TEIN3

2nd Edition

TEIN3 – The Research and Education Network for Asia-Pacific

Connecting East and West

EU-funded project

DANTE

GÉANT

Chronology of a success story

2000 Oct
TEIN initiative launched at ASEM 3, Seoul, Korea

2001 Dec
2 Mbps France-Korea (TEIN1) link installed by RENATER and KISDI

2004 May
Start of first phase of TEIN2: feasibility study

2005 Nov
TEIN2 deployment announced by EU Commissioner Viviane Reding at World Summit on the Information Society, Tunis

2006 Jan
TEIN2 network operational and announced at 21st APAN meeting, Tokyo

2006 Sept
Official launch and recognition of TEIN2's success at ASEM 6, Helsinki

2007 Jan
Network recovers quickly after Taiwan earthquake

All partners participate in tele-medecine applications for first time

2007 Dec
TEIN3 contract signed

2008 May
Feasibility study on network extension to South Asia begins

2008 Oct
Recognition of TEIN2's achievements and announcement of TEIN3 at ASEM 7, Beijing

2008 Dec
TEIN2 successfully completed

TEIN3 enters service

2009 Dec
TEIN3 extended to South Asia

TEIN – a continuing ASEM success story

Launched at the Asia-Europe Meeting (ASEM) 3 Summit in Seoul in October 2000 to improve Euro-Asian research networking, the Trans-Eurasia Information Network initiative took off in December 2001 with the installation of a France-Korea connection (TEIN1). ASEM 6 in Helsinki in September 2006 marked the official inauguration of TEIN2, which extended the bilateral success of TEIN1 to the regional level by creating the first large-scale regional data-communications network for research and education across Asia-Pacific.

In October 2008, leaders at ASEM 7 in Beijing recognised the success of the TEIN initiative in fostering research collaboration between ASEM partners and renewed their commitment to its long-term sustainability by announcing TEIN3.

Another milestone was achieved at the end of 2009, when the network was extended to South Asia, thus bringing the Asian community further together.

Linking Asia-Pacific to Europe and beyond

The third generation of the **T**rans-**E**urasia **I**nformation **N**etwork (TEIN3) provides a dedicated Internet for research and education communities across Asia-Pacific. It operates at speeds of up to 2.5 gigabits per second – the equivalent of sending 30 blockbuster-movie files down a phone line every minute.

With westbound links to GÉANT, its pan-European counterpart, TEIN3 offers direct high-speed intercontinental connectivity. Users get the shortest and hence fastest possible network routes for their data traffic, which significantly improves the performance of many network applications. TEIN3 provides Asia-Pacific with a gateway for global collaboration, enabling more than 40 million users across the region to participate in joint projects with their peers in Europe and other parts of the world.

Driving innovative applications

With powerful network links now in place, researchers across Asia-Pacific are participating in world-class collaborative research projects in areas such as radio-astronomy, distributed (grid) computing, tele-medicine, climatology, crop research etc. TEIN3 enables regional scientists to respond to global challenges, such as food sustainability and climate change, while addressing local concerns. Advanced connectivity also supports cost-effective and time-saving e-learning initiatives, making education more flexible and accessible.

Many of the applications supported by TEIN3 are of high societal impact, thus bringing tangible benefits to the general population rather than solely serving the scientific community.

• Disaster warning

The 2004 tsunami and subsequent natural disasters have highlighted the need to improve hazard evaluation and early-warning systems. TEIN3 plays a key role in the timely transmission of global meteorological data, which permits faster local weather forecasting. In May 2009, for instance, reduced delays in the transfer of data from the German weather bureau to its counterpart in the Philippines, via the GÉANT and TEIN3 networks, resulted in correctly predicting the path of typhoon Emong, thus allowing timely, accurate and, ultimately, life-saving weather warnings to be given to the public.

• Post-earthquake relief efforts

In the aftermath of the catastrophic earthquake in Sichuan province in May 2008, researchers at the European Commission Joint Research Centre in Italy used the trans-Eurasia link to transfer high-resolution images of the stricken region to their colleagues in China to aid post-disaster reconstruction.

• Earth observation

Following its successful launch in October 2008, the Thai Earth Observation Satellite (THEOS) collects high-resolution images which are transferred from a North Pole station across the Nordic research network to GÉANT, and then across TEIN3 to Thailand and other regional nodes for analysis and deployment in cartography, land use, coastal zone monitoring and flood risk management.

