



GÉANT2, ORIENT and TEIN2: Projects Connecting China and Europe

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EuChinaGrid Meeting,

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International Research Networking

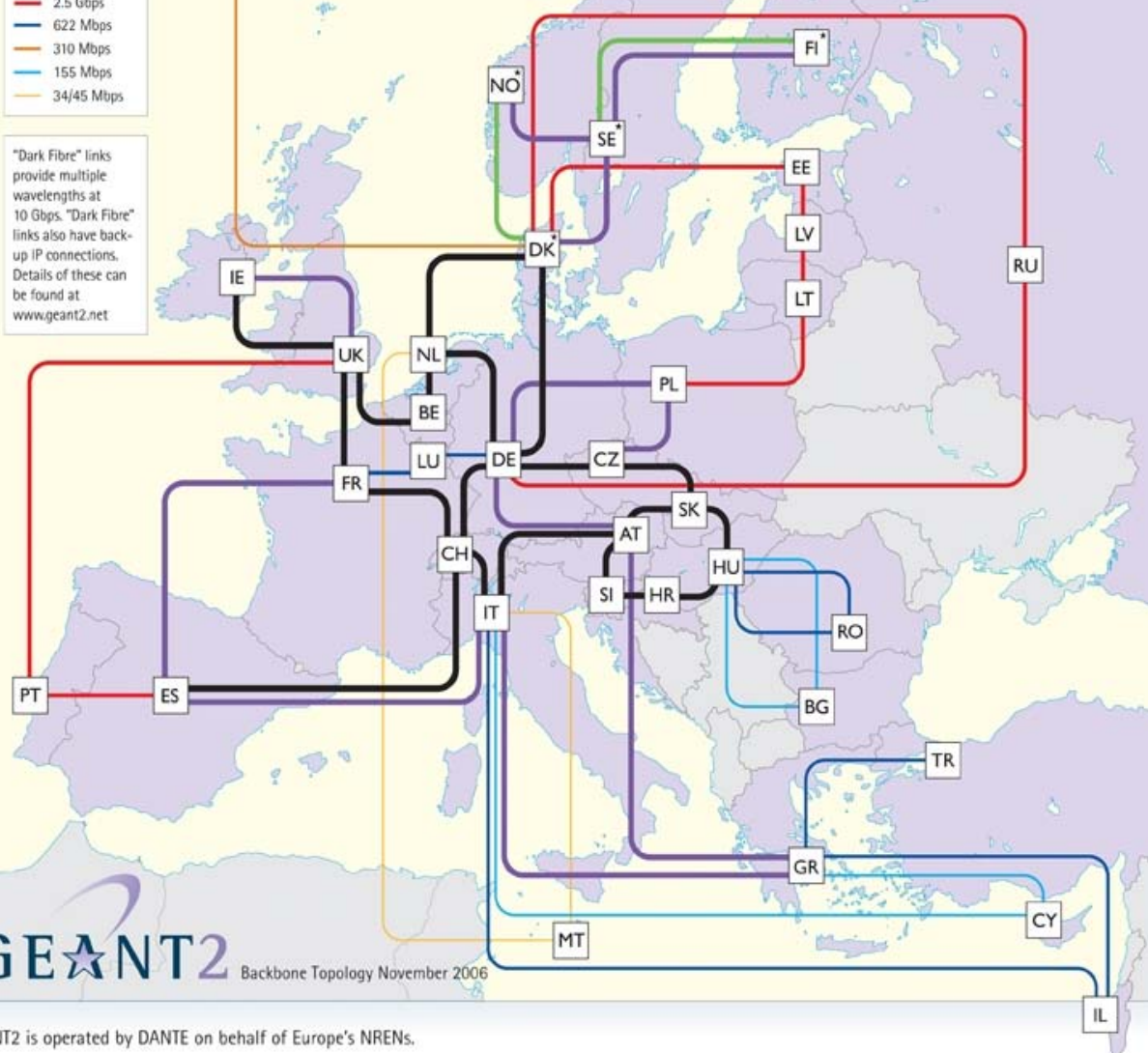
GÉANT2

Network Status Update

- GÉANT2 connects 34 countries across Europe...
...and a further 48 across the globe
- Dark fibre capacity allows P2P circuits: 13 now implemented
- P2P now transatlantic!
- Note Russia upgrade in late 2006 (now 2 x 2.5Gbps)

- Dark Fibre
- 10 Gbps
- 5 Gbps
- 2.5 Gbps
- 622 Mbps
- 310 Mbps
- 155 Mbps
- 34/45 Mbps

"Dark Fibre" links provide multiple wavelengths at 10 Gbps. "Dark Fibre" links also have backup IP connections. Details of these can be found at www.geant2.net



GEANT2 Backbone Topology November 2006

GÉANT2 is operated by DANTE on behalf of Europe's NRENs.

