Working together to build a regional network: TEIN

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ABSTRACT

With globalization, there is a great need not only for the commercial entity to have good internet connectivity, researchers also need good connectivity. Over the past year we have seen the "birth" of a number of National Research and Education Networks(NRENs) in the ASIA region. One of the factors that has accelerated the growth and formation of NRENs and interconnection of the NRENs with high-speed link within the region as well as with Europe, is the Trans Eurasia Information Network(TEIN) project. The paper will talk about the community working together to grown and take ownership of the management of the regional network in TEIN4 with the formation of the TEIN*CC entity.

Keywords

National Research and Education Network, National Grid Initiatives

1. INTRODUCTION

The government in the ASIA region has long recognized the importance of IT and research to the future of the country with major initiatives. They initiated a number of initiatives both nationally and regionally to build the required infrastructure to facilitate the researchers and educators to work in this global collaboration environment. A critical infrastructure component is the network connectivity to the global research and education community. Thus, we have seen the rise to the formation of National Research and Education Network in the region.

Section 2 will provide the background of the rise of the National Research and Education Network in the ASIA region and its evolution over the years in particular with the start of the TEIN2 project. Section 3 will focus on the new entity TEIN* Cooperation Center (TEIN*CC) and its continue role in the region. Last but not least section 4 will highlight some of some the challenges faced by the research community in the region.

2. Background

The Internet2 initiatives[1] in the mid-1990s has sparked a number of National Research and Education Network initiatives in Asia, eg. Singapore Advance Research and Education Network[2]. The National Research and Education Networks (NRENs) has quickly and surely proven their worth. In the case of Singapore, it has grown to support the many distance learning program with renown institution and universities. It has also enabled researchers to participate in major international initiatives.

1.1 Network Connectivity

In 1996, in the Asia Pacific region a regional network organization was formed Asia Pacific Advanced Network Consortium (APAN)[3]. It has been quite successful in linking up a number of NRENs in the region, eg. Thailand, Philippines, Singapore. Most of the above NRENs, were connected to Japan and/or Korea as well as to international exchange point STARTAP at Chicago, USA. Thus, most of the traffic between neighboring countries will transit their traffic via USA.

In Oct 2000, the Trans-Eurasia Information Network (TEIN) Initiative has it humble beginning as one of new initiatives endorsed by ASEM3 (Seoul, October 2000) to connect ICT infrastructures between Asia and Europe. Its aim has been to contribute to enhancing exchanges and cooperation between Asia and Europe through increased and more effective information flows; enhanced and diversified research exchanges and cooperation between Asia and Europe; expanded and diversified faster and more powerful telecommunication connections between Asia and Europe. At the beginning, in 2001, it was a 10 Mbps ATM link between Korea and France, providing transit service to neighboring countries in the region, eg. Singapore, China, Japan. The bandwidth was progressively upgraded to 155 Mbps due to the high bandwidth usage when the TEIN project(better known as TEIN1 project) was complete, in Jan 2006.

In 2004, there was a big initiative by the European commission(EC) to not only link the region to Europe but also work together with the other entities in the region, eg. Asia Pacific Advanced Network Consortium(APAN) and the various NRENs to build a high speed network within the region. The project is called Trans-EurAsia Information network (TEIN-2) project [4], funded by EC and managed by DANTE. The TEIN network, shown in figure 1(a) is formed from the purchase of new links as well as links contributed by different organization/projects in the region. The network became operational at end-2005.

The project transformed the entire international network connectivity landscape in the region. The speed of the links were

increased by multiple folds, from 10s Mbps to 100s Mbps to Gbps and what is more important the traffic between countries in the region were transiting their traffic within the region. This, helps in reducing the Round Trip-time (RTT) of communication between neighboring countries tremendously. The other major impact of the TEIN-2 project in terms of connectivity is the multiple high speed links to Europe. This links enable direct collaboration with Europe, where previously the traffic would have to transverse USA causing high latency delay, eg. Singapore(SG) to Europe via USA is approximately 400 milliseconds while the RTT is 279 milliseconds through the direct link of TEIN-2.

During the TEIN3 project period, the TEIN network has stretch its wings to cover other countries in South Asia, (Sri Lanka, India, Pakistan, Bangladesh, Nepal, and Bhutan). The community has grown from 11 NRENs to over 19 NRENs and number of researchers benefiting from the network has more than doubled. The growth and pervasiveness of the network can be seen by comparing the two network maps in figure 1.

To monitor the performance of the network, PerfSoNAR are deployed at various network hub in the TEIN network. The TEIN NOC is responsible for the operation of the network and updates the TEIN technical committee and NREN network engineers on the performance of the network on a regular basis.

