the Vendors after its commissioning can be continued without any changes.

### **5. Formulation of a policy for keeping HPC machines in Server Room 2 in CC Data Centre by Project Pls.**

The Chairman expressed the need for a proper policy document for keeping HPC machines in Server Room 2 in CC Data Centre by Project Pls/Departments. After a long discussion, the members finalized the policy document which is included in Annexure 4. As per the policy

document, an undertaking (given in Annexure 5) will have to be signed by PIs/HODs before keeping their clusters in the Data Centre.

**6. Proposal for the second phase of HPC project.**

The Chairman stressed upon the need for submitting a proposal to DST for the second phase of HPC project at the earliest. The current HPC project would be expiring on 12-11-2012. Prof. Sanjay Mittal, PI of the ongoing HPC Project, agreed to coordinate the work on preparation of the proposal for the second phase of the HPC project for submission to DST. A team consisting of Profs. Sanjay Mittal, M.K. Verma, N. Nair, M. Ranganathan, R. Sankararamakrishnan, Abhishek was formed for this purpose. This team will seek input from all HPC researchers of the Institute for preparation of the proposal. It was also agreed that the PI of the current HPC project would send a request to DST soon for extension of the ongoing project for one year and would also enquire with DST regarding the release of second installment of the ongoing project.

**7. Any other relevant item with permission of the chair.**

Head CC proposed formulation of a policy document for usage of Server room 3 of the CC Data Centre. It was agreed by all that such a policy document is indeed desirable for proper usage of the Server room 3. After a long discussion, the members finalized the policy document which is included in Annexure 6.

A member of the Committee suggested that HPC-AMC makes a concrete recommendation regarding how the HPC facility should be acknowledged in publications of work that has used the HPC facility, fully or partly. The members discussed the matter and suggested that the acknowledgement could be made in the following manner: "We gratefully acknowledge the DST-sponsored HPC Facility at Computer Centre, IIT Kanpur, where (part of) the calculations of the current work were carried out".

The Meeting ended with thanks to the Chair.

Head, CC

(Convener)

Dean, R&D

(Chairman)

## **Annexure 1**

### **Report of action taken by CC on the recommendations made by HPC Advisory cum Management Committee (HPC-AMC) in its meeting on October 28, 2011**

**HPC-AMC recommendation/decision:** *It was decided that the current policy of giving accounts in the HPC cluster would continue. The current policy is: (i) Users of previous HPC clusters (Sun and HP) will be given accounts, (ii) New Faculty HPC users will be given accounts on request. For students, the request for account will have to be routed through thesis supervisor(s). Specific recommendation of thesis supervisor(s) will be required.*

**Action taken by CC:** The policy as stated above is continued for giving new HPC accounts

**HPC-AMC recommendation/decision:** *It was also decided that the users would have to (a) submit a brief half-yearly report on their project that has used the HPC resources and (b) acknowledge CC/DST in their publications that have used HPC resources. Points (a) and (b) will be part of the agreement that users have to sign for using the HPC facility.*

**Action taken by CC:** The application form for HPC login has been appropriately modified so as to include the above points. The modified HPC login application form is available at the CC website, see [http://web.iitk.ac.in/cc/hpc/hpc\\_login\\_form\\_iitk\\_users.pdf](http://web.iitk.ac.in/cc/hpc/hpc_login_form_iitk_users.pdf). All applicants of HPC login now sign the agreement before they are given the account.

**HPC-AMC recommendation/decision:** *In view of maximal usage of the small and medium queues, it was decided to put (i) 8 nodes from seq queue to the small queue, (ii) 5 nodes from work queue to the small queue and (iii) 8 nodes from seq queue to the medium queue. With these changes, the medium and small queues will have 100 and 59 nodes, respectively. The large queue currently has 184 nodes and it was decided not to make any changes in the large queue. The total number of jobs allowed to be submitted per user will be limited to a maximum of three jobs, out of which maximum two can be running at a time.*

**Action taken by CC:** Changes as suggested above have been made in small, medium and seq queues.

**HPC-AMC recommendation/decision:** *It was decided to put a quota limit of 200 GB per user in the Home space. No quota will be put in Scratch space. However, it was suggested that files older than four weeks (counted from the date of creation) can be deleted automatically to keep enough free space in the Scratch area all the time.*

**Action taken by CC:** Disk quota policy of Home space has been implemented. The deletion policy of old files in Scratch space as suggested above would be implemented very soon, possibly by this week.