THEOS satellite image of Phuket, Thailand

• Crop research

Rice is the lifeline of Asia. However, climate change and an ever-expanding population threaten food security not only in the region but elsewhere in the world. The main objective of the International Rice Research Institute (IRRI) in the Philippines is to help farmers improve their yields and thus sustain their livelihoods – a mission that calls for joint efforts across the globe and for high-performance networks, such as TEIN3, to facilitate data-intensive collaborative research. For instance, IRRI scientists join forces with their colleagues in other parts of the world to develop resilient, "climate-proof" crop varieties, a collaboration that requires the exchange of vast genomic datasets as well as the transfer of high-resolution geographic information system (GIS) data for vegetation analysis and yield forecast.

IRRI rice breeder, Dr Darshan Brar, at work in the lab in Los Baños, Philippines.

> *"21st-century earth observation generates previously unimaginable amounts of data. The TEIN3 network allows us to make the high-resolution THEOS images available immediately to the GISTDA THEOS portal and other analysis centres across South East Asia."*
>
> Chanchai Peanvijarnpong, Deputy Director, Thai Space Agency (GISTDA)

• Tele-medicine

TEIN3 assists trainee surgeons throughout Asia-Pacific to adopt complex clinical techniques, such as endoscopic surgery, by supporting interactive tele-surgical training. Enabled by the fast and stable network connection provided by TEIN3, Digital Video Transfer System (DVTS) permits high-quality streaming of a live surgery event in near-real time from an operating theatre to a remote classroom. By facilitating interaction with European medical teams, like the European Institute of Tele-Surgery in Strasbourg, TEIN3 and GÉANT give an additional boost to the dissemination of best medical practice across the two continents.

• Socio-economic sciences

The INWA Grid project demonstrates how an intercontinental network infrastructure can help social scientists understand global market dynamics. Using grid technologies deployed over TEIN3, researchers in the UK, China and Australia can analyse distributed market data and use the results to develop predictive models of consumer behaviour.

• e-Learning

One of many examples is the CanalAVIST initiative which promotes an alternative, cost-effective way of providing education across Asia-Pacific: via live video links – courtesy of TEIN3 – students can attend lectures held thousands of miles away. Similarly, CanalAVIST organises virtual discussion fora around specific topics through a series of talks streamed over TEIN3 and GÉANT from various sites in Asia-Pacific and Europe.

South meets East: Bringing the Asian community together

Building on the achievements of its predecessors, the TEIN3 project marks a further major step towards an inclusive information society in the Asia-Pacific region: not only does the new network provide upgraded link capacity, it also expands its geographical footprint to connect the South Asia sub-region and other interested countries, such as Cambodia.

Promoting regional development

TEIN3 promotes digital inclusion and stimulates growth in national research networking in the developing countries participating in the ASEM initiative.

Many of the applications supported by TEIN3 have a high societal impact, thus contributing significantly to social cohesion and development in the region.

> *"We regard TEIN2 as a huge success: it has connected Asian and European research and education communities for the first time, thereby promoting scientific co-operation among ASEM countries.*
>
> *The European Commission's funding for TEIN3 reflects the importance that we attach to co-operation with ASEM countries as well as our commitment to promoting research and education for the benefit of societies in other regions."*
>
> Geoffrey Barrett, ASEM Co-ordinator of the European Commission

Thinking ahead...

The TEIN3 project aims to

- operate the Asia-Pacific regional network
- support and promote collaborative applications
- extend geographical coverage of the network
- transfer project management to Asian ownership
- develop funding models for long-term sustainability
- pave the way for TEIN4.