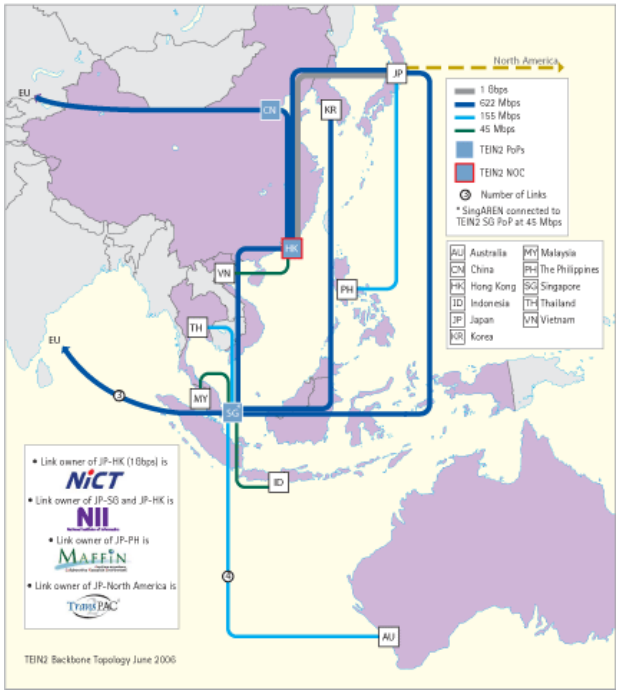

Figure 1(a): TEIN-2 network map

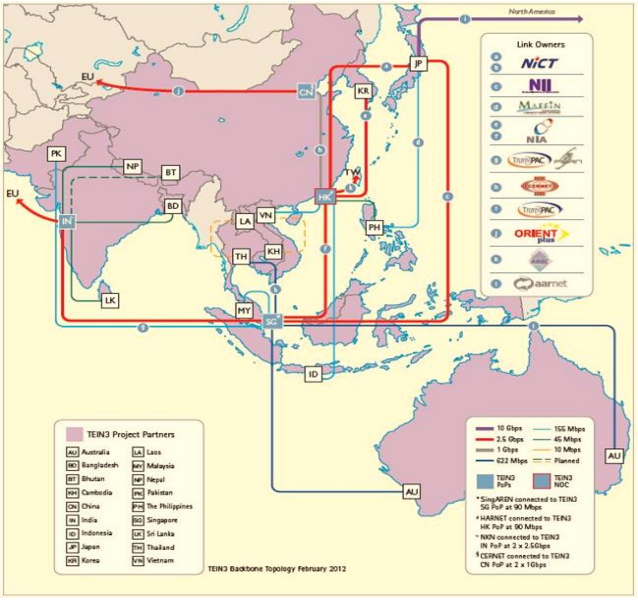

Figure 1(b): TEIN3 network map

1.2 Applications

Another aspect that defines the success of NRENs are the advanced applications that it has enabled. We can group applications into a number of categories.

- Big Science projects

  Big Science require the transfer of large amount of data and high computation needs. A good example is the THEOS project[5] where the Thailand Earth Observation Satellite collects high-resolution images for analysis and deployment in areas such as cartography, land use, crop yield forecast, etc.. Areas outside the ground receiving station are received by the station in Kiruna, Swedan and these images are transmitted via GEANT and TEIN network to Thailand for processing. In applications like disaster mitigation and response, the timely delivery and processing of data is of utmost importance. Other examples are Climate modeling and simulation, Bioinformatics.

- Distance Education

  These applications are characterized by the low latency requirement for effective communication between the parties. Although, the bandwidth requirement of these set of applications may not be significant the network latency is critical, usually less than 300 millisecond. In the special case of Telesurgery the bandwidth requirement is much higher. Within the region, the TEIN network has supported a number of Telesurgery events using the Digital Video Transfer System (DVTS) which requires high bandwidth.

On top of the above types of application are the general usage of the network for collaboration with other researchers globally using their various collaboration tools.

The TEIN network also supports network application/experiments, eg. CanalAvist[6] using the network

technology, multicast, to experiment with more effective disseminations of live video seminars among the community.

3. TEIN4 and TEIN*CC

ASEM leaders in ASEM6 (September 2006, Helsinki) acknowledged the important role of the TEIN2 in extending connectivity between Asia and Europe in the fields of research and education, and supported its application into broader areas, and also, in ASEM7 (October 2008, Beijing) ASEM leaders recognized the success of the TEIN in fostering research collaboration between all ASEM partners, welcomed the launch of TEIN3 and renewed their commitment to its long-term sustainability.

In the ASEM8 Summit in Brussels on October 2010, the Leaders endorsed the next phase of TEIN (TEIN4) and the establishment of the TEIN* Cooperation Center(TEIN*CC)[7] in its Chair's Statement. (Article 79) Leaders recognized the important role played by the Trans-Eurasian Information Network (TEIN) project in increasing direct internet connectivity among research and education in Asia and between Asia and Europe. The TEIN4 project is funded by the EC, Korea and NREN partners.

In TEIN4 project, there was a major change which is the operation and management of the project will be by TEIN*CC, a local entity. On the 4 May 2012, TEIN*CC was officially launched at its office at Seoul. TEIN*CC is hosted by the Republic of Korea with financial contributions from participating ASEM partners.