**HPC-AMC recommendation/decision:** *It was decided that CC would provide dedicated ftp servers for this purpose so that users can transfer their data through remote access. Additionally, external drives will also be put up at the Facility so that users can also come with their own disks and back-up their data.*

**Action taken by CC:** Four dedicated ftp servers have been put in place for transfer of HPC data through remote access. Now one can back-up his/her data from the HPC cluster using the ftp server ftp.hpc.iitk.ac.in. This ftp server can be used to transfer data both from home and scratch directories of the Cluster. This server is a collection of 4 servers and each server runs two ftp service daemons. It can act in an approximate round robin manner to achieve some degree of load balancing of ftp services. Apart from basic FTP mechanisms like ftp ftp.hpc.iitk.ac.in, other methods like sftp and browser based ftp://ftp.hpc.iitk.ac.in/home/<user\_id> are also supported.

**HPC-AMC recommendation/decision:** *The issue of giving HPC access to users of other academic Institutes was discussed. It was decided that first access would be given to those users who had submitted brief research proposals earlier for inclusion in our HPC proposal. These users will be encouraged to come to IITK for a short period to learn about the HPC system and to execute their calculations. The issue of giving access to other users from outside Institutes will be considered in future meetings of the Committee .*

**Action taken by CC:** Login information for non-IITK HPC users has been made available in CC website. See, [http://www.iitk.ac.in/cc/hpc/hpc\\_non\\_iitk\\_users.htm](http://www.iitk.ac.in/cc/hpc/hpc_non_iitk_users.htm). The login application form for non-IITK users is also provided in this site. Additionally, all participants including those who contributed to the HPC project proposal were informed of the availability of HPC accounts for non-IITK users at the HPC Meeting held at IITK in March, 2012. Till now, no application for HPC account from outside IITK has been received by CC.

***HPC-AMC recommendation/decision:*** *The issues of user help and manpower were discussed. It was suggested that an HPC forum be created where queries and answers by HPC users could be posted. It was also noted that there are two available positions of a Secretary and a System Administrator (to be funded by IITK) as part of the HPC project. Hence, these positions could be filled to have more manpower for the HPC facility.*

**Action taken by CC:** Currently, two HPC Lists are available for e-mail based queries and discussions: [hpc@lists.iitk.ac.in](mailto:hpc@lists.iitk.ac.in) (all account holders of the HPC facility) and [hpcgroup@lists.iitk.ac.in](mailto:hpcgroup@lists.iitk.ac.in) (a group of interested Faculty/Engineers working in the area of HPC - this group was formed in April 2012 after an open invitation to all acadstaff, see [http://web.iitk.ac.in/cc/hpc/hpc\\_group\\_members\\_2012\\_04\\_20.pdf](http://web.iitk.ac.in/cc/hpc/hpc_group_members_2012_04_20.pdf)).

One IITK-funded Junior Technician (Mr. Praveen Kumar Patel) has been added to the HPC Support Team. The job of System administration is currently looked after by a CC Engineer (Mr. Brajesh Pande) and an HP Engineer (Mr. Abhishek Kesarwani). Secretarial aspects related to login opening, file keeping etc are taken care of by CC office. Applications for five new Computer Engineers for CC with Institute funding are being processed and it is hoped that at least one of them would be in the area of HPC System Administration.

