



Remote Control: Investigating crystal structures across continents

Scientists in India use the TEIN3 high-speed network to operate a 'super-microscope' in France for innovative drug design

From laboratories to collaboratories

With an increasing demand for specialists, precision scientific instruments and the current global financial situation, it is becoming more and more challenging for individual research institutes to continue funding scientific projects. It is, therefore, imperative that laboratories pool resources, conducting experiments and having access to scientific instruments and datasets across geographical boundaries.

This is particularly important for researchers in fast developing countries, where participation in e-Science – international scientific collaborations requiring substantial bandwidth and computing power – helps build a national knowledge base and close the digital divide, potentially covering the loss of highly qualified scientists and delivering research to benefit society.

Thanks to TEIN3, the research and education internet network that provides high-speed connectivity between Asia and Europe, such a collaborative environment that virtualizes experiments, data access, processing and data analysis is now available to European and Indian scientists.

From Mumbai to Grenoble and back: TEIN3 enables remote experiments

In a series of international collaborative experiments, scientists at the Homi Bhabha National Institute, India (HBNI) relied on TEIN3's fast internet access to connect remotely to the third generation European Synchrotron Radiation Facility (ESRF) in Grenoble, France using the collected high-quality protein crystallographic data for the design of new drugs.



ESRF synchrotron facility, Grenoble, France
(Photo Credit Denis Morel, ESRF)

The Challenge

To meet BARC's objectives to access world-class synchrotron facilities in France from India for crystallography experiments.

The Solution

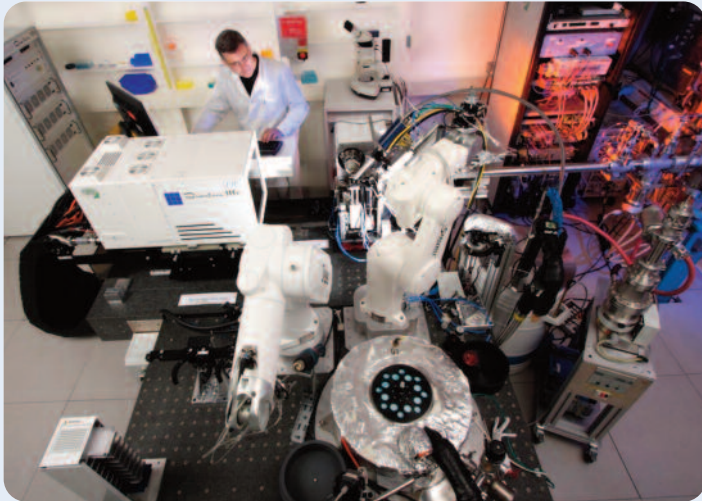
Through its connection to NKN, the Indian research network, BARC scientists are able to access the high-capacity, secure TEIN3 and GÉANT regional internet networks. These networks provide a fast route to operate remotely a super-microscope in France to collect and exchange large crystallographic datasets.

Key Benefits

TEIN3 enables scientists in India to conduct crystallography experiments remotely for the design of new drugs, giving them more control over how research is conducted and results analysed.

Expensive to build and operate, synchrotron resources can be compared to 'super-microscopes,' revealing valuable insights into the structure of matter. Third generation synchrotrons are available in only very few countries.





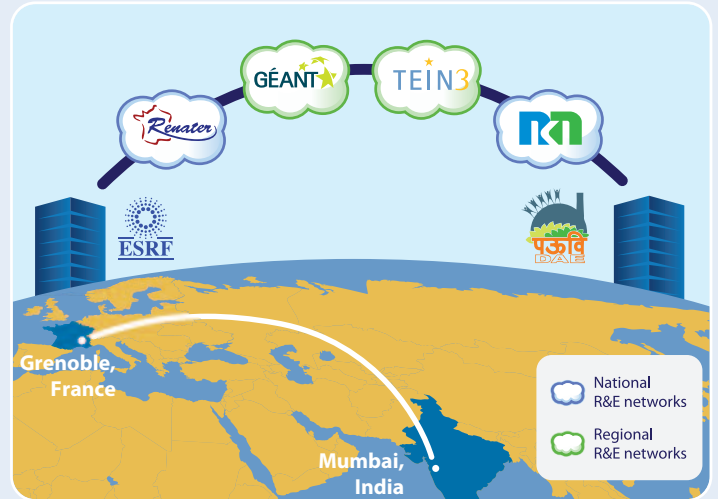
Remotely controllable experiment set-up at ESRF. (Credit: CEA)

The experiment was part of an on-going collaboration between Dr. Jean-Luc Ferrer at IBS (Institut de Biologie Structurale)/ESRF and Dr. M.V. Hosur and colleagues at BARC (Bhaba Atomic Research Centre), under an MoU signed between BARC and CEA (the French Atomic Energy Commission), for co-operation in the field of Life Sciences.

Since the establishment of the Remote Data Collection Facility, fifteen good quality data sets have been collected on protein samples and less experienced members of the BARC team have been trained to use ESRF's mega facility.

"TEIN3 has given us more control over the way we conduct our experiments, the way our research is conducted and results analysed. Without this network we would not have easy and fast access to ESRF's world class facility. The process demonstrates that research is becoming more democratic and transparent."

Shri Jagadeesh, Head, Grid Et Networking Section, Computer Division, BARC (BARC, Mumbai)



The route of data between the Indian and French institutions, via dedicated national and regional research and education Internet networks.

This remote experiment was only possible thanks to the respective research and education networks: TEIN3 the Asia-Pacific regional network, GÉANT, its pan-European counterpart, and the national research and education networks NKN, India and RENATER, France.

The networks enabled the teams from BARC and ESRF to transfer large datasets between institutions. These dedicated, reliable and stable networks also enable scientists to record the provenance of results, helping them repeat the experiment or conduct future experiments at a faster rate.

Before this remote usage collaboration, individuals from BARC flew to Grenoble with samples to carry out the experiments with significant expense and disruption of travel.

The experiment was facilitated by EU-IndiaGrid2, a Grid/distributed computing infrastructure between Europe and India providing interoperability between the networks, allowing researchers to virtualise the experiments, and providing data access, data processing and analysis.

TEIN3 – the research and education network for Asia-Pacific

- the third generation of the Trans-Eurasia Information Network
- dedicated high-capacity IP network for the research and education communities across Asia-Pacific
- provides direct connectivity to GÉANT and a gateway for global collaboration for over 50 million users in Asia-Pacific
- supported by €11.4m EU funding until 2012

For more information:

TEIN3: www.tein3.net
 GÉANT: www.geant.net
 NKN: www.nkn.in
 Renater: www.renater.fr

BARC: www.barc.ernet.in
 ESRF: www.esrf.eu
 EU-Indiagrid2: www.euindiagrid.eu
 EC: http://ec.europa.eu/europeaid/index_en.htm

