

TEIN3

Richard Hughes Jones
OGF31 EU-Asia Workshop
DANTE
23 March 2011

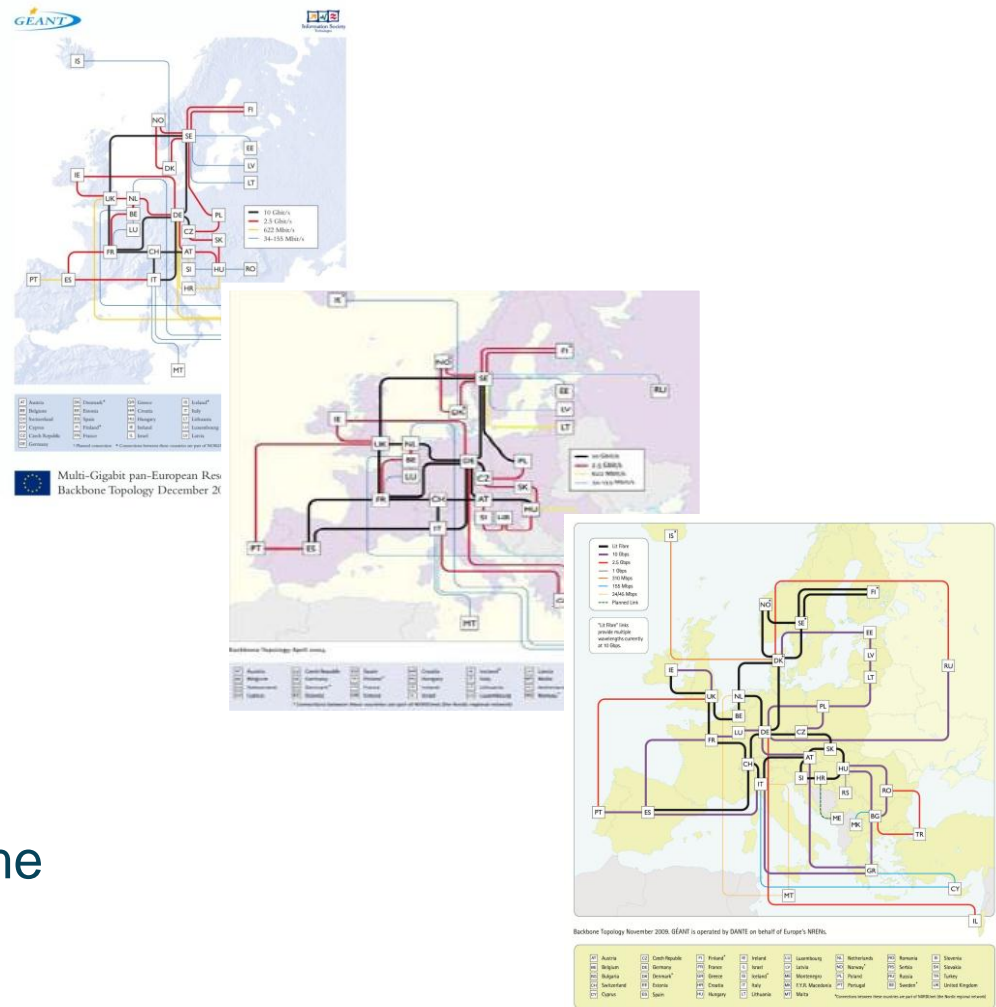


GÉANT: a European Success Story **TEIN3**

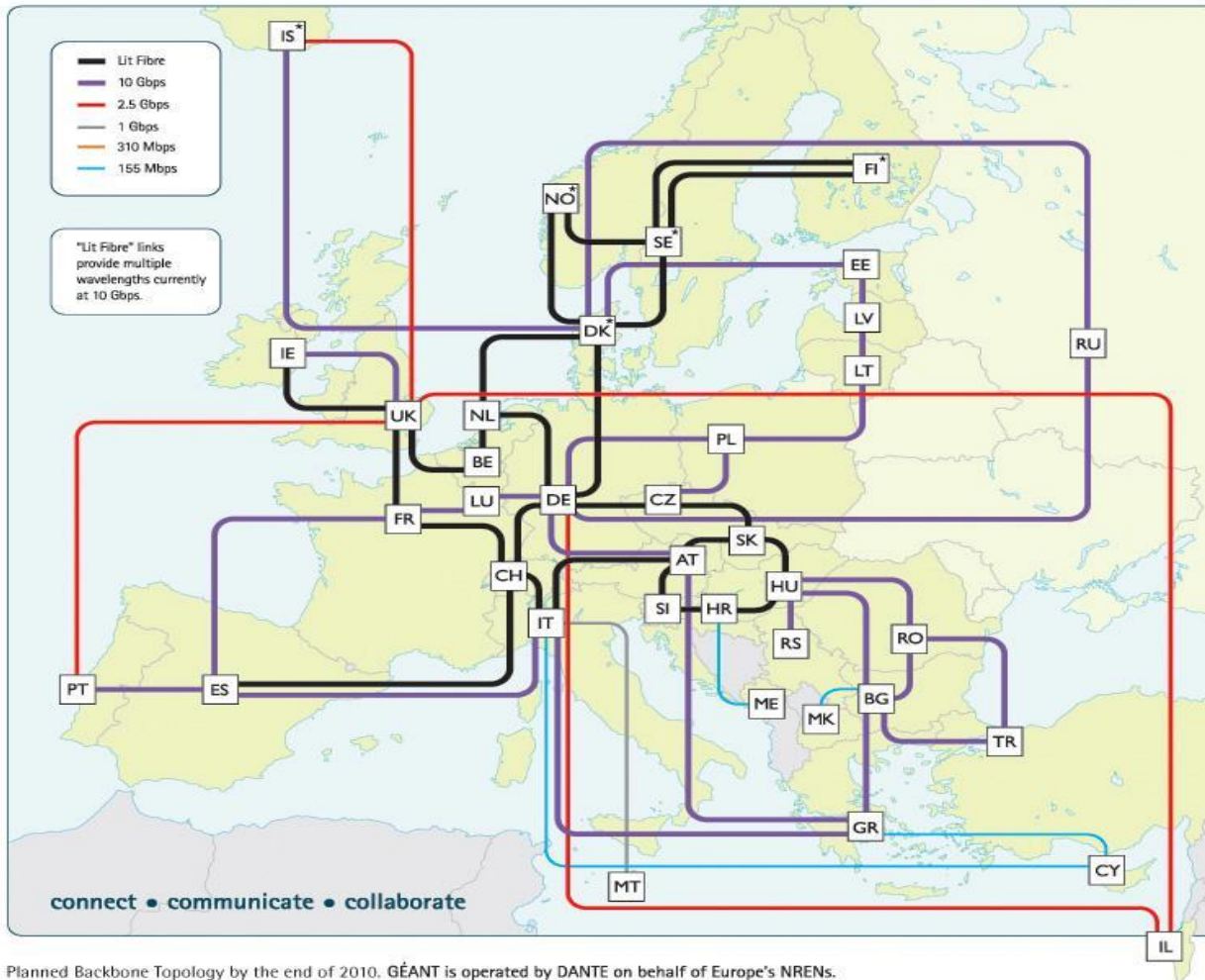
- 2000-2004: GN1 Project
 - GÉANT Network