***HPC-AMC recommendation/decision:*** *It was felt that the second phase of the HPC proposal should be taken up on priority basis in order to get funds to upgrade the current hardware and software.*

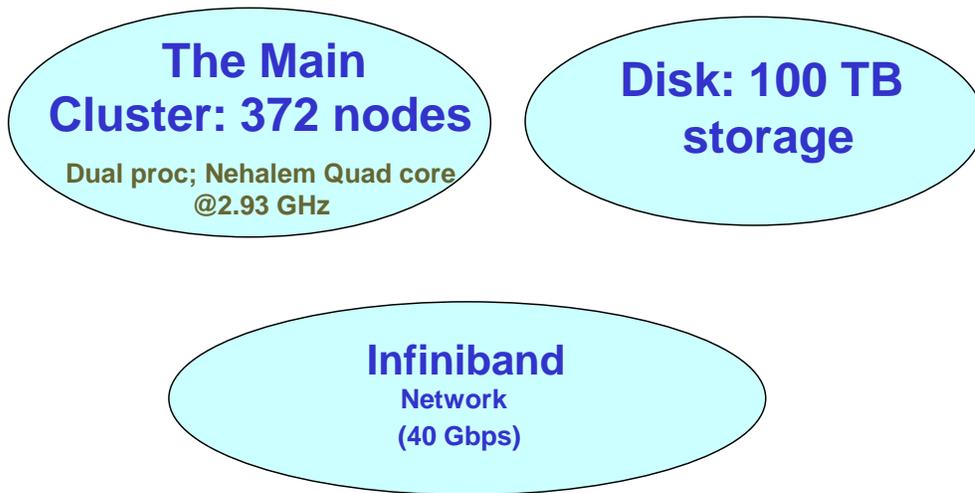
**Action taken by CC:** Pending. This has to be taken up by the HPC Group.

## Annexure 2

(Presentation made by Head CC on the current status of the HPC facility)

### Agenda Item 3: Current Status of the HPC Facility at CC

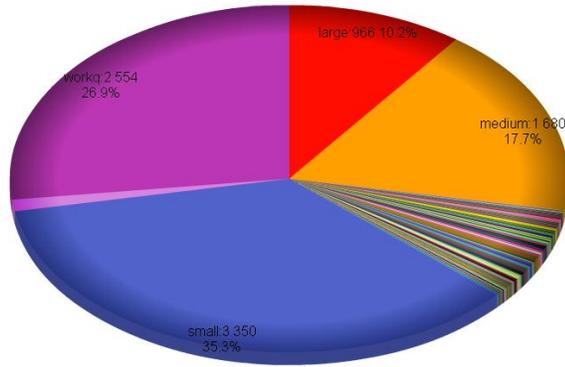
## The Main HPC Cluster



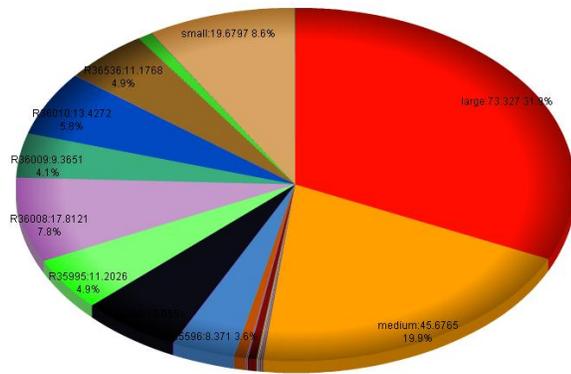
## Queue Configuration

Queue	Total Nodes	Min-Max Nodes	Min-Max Cores	Wall Time
Large	184	16-32	128-256	72 hours
Medium	100	4-12	32-96	96 hours
Small	59	1-4	2-32	120 hours
Seq	16	1	1	120 hours
Workq (interactive)	6	1-4	1-16	24 hours
Test	2	NA	NA	NA

Total Number Of Jobs by Queue Name with date range of '15-03-2012' and '15-09-2012'



Avg wait time (hrs) by Queue with date range of '15-03-2012' and '15-09-2012'



# Road Ahead .....

## Second phase of the current HPC project (DST)

- New HPC projects
- Other resources (Institute?)

