

campus design, operations, security and monitoring and management.

The development programmes run by NSRC and TEIN have already helped to build both human and technical capacity within local institutions and countries, providing a stronger foundation for research and education communities across the region. This is already driving greater international collaboration, benefiting students, universities and the wider population of these countries.

Challenge

Ensuring that countries and their institutions can make full use of the speed and capacity of the TEIN network is vital to international collaboration. Having the local technical and human capacity in place is critical to avoiding bottlenecks and optimising the ability of academics to work with their regional and global colleagues.

Solution

Working together with the Network Startup Resource Center, TEIN*CC organised and ran eleven hands-on training and engineering support programmes in nine countries over the course of 2015/16. These activities trained over 500 people, and provided engineering assistance and equipment donations at nine universities and three R&E core network infrastructure locations.

Key benefits

The programmes delivered by NSRC have established a stronger foundation for research and education communities across the TEIN region, which in turn facilitates greater collaboration and more open scientific advancement for the benefit of member countries and their citizens.

Trans-Eurasia Information Network

TEIN is the regional research and education (R&E) network connecting scientists and researchers across

the Asia-Pacific region and globally. Co-funded by the EU and Asian partners, and managed by TEIN*CC, the network began operating in 2000 and now is available through the Asi@Connect project.

The Network Startup Resource Center

The Network Startup Resource Center which is based at the University of Oregon, was established in 1992 to provide technical assistance to organizations setting up computer networks in new areas to connect scientists engaged in collaborative research and education. For the past 25 years, the NSRC has helped develop Internet infrastructure and network operations communities in Africa, Asia/Pacific, Latin America/Caribbean, and the Middle East. The NSRC is partially funded by the International Research Network Connections (IRNC) program of the U.S. National Science Foundation and Google, with additional contributions from dozens of public and private organizations.



What is Asi@Connect?

The EU co-funded Asi@Connect Project provides a dedicated regional high capacity and high quality internet network, TEIN, for research and education (R&E) communities across Asia-Pacific and Europe, and leverages e-infrastutures developed for public service project.

For more information **TEIN** : www.tein.asia, www.teincc.org **NSRC** : www.nsrc.org **National Science Foundation** : www.nsf.gov

Disclaimer

This work has been produced with the financial assistance of the European Union for the Asi@Connect project under Grant contract ACA 2016/376-562. The contents for this document are the sole responsibility of TEIN*CC and can under no circumstances be regarded as reflecting the position of the European Union.



Developing network capacity

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Network training and engineering assistance

Science is an international affair. Researchers from different countries frequently collaborate with each other, a process made ever easier by the rise of international research and education (R&E) networks, such as TEIN.

However, no scientist connects directly to an international R&E network – they first link to campus or enterprise networks, and then their national R&E network (NRENs) in order to collaborate across the region and globally. It is vital that local institutions therefore have the right technology and skills in place to ensure that they are able to avoid bottlenecks that make it difficult to take advantage of TEIN's high-speed connectivity.

Therefore, part of the mission of TEIN*CC, the organisation that runs the TEIN network, is to support NRENs and local institutions to ensure that they are able to access the connectivity that it offers, both through technology and training local engineers. As well as supporting collaboration, this has a wider benefit - enabling academic access to the internet nurtures knowledgeable graduates who can then enter the private sector to offer internet services to the public.

To build human capacity in local institutions and NRENs, TEIN*CC partnered with the Network Startup Resource Center (NSRC), part of the University of Oregon. Through hands-on, lab-based curricula and

a train-the-trainers approach, NSRC provides technical capacity development, direct engineering assistance and equipment to thousands of network engineers working in hundreds of R&E institutions to augment their networking expertise. The aim is to ensure that institutions can properly design, implement and run high-speed networks on their own, with their personnel leading operations and future growth.

Between 2015-2016, TEIN*CC and the NSRC worked in close cooperation with partner institutions to conduct a series of hands-on network training and human capacity development programmes with research and education institutions in Bangladesh, Bhutan, Laos, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka and Thailand. The eleven programmes in nine countries had participants from all TEIN member countries and included engineering assistance to improve the infrastructure and NREN network operation centres. These activities trained over 500 men and women in the TEIN region, with direct engineering assistance at nine universities and three R&E core network infrastructure locations.

In four countries TEIN*CC and NSRC provided more intensive direct engineering assistance, working with local network staff to help improve operational network infrastructure.

Bhutan

NSRC personnel worked with the Bhutanese Research and Education Network (DrukREN) team as well as members of the Royal University of Bhutan (RUB), the Department of Information Technology and Telecom (DITT) and many other local and regional groups, helping to create a 10 Gbps national research and education network in Bhutan that is linked via the National Knowledge Network of India (NKN) and TEIN to the global research community.



Myanmar

Through a workshop at the University of Computer Studies, Yangon (UCSY), NSRC helped ensure that Myanmar's universities were ready to connect to the country's planned national research and education backbone (mmREN). After the workshop ended NSRC personnel worked with UCSY staff to help install new routers and switches donated by the NSRC as part of a major infrastructure upgrade to the campus network. As part of this effort NSRC and UCSY personnel installed

and configured network monitoring and management software for the updated network and helped to design an even more scalable campus backbone going forward.



Laos

NSRC trained 31 engineers from the National University of Laos (NUOL) and other institutions on campus network design. The team then provided direct engineering assistance to NUOL IT staff working on the second phase of the redevelopment of NUOL's campus infrastructure. Together NUOL staff and the NSRC team worked on improving networking links, updating the campus network core and installing building and departmental distribution and access switches donated by the NSRC to LERNET. Finally, the NSRC team assisted with improvements to the local network monitoring and management infrastructure, and assisted in the development of LERNET, working towards an operational NREN for the Lao People's Democratic Republic.

Sri Lanka

NSRC was invited to visit three universities within Sri Lanka by the Lankan Research and Education Network (LEARN), providing direct engineering assistance with their current campus network operations. These instantly improved performance and traffic delivery from LEARN to TEIN, with visible increases in IPv6 network traffic. With each university planning to scale its infrastructure for increased capacity and better redundancy to keep up with user demand, NSRC also discussed best practice