- 2004-2009: GN2 Project
 - GÉANT2 Network
 - Services
 - Joint Research Activities
 - Networking Activities

- 2009-2013: GN3 Project
 - GÉANT Network
 - Wider Range of Services
 - Larger Research Programme
 - Wider Networking Activities



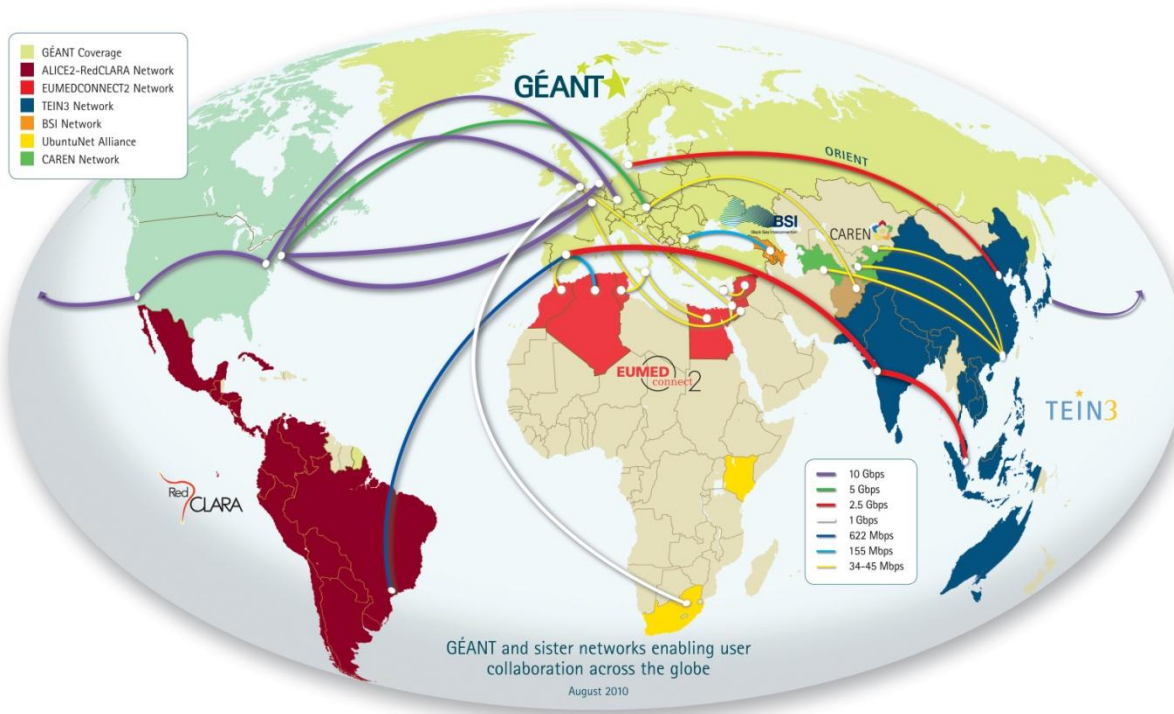
GÉANT & NREN Connectivity & Network Services



- 38 European Countries
- Dark Fibre + DWDM
- Hybrid network:
 - IP Packet routed IPv6, multicast, VPN
 - Point-to-point Circuits typically 1Gbit/s
 - Dedicated Lambdas Full 10Gbit/s
- Network monitoring
- Network provisioning
- Security & Mobility