## Upgradation of CC Infrastructure to host more HPC machines

New UPS

New Transformer

New DG Sets

New Control Panels

New Electrical Cables

Backbone of campus network is upgraded to 10 Gbps

**New Data Centre at CC (under construction)**

## **Annexure 3**

### **Plan of utilization of the Data Centre**

#### **Server Room 1:**

Available rack space: 24

Expected occupancy soon after commissioning of the Data Centre: About 12-13 racks

Original plan: 12 racks for the existing HPC cluster. Other 12 racks for the next cluster which was planned to be purchased in the second phase of the DST project.

Current (revised) plan:

- (i) The existing HPC cluster will continue to stay in the old Server Room.
- (ii) SUN cluster with 4 racks will be kept in Server Room 1
- (iii) HP cluster with 2 racks will be shifted from old Server Room to Server Room 1 to create space for two new racks of CC servers
- (iv) One rack with 4 GPU servers will be shifted to Server Room 1 from the current utility server room
- (v) HPC servers to the extent of about 3 racks would be purchased from CC budget in the current financial year to augment the current facility and would be kept in Server Room 1.
- (vi) 2-3 additional racks from the old Server Room will be shifted to Server Room 1 in order to keep the average heat load of the old Server Room under control. This is required for smooth running of the existing HPC Cluster in peak summer which is kept in the old Server Room.
- (vii) A proposal for purchase of a new central file server and an SMP server has been submitted to the Institute. If approved, new file server and SMP server with about 4 racks would be purchased in the current financial year and would be kept in Server Room 1.
- (viii) Future clusters from the second phase of DST project/Institute budget/other resources with **X** racks

## **Server Room 2:**

Available rack space: 20

Expected occupancy soon after commissioning of the Data Centre: About 10-12 racks

Original plan: To be used for keeping clusters of Project PIs/Departments

Current Plan: Same as above

## **Server Room 3:**

Available rack space: 10

Expected occupancy soon after commissioning of the Data Centre: 10

Original plan: To be used for keeping utility servers of CC, OA and other sections of the Institute

Current Plan: Same as above

- (i) 5 racks from OA
- (ii) 3 racks for miscellaneous servers (DRPG, Student Gymkhana, SPO, Alumni etc)
- (iii) 2 racks from Ernet/Network

## **Annexure 4**

### **Policy for use of Server Room 2 in CC Data Centre by Project PIs and Departments**

**Capacity of Server Room 2: 20 racks (expandable to 24 racks in future)**

**Policy:**

1. Only clusters with rack-mountable servers (nodes) and switches would be allowed. Nodes/switches should be mountable in 42U 19"-racks of depth 40". Some reasonable flexibility in the depth can be allowed (say 10-15%) but the width must be such that the servers/switches fit into 19" racks.
2. Clusters should be new when they are brought to CC and would be kept in CC for a maximum period of 6 years from their date of purchase order.
3. A one-time relaxation to point #2 can be considered when the server room is populated for the first time after its commissioning in late 2012. For the first-time population of the Data Centre, existing clusters with different PIs/Departments which are not more than four years old, as counted from the date of purchase order, can be kept in the Data Centre.
4. Minimum size of a cluster should be 4 nodes or 8 processors (not cores) and maximum one 42U rack per PI will be allowed. Thus, a PI can keep multiple clusters subject to the total space limit of one rack per PI. For Departmental clusters (not belonging to any individual PI) such as those purchased from DST FIST, DPA etc, maximum two racks can be allowed subject to availability of space.
5. Only standard 19" 42U racks will be allowed. Required cooling per rack should not exceed 10 kW. A document from the OEM/Vendor would be required for this purpose. Also, PIs are encouraged to put foldable TFT monitors in the racks for their optimal use.
6. In order to make cool-pool functional, all racks should be of same height. For this purpose, standard 19" 42U racks would be provided by CC. For the first-time population in late 2012, standard 19" 42U racks from PIs/Departments can be accepted on case-to-case basis. The racks should be fully populated which might require sharing of a rack by two or more groups/Departments. If a PI brings some additional nodes at a future date, efforts will be made to do some relocation of nodes within the limit of maximum one rack per PI.

