

Institute of Technology Computer Center Base paper for discussion and comments

The Revered Founder of BHU Pt. M.M.Malviyaji was foresighted to start the Eng. College & other Technology departments at the very start of this university. The infrastructure and academic requirements of the Institute have been growing, but lately due to shortage of funds many basic facilities and services have been either sub-existent or altogether missing. The challenges of Higher Technical education have been growing due to exploding developments in New Technologies, providing enormous knowledge expansion and growth opportunities. It is also important to note that IT-BHU cannot continue to remain untouched by these demands and global requirements. It is therefore a matter of great satisfaction that due to the efforts of the University authorities and realization at the MHRD and UGC level, that this institute has been provided an up gradation opportunity that can make IT strong in Infrastructure, Globally Competitive and Nationally at the forefront of Research & Teaching in Technical Education. This opportunity is also a challenge to our ability to rise to the occasion and build the IT that can inspire and train the future generation of our students to face the challenges of innovation, creativity and knowledge generation which only can ensure development & progress of India in years to come.

System Design Assumptions:

1. The Student Strength of the Institute currently is:

UG	-	1600	÷ 3	≈ 550 Nodes (One Node for three students on sharing basis)
PG	-	500	÷ 2	= 250 Nodes (One Node for two students on sharing basis)
Ph.D.	-	<u>200</u>	÷ 2	= 100 Nodes (One Node for two students on sharing basis)
Total		<u>2300</u>		900 _____

As per the National Computation availability norms the Institute must provide at least 1 Node for 3 students at UG level and 1 Node for Two students at PG & Ph.D. level.

This comes to total requirement of 900 Nodes in the Institute. Many departments and Sections have about 400 to 500 operational Nodes in various forms and also the first year lab has about hundred Nodes for Programming classes, which provide access to students at PG & UG level for about 12 hrs/day. This needs augmentation by about 500 additional systems on 12 hrs/day operation schedule. If however, we operate on 24 x 7 schedule the number of terminals can be reduced to 250. The Breakup for these 250 Nodes, systems wise will be 200 P4 level normal Desktops and 50 Design W/S. To provide the different facets and services it will be required to have at least 8 Servers to meet the Development, Application & Teaching / Project work of the students.

2. Storage Needs:

Since every student and faculty must be provided access and storage work space hence as per current norms we shall need about 1 GB for 1st & 2nd yr and 2 GB for 3rd and 4th yr student an account of project load at UG level. In PG & Research Scholars we need to provide 2 GB at 1st yr and 3 GB at 2nd yr. level with 4 GB for the Research Scholar. This defines the minimum storage as-

1 * GB * 800 – 800 GB	}	UG
2 * GB * 800 – 1600 GB		
2 * GB * 250 – 500 GB	}	PG ~ 5 TB
3 * GB * 250 – 750 GB		
4 * GB * 200 – 800 GB	}	Research Scholar

For the faculty it is proposed to provide at least 10 GB of storage space and with 1 GB shareable part. Considering the current faculty strength of 300 we need 300 * 11 GB = 3.3 TB.

For ERP and other activities we need about

Student Records	-	}	7 TB
Faculty Records	-		
Non Teaching Records	-		
Institute Documentation Records	-		

The total requirement comes to 15 TB

3. Computational Needs:

The system will be used by four types of users:

- Faculty for their R&D needs from respective departmental Nodes.
- Students for their practical / Project needs from department / CC premises.
- Faculty from remote location through Internet and BHU Intranet.
- Students, Alumni and other stake holders through Internet from remote locations.

The Computational load would be for five types of services.

- Applications running on HPC for modeling and simulation using special software like Ansys, Femlab, Hyperchem etc.
- ERP services for office, faculty & student and Institute management.
- DB services for storing & retrieving data pertaining to various institute activities.
- Intranet, Internet & Web Services.
- File services for providing personal filing system to faculty, students & support staff.

Besides the above services the CC would have to provide, Authentication, Proxy access, Software Development and Patch management, License Management, and user management, Network management and security management.

The Preliminary setup is as given in next page.

4. Space Requirement:

A) Server Space: For meeting the need of about 900 Nodes out of which 600 are located on the campus and 250 will be located at site the need of seven servers and one HPC will be necessary to start with.