GÉANT topology end 2010



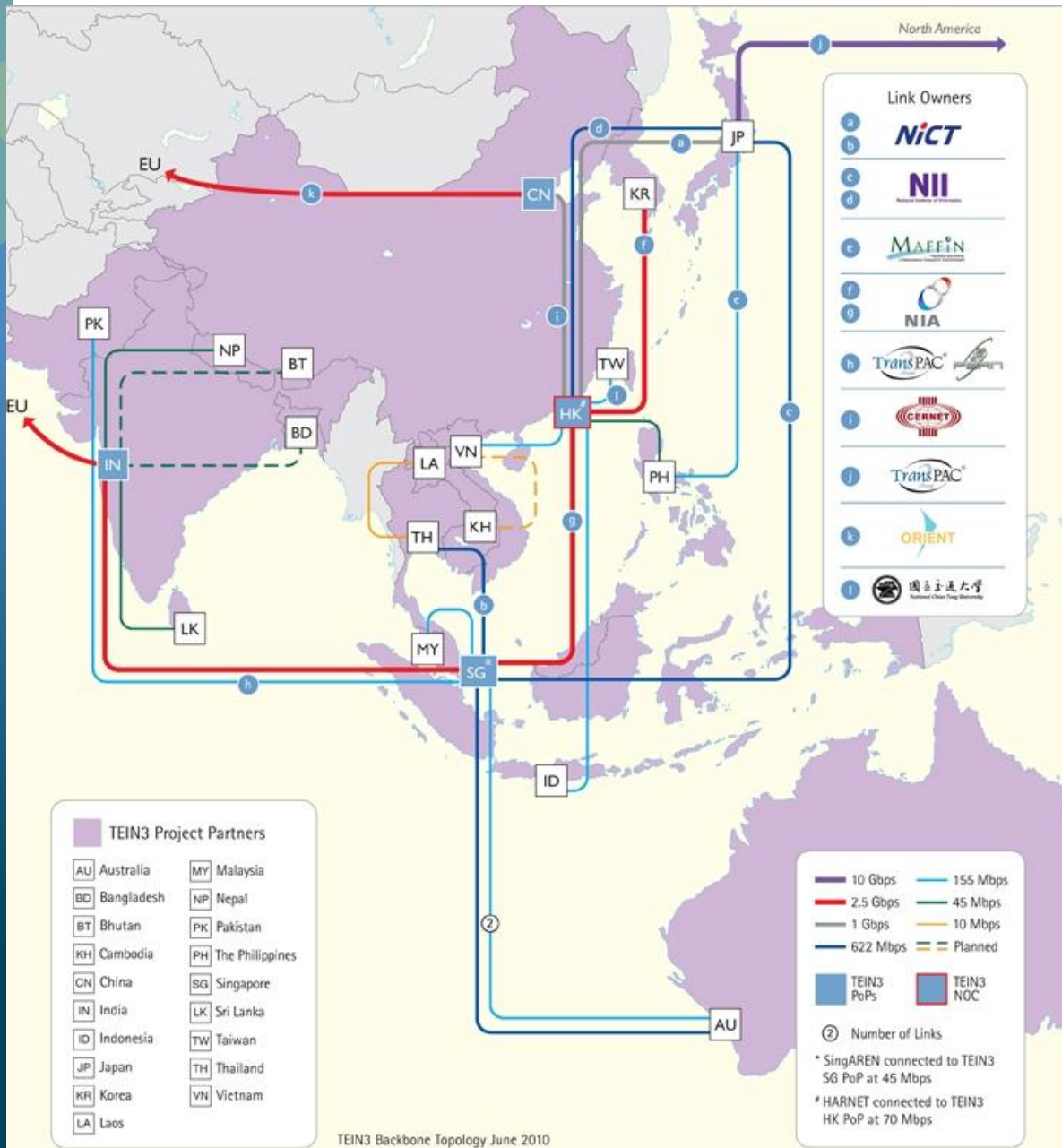


- The GÉANT network has high speed links to networks in other world regions, to connect researchers across the globe:

- Asia-Pacific
- South Caucasus
- Central Asia
- Latin America
- North America
- Southern and Eastern Africa
- Southern Mediterranean



TEIN3 Network



12 beneficiary partners
7 non-beneficiary partners

45M+ connected users

4 hubs:
Mumbai,
Singapore,
Hong Kong,
Beijing

Short RTTs within Asia

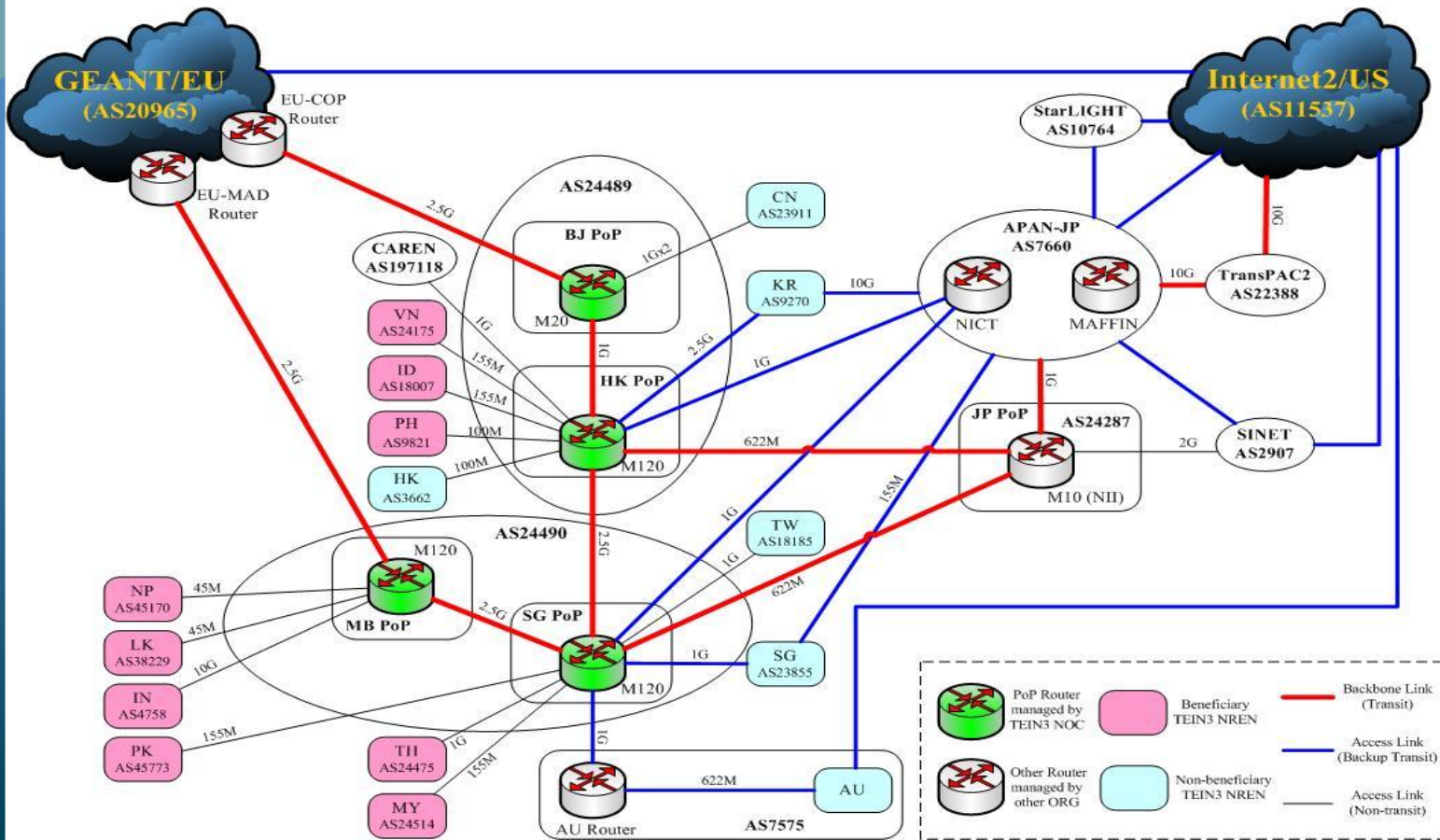
Short RTT and highest capacity direct links with Europe

11.4M Euro EC funding
(65% co-funding)

TEIN3 Topology



- Managed network
- NOC in Hong Kong
- Performance
- Routing
- Optimisation
- New services