Figure 2 shows the TEIN4 network map, which has greater bandwidth capacity and more pervasive network in the region. TEIN*CC will become more pervasive as new members are connected, eg. Afghanistan and in addition feasibility studies are been carried out in a number of countries in the region, eg. Myanmar, Mongolia.

The focus of TEIN4 will be increasing the usage of the network by user communities through greater promotion of the network and including a broad range of sectors for research and other non-commercial applications, in fields such as food security, health, earth and ocean observation related to natural disasters, government, education and training, and cultural heritage, and with an emphasis on applications of broad societal benefit. This is supporting the move towards achieving the UN Millennium Development Goals[8].

There are 2 central themes to the TEIN4 project:

- To give the highest priority to fostering the use of the TEIN4 network for applications of social benefit.
- To put in place funding and governance model that will allow it to be sustained beyond the TEIN4 planned period.

To meet the first goal, TEIN*CC has been actively organizing application workshops and training programs for the community. TEIN*CC has been working together with the NRENs and other organisations in the region and beyond, eg. APAN, such as Asian Institute of Technology(AIT)[9], Network Startup Research center(NSRC)[10] and Asia Pacific Network Information Center(APNIC)[11]. In 2013, TEIN*CC signed an Memorandum of understanding with Asia Pacific Network Information Center(APNIC), Asia Pacific Regional Internet Registry to jointly develop training program for the community. TEIN*CC has also been actively working with APAN in building the community. An example is the starting of a new group working in the area of Dengue Fever which affects a large number of the partner countries.

On the second goal, TEIN*CC has been set-up as non-profit foundation corporation govern by Korean civil act. In the organization structure is the Steering committee, which consist of elected representatives of the community as well as representatives from EC and Dante. The Steering Committee function is to provide input TEIN*CC executive committee on its ongoing activities as well as strategic planning.

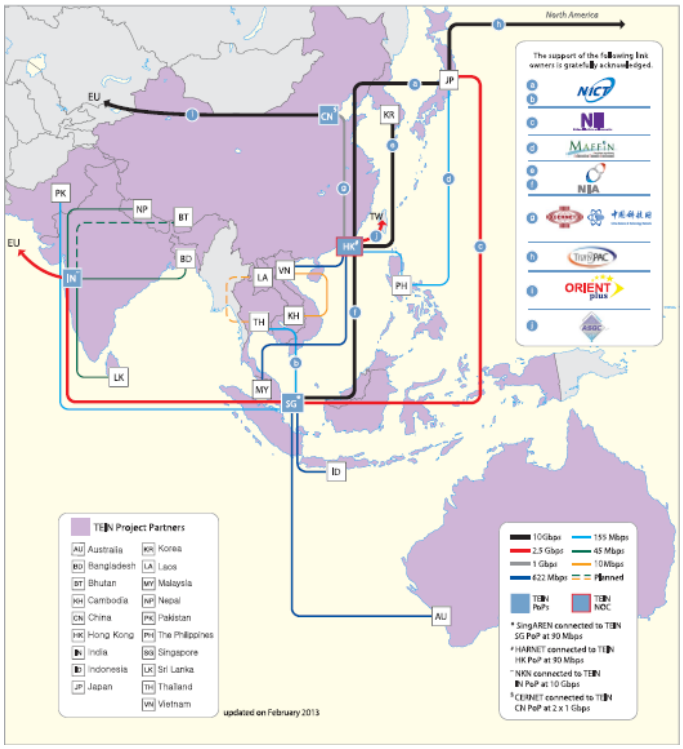

Figure 2: TEIN4 network map

4. Conclusion

The success of the TEIN project has been due to a large extend the collaborative nature of the community. Each member, whether they were beneficiary or non-beneficiary were willing to step forward to work together and in return all has benefitted from the collaboration in terms of a more pervasive and high-speed network which would not have been possible. The power of the community working together enable us to get a much better pricing in the tender, as we tender for a large network with

multiple links of various speed around the region. This has ensured that we achieve better price for the network links. By pulling our resources together we have a much bigger "voice". In addition, a number of organization has stepped forward to donate links to the TEIN network, further enriching the connectivity. As a result the net worth of the network is multiple times greater than would have been possible with the funding received. Member countries have step up at crucial moments to help each other, eg. VinaREN helping in the connection of the Cambodian Research and Education Network(CAMREN) to the TEIN network[12].

In addition, the TEIN network has also been instrumental in enabling global collaboration for the community. Researchers in the region are working more closely together as well as globally using the TEIN network. The beauty of TEIN is that once the NRENs are connected to TEIN network, the researchers and educators of the NRENs can freely access the entire network transparently.

Moving forward, the community marches knowing there are more challenges it has to face, but knowing that facing such challenges together will certainly bring success. During the TEIN4 period, we would more cohesive joint work with other organization, eg. World Bank, APAN to better serve the community. This is especially so for APAN which it has a close relationship since the start of TEIN2.

5. ACKNOWLEDGEMENTS

I would like to thank all the people involved in the various national and regional initiatives and from the APAN and TEIN members for the numerous discussions.

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