Space for HPC – 70 sq.m. [Single Rack]

Space for 7 Servers – 75 sq.m. [Quad Rack]

B) Switch and SAN space:

Enterprise Switch : 15 sq.m. [Rack]

Distribution Switch : 25 sq.m. [Rack]

SAN Boxes (x 3) : 45 sq.m. [Rack]

C)

i) 200 Nodes for general purpose access to each node for

$200 \times 2.5 \text{ sq.m.} = 500 \text{ sq.m.}$

ii) 50 Nodes for High end Graphical W/S users in separate cubicles:

$2.55 \text{ sq.m.} \times 50 = 150 \text{ sq.m.}$

D) Control and System Administration space:

with five and seven consoles : $7 \times 4.5 \approx 30 \text{ sq.m.}$

E) UPS and Anxillary Components:

i) Printer Space : 15 sq.m. [2 Line Printers]

ii) Laser Printer : 12 sq.m.

iii) UPS Space : 45 sq.m. [2 x 50 KVA] [4 hrs backup]

F) Meeting Space : 40 sq.m.

Total space needed : $900 \text{ sq.m.} \approx 1000 \text{ sq.m.}$

The committee feels that ideal place would be to have a floor on top of the current Library but as the time is short hence if F-5 and F-6 are provided by the Institute it would serve the purpose.

5. Power and Electrical Load Due to Air Conditioning & Systems:

A) Air conditioning requirement: the 1000 sq.m. space would generate heat load of 250 persons@200 WH and M/C load at 100 WH the HPC and servers would contribute about 7 KWH and the Temperature difference for worst case design would be at ambient of 50° C and inner temperature to be maintained at 23 to 25° C. This

would be achieved by having at least 7KWH + 250 x 200 WH + 250 x 100 WH + 25 x 100 WH = 90 KWH \approx 100 Tons.

As the central AC system has not been very successful due to poor maintenance of the equipment and the current split overhead systems are as efficient hence it is proposed to have 2.5 Ton x 30 systems to provide the ambient temperature control in the area with proper thermal insulation of surfaces and floor & ceilings.

B) Electric load would be about

AC Load	=	100 KWH
System Load	=	100 KWH
Total	=	200 KWH

6. Network Requirement:

The IT campus has four main functional Blocks, Housing Chemical, Ceramic, Pharmacy & Applied Physics Departments in one Block.; Electrical, Bio-Chemical, Bio-Medical, Applied Maths, Applied Chemistry, Mechanical, Civil, and Electronics Departments in second Block.; Computer Engineering Department in third Block, and Mining, Metallurgy Departments in the fourth Block. While these Blocks are connected on the existing BHU network and the second level would be to connect on WiMAX Connectivity through supplementary wireless Network from three towers. Which will have to be fed by fiber links from Enterprise switch. The first tower can be above F-5, while the other two towers would need fibre link of 600 mtrs. and 1.2 kms respectively for first and fourth Block. The third Block would have access from the tower at F-5.

The Internet linking would need a link bandwidth of 8 MB and the same will have to be obtained from ISP like BSNL/ Reliance/ Sify at competitive rates. The link to BHU Network and Internet ISP would be through a Firewall & IDS and the WiMAX would have WEP security through appropriate measures.

The local Nodes would be connected by UTP Cat 6e cable and the servers would be connected on 10 GB Ethernet fiber link.

7. To provide Library Service to the IT user community and e-library access the necessary server of IT library would be integrated on a special FO link to the IT library.

8. The IT CC system would provide Application support, Software Development Environment and Language & e-learning services as requested.

Issues for Resolving with the external Agency

- 1) Power Supply
 - a) Estimate & availability
 - b) Solar Panel [Part Load]
 - c) UPS and Backup System

- 2) Server farm & Switch
 - a) 1 HPC & 6 High End Servers including NAS server,
 - b) 10 x 3 TB SAN, or EVA of 500 GB x 60.
 - c) Enterprise Switch 7604, distribution switches and IDS/ ADS/ Routers

- 3) Computation Nodes & Networking
 - a) 200 Nodes like PC's /Thin Client / Laptop
 - b) Network on Switches at level 3 & 2
 - c) 50 W/S for High end Design / Computing
 - d) Wireless Access on WiMAX

- 4) Furniture and A/C
 - a) Layout of Electric / Net / Segment
 - b) Air and Environmental conditioning.
 - c) Table and Chairs

- 5) Server Room Partition
- 6) Printing & Peripherals
- 7) Intranet Management & Control
- 8) Software services & security.

The Three Committees to complete the project in short time of 4 months shall be:

- Tendering, Negotiation & Policy.
- Requirement & Services.
- Operational & Management.