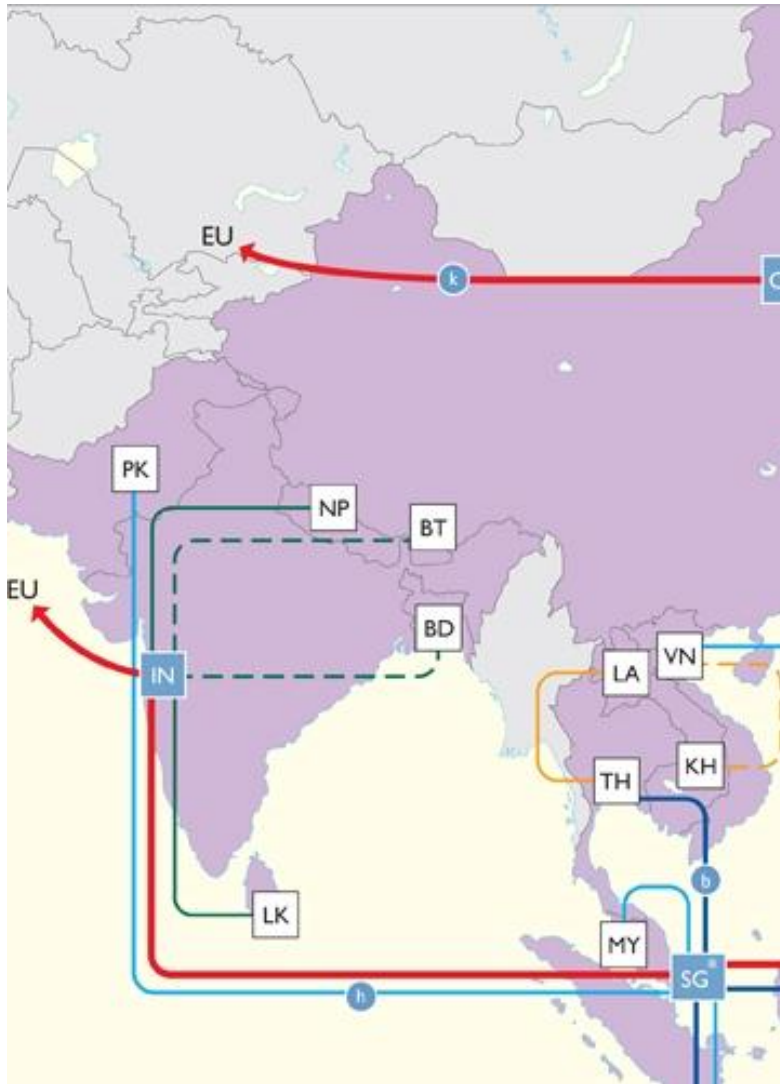


Current Status of Advanced Service



TEIN3 NREN/Partner	BGP IPv4 Unicast	BGP IPv6 Unicast	PIM IPv4 Neighbor	BGP IPv4 Multicast	MSDP IPv4 Neighbor	PIM IPv6 Neighbor	BGP IPv6 Multicast	MPLS	BGP IPv4 Labeled Unicast
AARNet (AU)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
ASTI (PH)	Yes	Yes	No	No	No	No	No	No	No
CNGI-6IX (CN)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
HARNET (HK)	Yes	Yes	Yes	Yes	Yes	No	No	No	No
ITB (ID)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
KOREN (KR)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
LEARN (LK)	Yes	Yes	No	No	No	Yes	No	No	No
MYREN (MY)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
NCTU (TW)	Yes	Yes	No	No	No	No	No	No	No
NKN (IN)	Yes	Yes	No	No	No	No	No	No	No
NREN (NP)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
PERN2 (PK)	Yes	Yes	Yes	No	No	Yes	No	No	No
SINET (JP)	Yes	Yes	No	No	No	No	No	No	No
SingAREN (SG)	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
ThaiREN (TH)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
VinaREN (VN)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
GEANT	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
APAN-JP	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
CAREN	Yes	No	No	No	No	No	No	No	No
TEIN3 JP POP	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
TEIN3 BJ/HK/SG/MB POP	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes



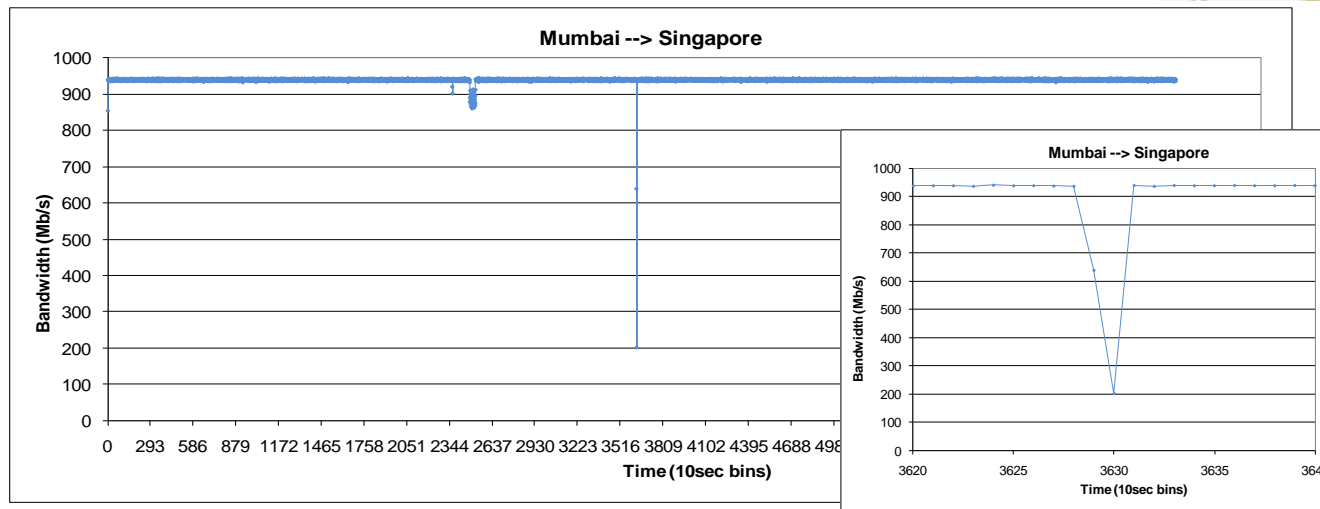


- PoP in Mumbai
- 10 Gigabit peer with NKN National Knowledge Network.
- NKN provides access to
 - ERNET
 - GRIDs: GARUDA and LHC centres
 - Other R&E communities
- User example: LHC T2 traffic
- Other Links to:
 - Nepal
 - Sri Lanka
 - Bangladesh to start this week