Project partners and funding

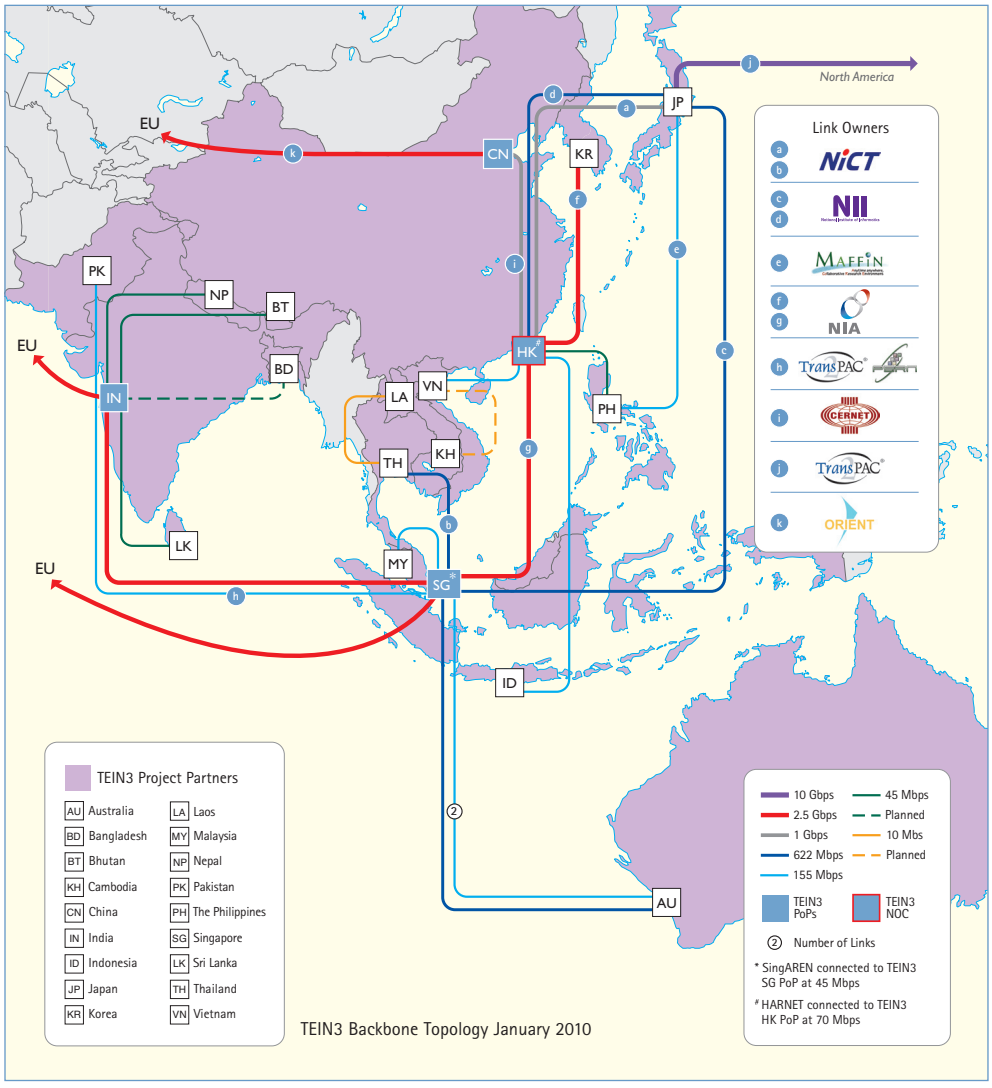
The TEIN3 project is co-ordinated by DANTE, a not-for-profit organisation that operates regional networking projects across the globe. For TEIN3, DANTE is partnered by RENATER, SURFnet and JANET, the national research and education networks (NRENs) of France, the Netherlands and the United Kingdom, respectively.

The Asian partner networks are Bangladesh (BdREN), Bhutan (tba), Cambodia (CamREN), China (CERNET and HARNET), India (ERNET), Indonesia (INHERENT), Japan (JGN2plus, SINET3 and MAFFIN), Korea (KOREN), Laos (LERNET), Malaysia (MYREN), Nepal (NREN), Pakistan (PERN2), the Philippines (PREGINET), Singapore (SingAREN), Sri Lanka (LEARN), Thailand (ThaiREN) and Vietnam (VinaREN).

The Australian NREN AARNet and the NFS-funded TransPAC2 programme are also actively participating.

Supported by €12 million from the European Commission and with substantial funding and capacity by the Asian partners, the TEIN3 network will operate until 2011.

> *Joining TEIN2 made a huge difference to the research and education sector in Indonesia. For the first time collaboration was possible, not only nationally, but globally. Being part of the TEIN project and having access to the network bring so much more than bilateral links – it means joining a community.*
>
> *Today it is impossible to imagine not being a part of TEIN3 – it is Indonesia's connection to the rest of the academic world.*
>
> **Intan Ahmad, Institut Teknologi Bandung (ITB), Indonesia**



TEIN3 Backbone Topology January 2010

TEIN3 topology

The diagram opposite shows the network topology as of January 2010. Circuits are up to 2.5 Gbps. The capacity of most links has been upgraded compared to the predecessor network to meet increased demand from the user community.

TEIN3 comprises four network hubs (PoPs) in Beijing, Hong Kong, Mumbai and Singapore, connected to GÉANT in Europe via high-speed links on northern overland and southern sea-cable routes. A fifth TEIN3 hub in Tokyo is managed by APAN-JP. In addition, TransPAC2 provides transit for TEIN3 partners with North America. A significant amount of the network capacity is generously provided by TEIN3 partners as illustrated in the map. The remainder has been procured directly through the TEIN3 project.

The TEIN3 network is managed by Tsinghua University from a purpose-built network operations centre (NOC) in Hong Kong.

www.tein3.net

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www.geant.net www.dante.net ec.europa.eu/europeaid/index_en.htm

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