7. Relocation of nodes/racks or any other rearrangement within the Data Centre may become necessary from time to time due to operational reasons and CC keeps the right to make such relocations/rearrangement as and when they are needed. Also, if a new cluster of a PI/Department will have to be kept in CC Data Centre, the concerned PI/Department should take clearance from Head CC before issue of the purchase order of the new cluster.
8. All aspects of the maintenance of PI's/Department's clusters kept in CC would be fully the responsibility of PIs/Departments. CC would only provide the space with cooling and UPS power for hosting those clusters. If a cluster is not operational for more than three months, the PI will be requested to take the non-operational cluster/server out of the Data Centre so as to free space for others.
9. For all planned maintenance of the Data Centre, the PIs/Departments would be responsible for shutting down all their clusters by the time line as communicated to them by CC. The PIs/Departments would also be responsible for switching on their clusters after completion of the maintenance work of the Data Centre as communicated to them by CC. In the event of emergency or non-planned maintenance of the Data Centre, CC Engineers would have the right to force-shutdown all such clusters. Additionally, CC keeps the right to ask for access to root password of all clusters kept in CC Data Centre.
10. As per design of the Data Centre, access to all server rooms will be controlled. Access to the Server room 2 will be given to one person per PI/Department as authorized by the PI/HOD. CC security may check the ID of the person entering the server room.
11. PIs/Departments are encouraged to contribute an amount to CC DPA for keeping their clusters in CC Data Centre.
12. For any other matter related to usage of Server room 2 which is not covered in this policy document, Head CC can consult the HPC Advisory cum Management Committee or its Chairman for needful action.
13. The policy will be reviewed as and when required and necessary changes, as deemed fit by the HPC Advisory cum Management Committee, would be made.
14. An undertaking accepting the above points, as attached herewith\*, will have to be signed by the concerned PI/HOD and submitted to Head CC.
15. CC would maintain a separate file with details of all such clusters kept in Server Room 2, like names of the concerned faculty & Department, date of bringing the clusters to the Data Centre, date of expiry of period/date of taking away the servers from Data Centre, contact numbers of all concerned PIs/HODs etc.

\*See Annexure 5 of the Minutes.

## Annexure 5

### Undertaking by PI/HOD for keeping Project/Department Clusters in Server Room 2 of CC Data Centre

To

Head, CC

IIT Kanpur

Date:

I accept the following points for keeping my project/Department Cluster in the Server Room 2 of CC Data Centre. This is as per the decision of the HPC Advisory cum Management Committee taken in its Meeting on September 26, 2012 (see [http://web.iitk.ac.in/cc/meetings\\_hpc.htm](http://web.iitk.ac.in/cc/meetings_hpc.htm)).

1. Only clusters with rack-mountable servers (nodes) and switches would be allowed. Nodes/switches should be mountable in 42U 19"-racks of depth 40". Some reasonable flexibility in the depth can be allowed (say 10-15%) but the width must be such that the servers/switches fit into 19" racks.
2. Clusters should be new when they are brought to CC and would be kept in CC for a maximum period of 6 years from their date of purchase order.
3. A one-time relaxation to point #2 can be considered by CC when the server room is populated for the first time after its commissioning in late 2012. For the first-time population of the Data Centre, existing clusters which are not more than four years old, as counted from the date of purchase order, can be kept in the Data Centre.
4. Minimum size of a cluster should be 4 nodes or 8 processors (not cores) and maximum one 42U rack per PI will be allowed. Thus, a PI can keep multiple clusters subject to the total space limit of one rack per PI. For Departmental clusters (not belonging to any individual PI) such as those purchased from DST FIST, DPA etc, maximum two racks can be allowed subject to availability of space.
5. Only standard 19" 42U racks will be allowed. Required cooling per rack should not exceed 10 kW. A document from the OEM/Vendor would be provided for this purpose. Also, it is desired to put foldable TFT monitors in the racks for their optimal use.
6. In order to make cool-pool functional, all racks should be of same height. For this purpose, standard 19" 42U racks would be provided by CC. For the first-time population

in late 2012, standard 19" 42U racks from PIs/Departments can be accepted by CC on case-to-case basis. The racks should be fully populated which might require sharing of a rack by two or more groups/Departments. If a PI brings some additional nodes at a future date, efforts will be made by CC to do some relocation of nodes within the limit of maximum one rack per PI.