Reliable Infrastructure: Testing the link to Singapore

- Part of acceptance testing for the European-India-Singapore links.
- The low level network layer will switch to an alternate data path when an error is detected e.g. a fibre cut.
- Measure the effect with a 24 hr. user TCP flow:

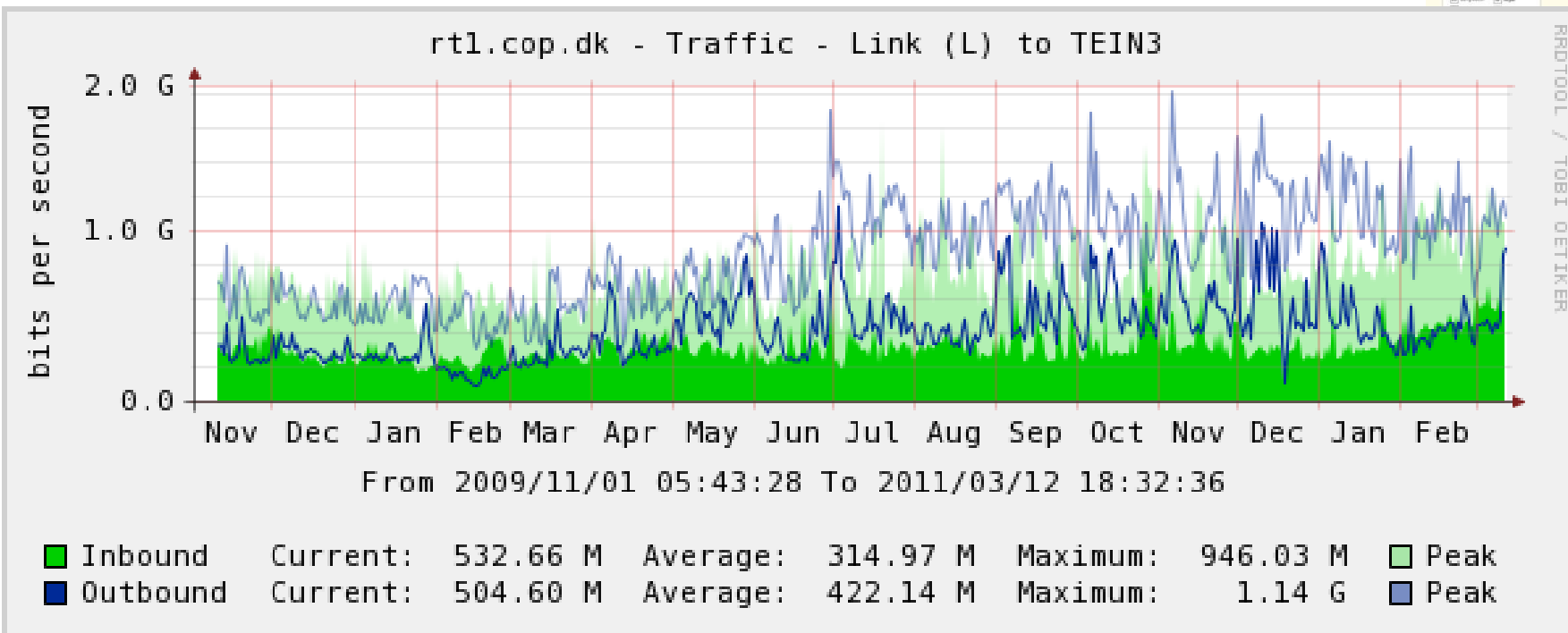
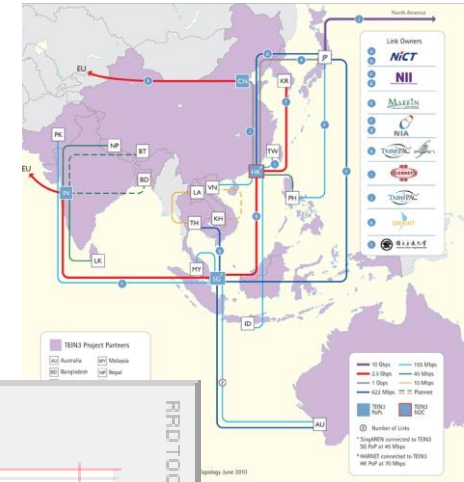


- TCP link remains up and active.



