

The Indian Institute of Technology (IIT), Bombay, is ranked amongst the leading educational institutions in the country. The institute recognised the need to upgrade its dated communications infrastructure to one that provided robust 24x7 connectivity. The idea was to increase efficiency, improve network connectivity and reduce downtime. tele.net traces the development of the institute's IT and telecom infrastructure...

### **Background**

The institute was established in 1958 at Powai, a northern suburb of Mumbai. It was the second IIT to be set up in the country after IIT Kharagpur.

IIT Bombay has 14 departments including aerospace engineering, chemical engineering, chemistry, civil engineering, computer science, earth sciences and electrical engineering. It also has 10 separate centres dedicated to a variety of disciplines ranging from nanotechnology to aerospace designing.

### **Legacy system**

Initially, the campus had a very simple and heterogeneous communications infrastructure. Each department had its own IT and telecom set-up, with little interface between various departments. There were islands of information which hindered timely coordination amongst departments, and the probability of data being replicated was extremely high.

### **The shift**

IIT Bombay realised that it required a system overhaul involving new technologies and solutions to improve the functioning of its communications set-up. The institute had a two-pronged agenda: replace or upgrade outdated applications and attain seamless communication while ensuring security and business continuity.

A multi-tiered telecom infrastructure was put into place. The key elements of the network included approximately 20 km of fibre optic cables for computer networks, 104 Mbps of internet

bandwidth, 10,000 nodes of which around 7,500 are currently being used, and 40 km of copper cables for telephones.

In addition, multiple wide area network (WAN) technologies were adopted to ensure connectivity. The institute makes use of digital loop carrier (DLC) (local), ISDN, VSAT, multi-protocol label switching (MPLS) and internet protocol virtual private network (IP-VPN).

VSATs are utilised for its distance learning programmes, wherein lectures by the institute's faculty are broadcast to teachers and industry professionals in various locations across the country through remote satellite centres. The VSAT footprint covers the entire country, thus making it possible to set up remote centres anywhere. Ku-band frequencies with an uplink frequency of 14 MHz and downlink of 11 MHz are used by the VSATs.

Similarly, MPLS has helped IIT Bombay achieve higher network scalability, simplified network service integration, integrated recovery and simplified network management.

For internet access, optic fibre and wireless connectivity were put in place. Optic fibre connectivity provides a higher rate of data transfer and bandwidth and connectivity across longer distances in comparison to other mediums. It is cost effective as well.

Several security solutions were adopted. These include access logs, security audits, user authentication, firewalls and proxy servers. Also, applications such as enterprise resource planning (ERP) and supply chain management (SCM) are being used by research groups within the institute.

For disaster management, IIT Bombay uses the services of two vendors for internet bandwidth. This is necessary to avoid downtime. In addition, the campus network is a closed one with a ring topology, and can switch over immediately to the back-up in case of any break in connectivity.

### Benefits and challenges

The new, upgraded communications infrastructure has afforded multiple benefits to the institute. Seamless connectivity anywhere on campus has been achieved, and the response time of all processes has improved. Data and information are no longer vulnerable as stringent security measures have been enforced.

The institute did not face any major challenges while upgrading its communications infrastructure. Amongst the current issues is the security of the wireless network. Also, the network needs to be expanded to reach all parts of the campus.

Plans have been made to increase the optic fibre and copper cable capacity by around 20 per cent, and internet bandwidth by three times. The institute also wants to add voice over internet protocol and wavelength division multiplexing technologies to its telecom infrastructure, and expand the network to all residential areas in the campus using managed switches.

Net, net, IIT Bombay's timely upgrade of its communications infrastructure has gone a long way in helping the institute achieve its objective of increasing network efficiency, improving connectivity and reducing downtime.

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