7. Relocation of nodes/racks or any other rearrangement within the Data Centre may become necessary from time to time due to operational reasons and CC keeps the right to make such relocations/rearrangement as and when they are needed. Also, if a new cluster of a PI/Department will have to be kept in CC Data Centre, the concerned PI/Department should take clearance from Head CC before issue of the purchase order of the new cluster.
8. All aspects of the maintenance of PI's/Department's clusters kept in CC would be fully the responsibility of PIs/Departments. CC would only provide the space with cooling and UPS power for hosting those clusters. If a cluster is not operational for more than three months, the PI will be requested by CC to take the non-operational cluster/server out of the Data Centre so as to free space for others.
9. For all planned maintenance of the Data Centre, the PIs/Departments would be responsible for shutting down all their clusters by the time line as communicated to them by CC. The PIs/Departments would also be responsible for switching on their clusters after completion of the maintenance work of the Data Centre as communicated to them by CC. In the event of emergency or non-planned maintenance of the Data Centre, CC Engineers would have the right to force-shutdown all such clusters. Additionally, CC keeps the right to ask for access to root password of all clusters kept in CC Data Centre.
10. As per design of the Data Centre, access to all server rooms will be controlled. Access to the Server room 2 will be given to one person per PI/Department as authorized by the PI/HOD. CC security may check the ID of the person entering the server room.
11. PIs/Departments are encouraged to contribute an amount to CC DPA for keeping their clusters in CC Data Centre.
12. For any other matter related to usage of Server room 2 which is not covered in this policy document, Head CC can consult the HPC Advisory cum Management Committee or its Chairman for needful action.
13. The policy will be reviewed as and when required and necessary changes, as deemed fit by the HPC Advisory cum Management Committee, would be made.

Signature

Name:

Department

Note: Please also attach a copy of Purchase Order of the cluster

## Annexure 6

### **Policy for use of Server Room 3 in CC Data Centre for keeping Utility Servers**

#### **Capacity of Server Room 3: 10 racks**

1. Only utility servers used for providing services to a large number of users (compute servers excluded) and mountable on standard racks can be kept in Server room 3. Cooling requirement should not exceed 5 kW per rack. This Server room is primarily designed for hosting utility servers of CC and Office Automation which do not require intense cooling. Rack-mountable utility servers from other Sections/Facilities of the Institute can also be considered on case-to-case basis. Such requests from other Sections/Facilities should come from the Head or Faculty In-Charge of the respective Sections/Facilities of the Institute.
2. All aspects of the maintenance of non-CC servers kept in CC Data Centre, including planned shutdown, would be fully the responsibility of System Administrators of those machines as authorized by the respective Head/faculty-In-Charge. CC would only provide the space with cooling and UPS power for hosting those servers.
3. For all planned maintenance of the Data Centre, the System Administrators of Sections/Facilities would be responsible for shutting down all their servers by the time line as communicated to them by CC. In the event of emergency or non-planned maintenance of the Data Centre, CC Engineers would have the right to force-shutdown all such servers. Additionally, CC keeps the right to ask for access to root password of all servers kept in CC Data Centre.
4. As per design of the Data Centre, access to all server rooms will be controlled. Access to the Server room 3 can be given to one person per Section/Facility as authorized by the respective Head/Faculty-In-Charge or an access key would be made available with CC security. CC security may check the ID of the person entering the server room.
5. For any other matter related to usage of Server room 3 which is not covered in this policy document, Head CC can take needful action.
6. The policy will be reviewed as and when required and necessary changes would be made.

*Whenever a server from other Sections/Facilities is accepted by CC for keeping in Server Room 2, it is assumed that the Head/Faculty-In-Charge of the respective Sections/Facilities accept all the above points. In case of any disagreement, the Head/Faculty-In-Charge of the concerned Section/Facility should inform Head CC before bringing the server to CC.*