Traffic on the ORIENT Link

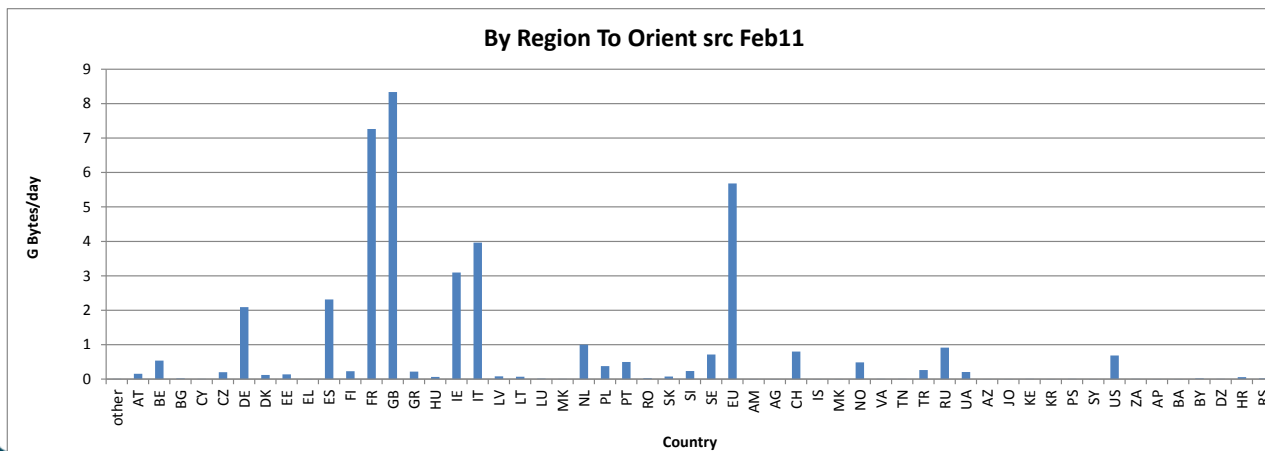
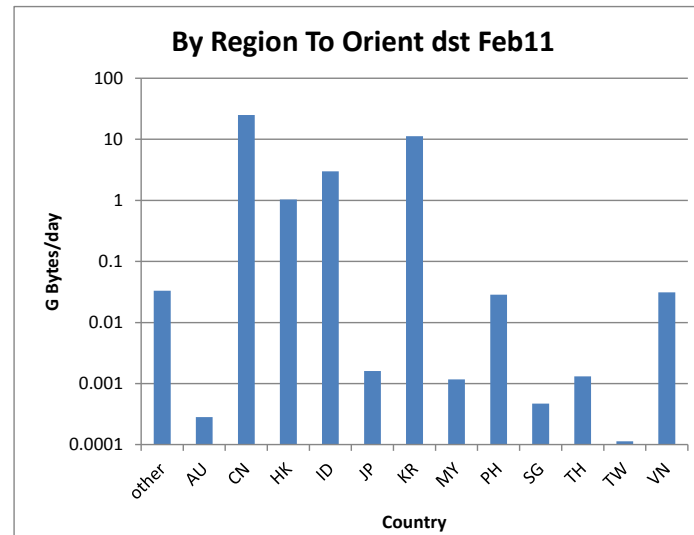
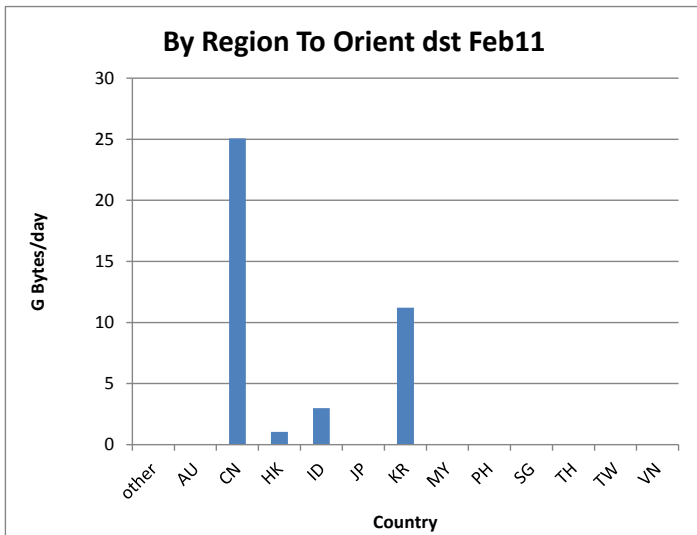
- Plot of traffic from : Nov 09 – Mar 11
- Peak values important for achieving throughput
- Risen to 1.2-1.5 Gbit/s with peaks at 2 Gbit/s out of Europe
1-1.4 Gbit into Europe.
- Sustained from June 2010



Traffic To ORIENT By TEIN Region



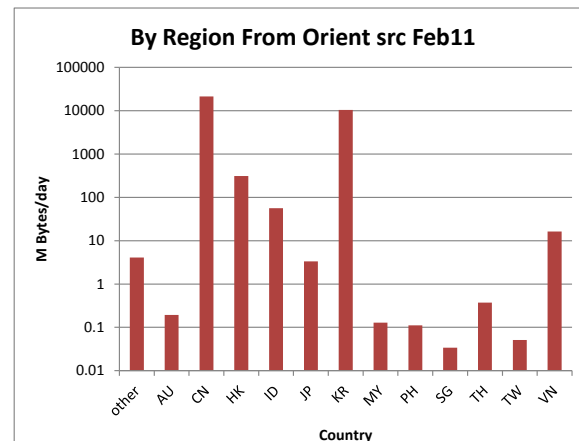
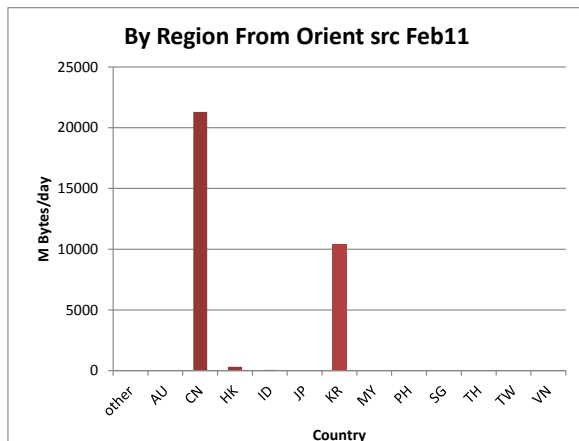
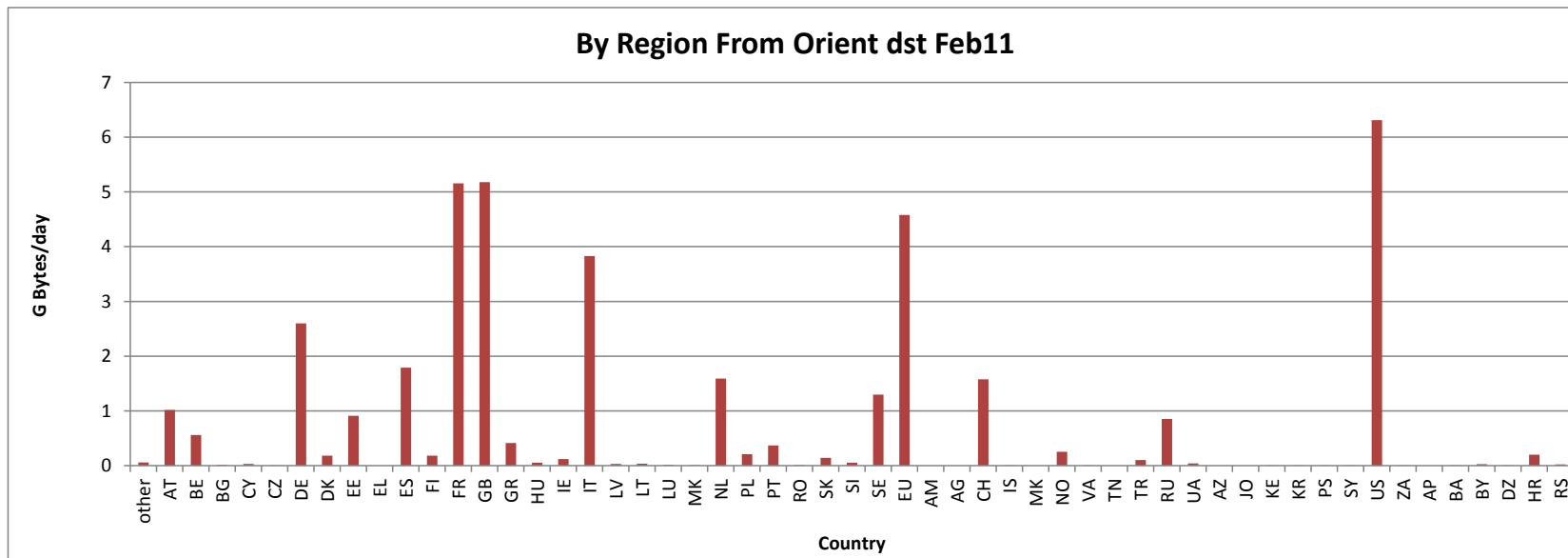
- Data for one week February 2011
- China & Korea dominant but other countries in TEIN also important
- Many European countries and subject areas