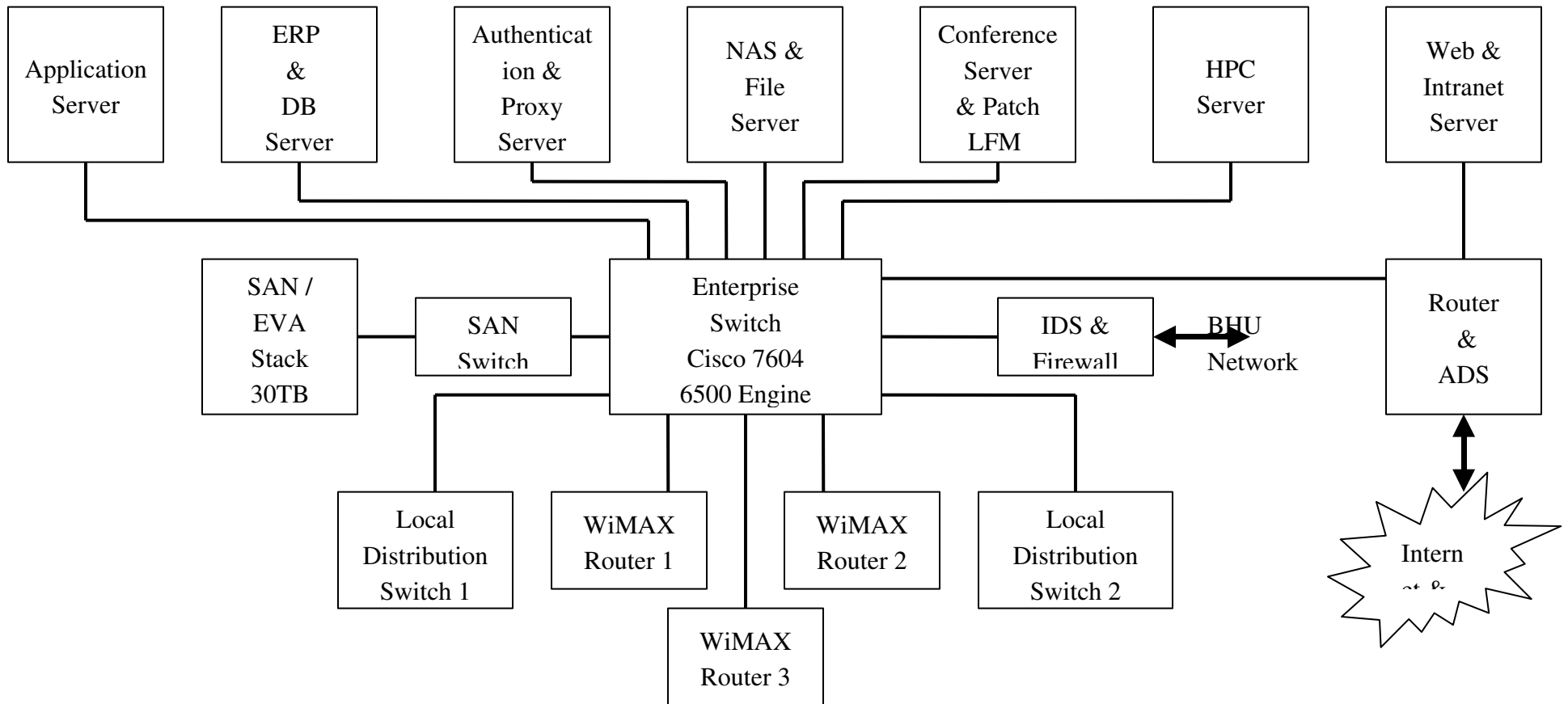
Base Members are –

- Prof. J.N.Sinha [Tendering, Negotiation & Policy]
- Prof. K.K.Shukla [Requirement & Services]
- Prof. P.K.Jain [Operational & Management]
- Prof. S.K. Kak [Coordination]

The following Vendors may be invited for the bid and called for presentation/ negotiation/ discussion:

IBM /Lenovo

1. HP / Compaq
2. Sun / Wipro
3. SG / Tata Elxsi
4. HCL Technologies



The System will have RedHat Linux Enterprise Server 4/5 as the OS and High Performance Computer (HPC) also be a Linux Cluster of 16 Node Xeon Processor with 4Gb RAM. All other servers will be Quad Processor Servers with 1 Gb RAM. The Enterprise Volume Array would need HP Service Guard and QLogic 8.0x.xx with HP Command View EVA and Business EVA v3.2. All other Routers and Switches would be from Cisco including WiMAX System routers. All application Software would have floating Licenses and the same would be managed by LFM and every software update shall be managed by the patch server automatically. The basic Enterprise Switch connectivity is on 10Gb Fiber links while the local network is on Gigabit