Senders

Traffic From ORIENT By Region

- Many destination countries involved, but is variable
- China & Korea dominant senders but other countries in TEIN also important

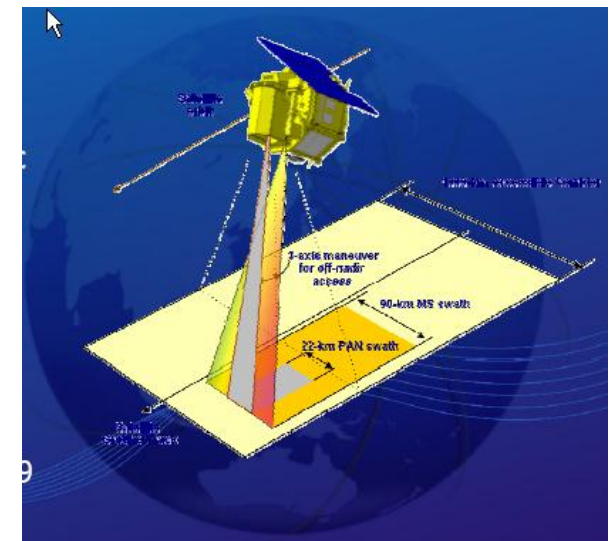
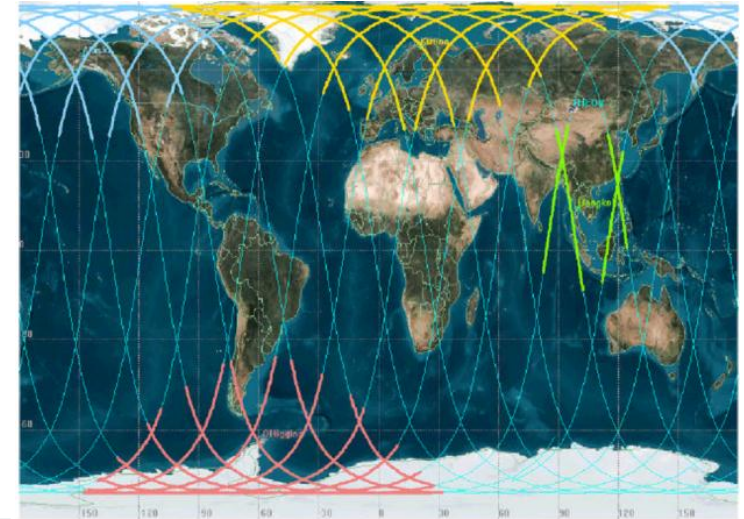


Senders

Earth Observations: THEOS



- First Thai Earth Observation Satellite
- Launch 1 Oct 2008 with Polar Orbit ~14/day
- Polar station at Esrange Space Centre, Kiruna, run by Swedish Space Corporation
- Main control, processing & data archive centre run by GISTDA in Bangkok, Thailand.
- MoU signed with DANTE
- Link Kiruna-SSC-Stockholm to connect to SUNET expected in a month
- File transfer: Emergency & Disaster, flood, forest fire

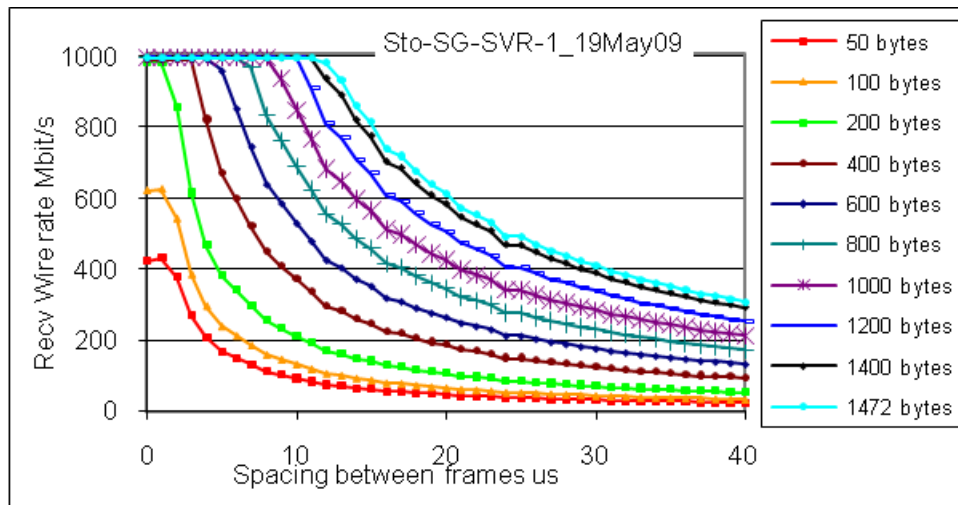


- Data Path being tested:
- SSC (Kiruna) – SUNET
 - NORDUNET
 - GEANT
 - TEIN3 (Pan Asian network)
 - ThaiREN (Thailand NREN)
 - GISTDA (Bangkok)

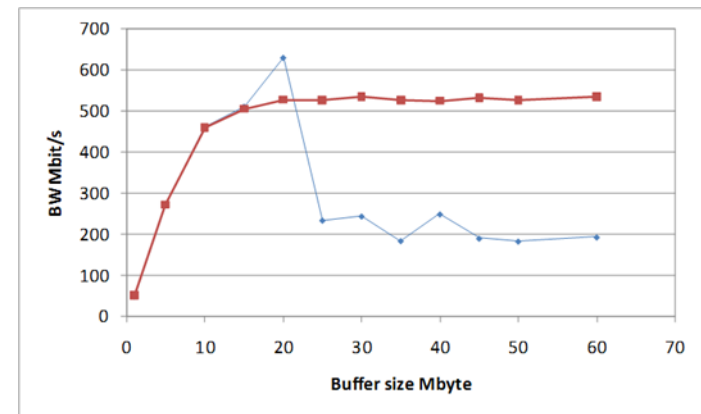
The final End-2-End path



Stockholm-Singapore udpmon throughput
Looks good



TCP throughput Not quite expected



Typhoon forecasting



- GÉANT and TEIN3 provide a stable and reliable connection between the expertise and high-speed computing capacity of the German weather bureau DWD and the meteorologists at its counterparts in the Philippines.
- Timely transmission of global meteorological data to make local prediction of typhoons.
- Typhoon Ketsana struck Cambodia in 2009.
- **High-speed networking: saving lives by typhoon forecasting**



Data Intensive Collaborative Crop Research: New Rice Varieties

★
TEIN3

- Work on genes done at the International Rice Institute (IRRI) in the Philippines
- International collaboration to develop resilient, climate-proof crop varieties.
- Marker assisted selection used to develop water tolerant enhanced rice.
- Applied DNA-sequencing to the genomes of different rice varieties
- Vast genomics datasets created, analysed, and exchanged.
- High-resolution GIS data for
 - Vegetation analysis,
 - Yield forecast,
 - sustainable land,
 - water management
- Over 60% of the population in Cambodia rely on agriculture for their livelihoods and rice is principal crop.



NRENs & TEIN3 contribute to food security.



★ TEIN3 saves lives

TEIN3 allows accurate typhoon forecasting and life-saving weather warnings through timely transfer of meteorological data from Germany to the Philippines.

★ TEIN3 trains doctors

TEIN3 allows surgeons at their hospitals to learn complex clinical techniques from world experts through interactive remote training.



Information Network (TEIN3) provides for over 45 million researchers and academics in 18 countries across Asia-Pacific.

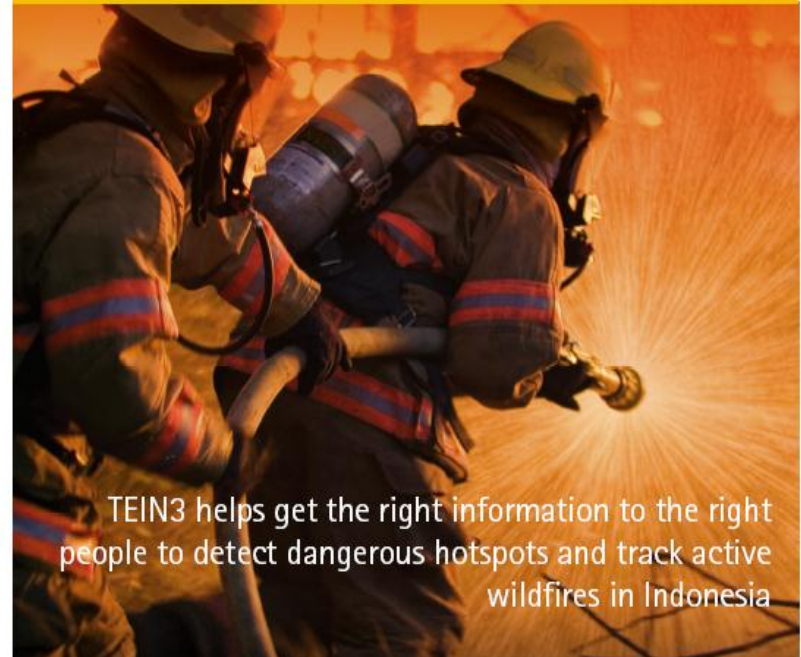
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the research and education network for asia-pacific

★ TEIN3 fights hunger



★ TEIN3 tackles wildfires



TEIN3 helps get the right information to the right people to detect dangerous hotspots and track active wildfires in Indonesia

The third generation of the Trans-Eurasia Information Network (TEIN3) provides a dedicated high-capacity Internet for over 45 million researchers and academics in 18 countries across Asia-Pacific.



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the research and education network for asia-pacific

water yields
archers to
the growing
ions faster.

TEIN3) provides
researchers and
in Asia-Pacific.

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work for asia-pacific



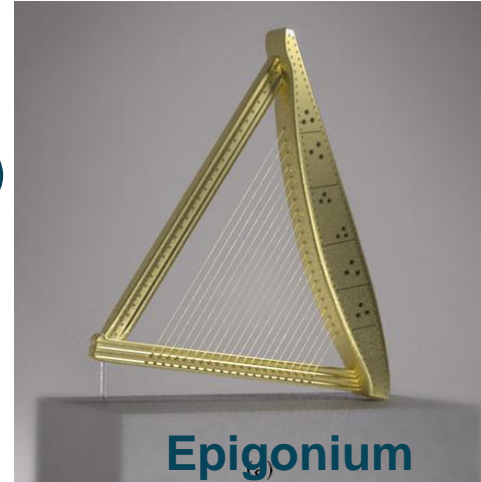
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the research and education network for asia-pacific

GÉANT & TEIN3 Join Cultures through Music & Dance: Launch Performance



- Art Exchange
- Ancient musical instruments on stage in Stockholm (Grids used to reconstruct)
- Dance: Water-stone power symbolism
 - Choreographed on traditional Malaysian movements & costumes



- Worked with NRENs on testing the link
- PoC for transmitting Audio & Video over 10,000 km latency ~500ms.

Domenico Vicinanza



Dancers in Kuala Lumpur

The Research and Education
Network for Asia-Pacific

SLIDE 18

- EC is planning to fund TEIN4.
- Timing of project: 2012 to 2015 – continuous after TEIN3.
- Emphasis on supporting
 - High capacity links between Asia and Europe
 - Developing countries, especially those not yet connected
e.g. Afghanistan, Cambodia, Laos, Myanmar
 - Network take up by user communities
- Network will be re-tendered for TEIN4



- TEIN4 will be contracted with TEIN* Co-operation Center:
 - New not for profit organisation registered in Korea
 - Significant financial backing from Korea government
- Endorsed by EU and Asian heads of state at ASEM8 4/5 Oct 2010
- TEIN will continue to be a community wide program
- DANTE will continue to advise and support TEIN programme



ANY QUESTIONS ?



Link Availability (with maintenance)