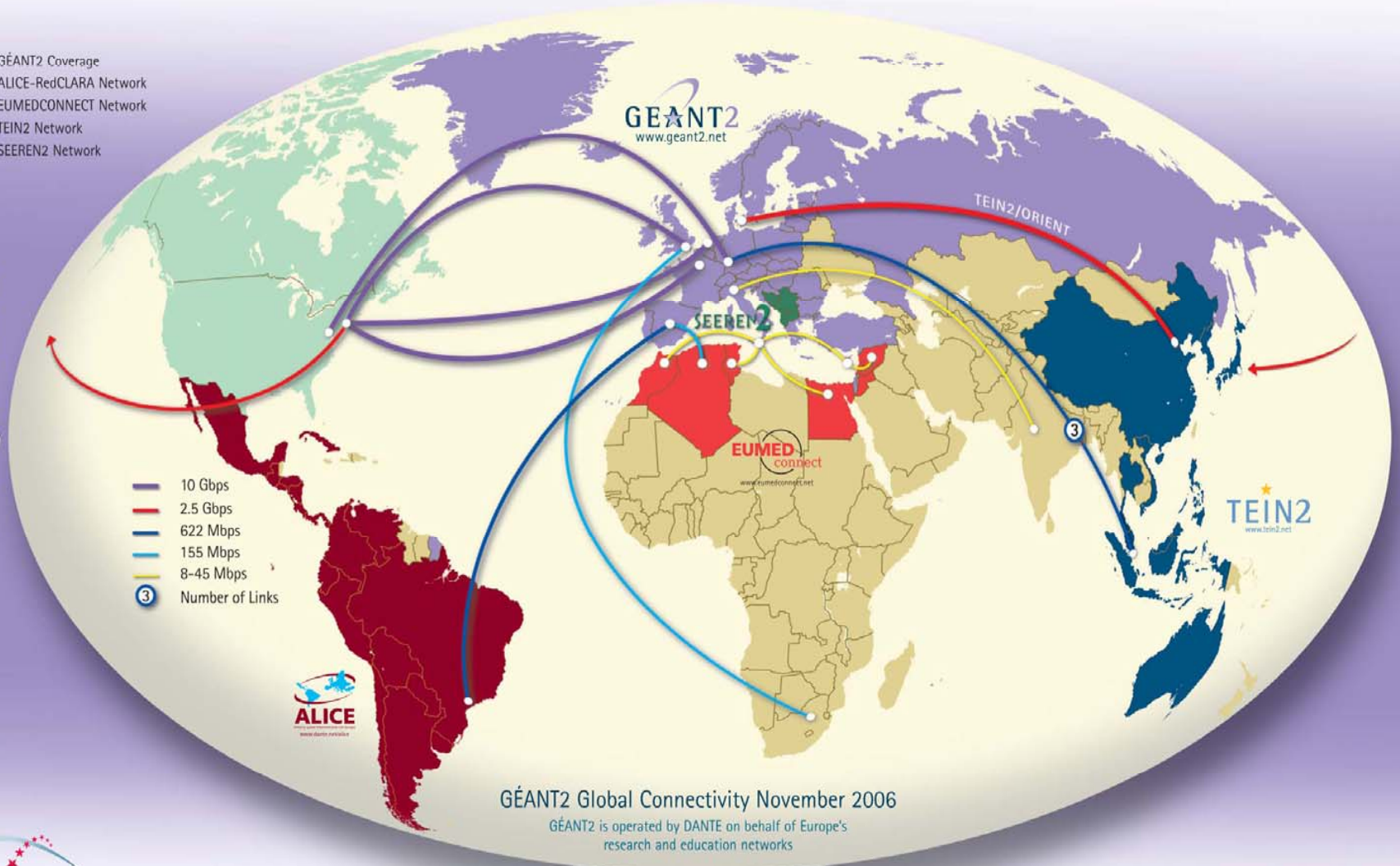


GEANT2 At the Heart of Global Research Networking

- GEANT2 Coverage
- ALICE-RedCLARA Network
- EUMEDCONNECT Network
- TEIN2 Network
- SEEREN2 Network

www.geant2.net

- 10 Gbps
- 2.5 Gbps
- 622 Mbps
- 155 Mbps
- 8-45 Mbps
- ③ Number of Links



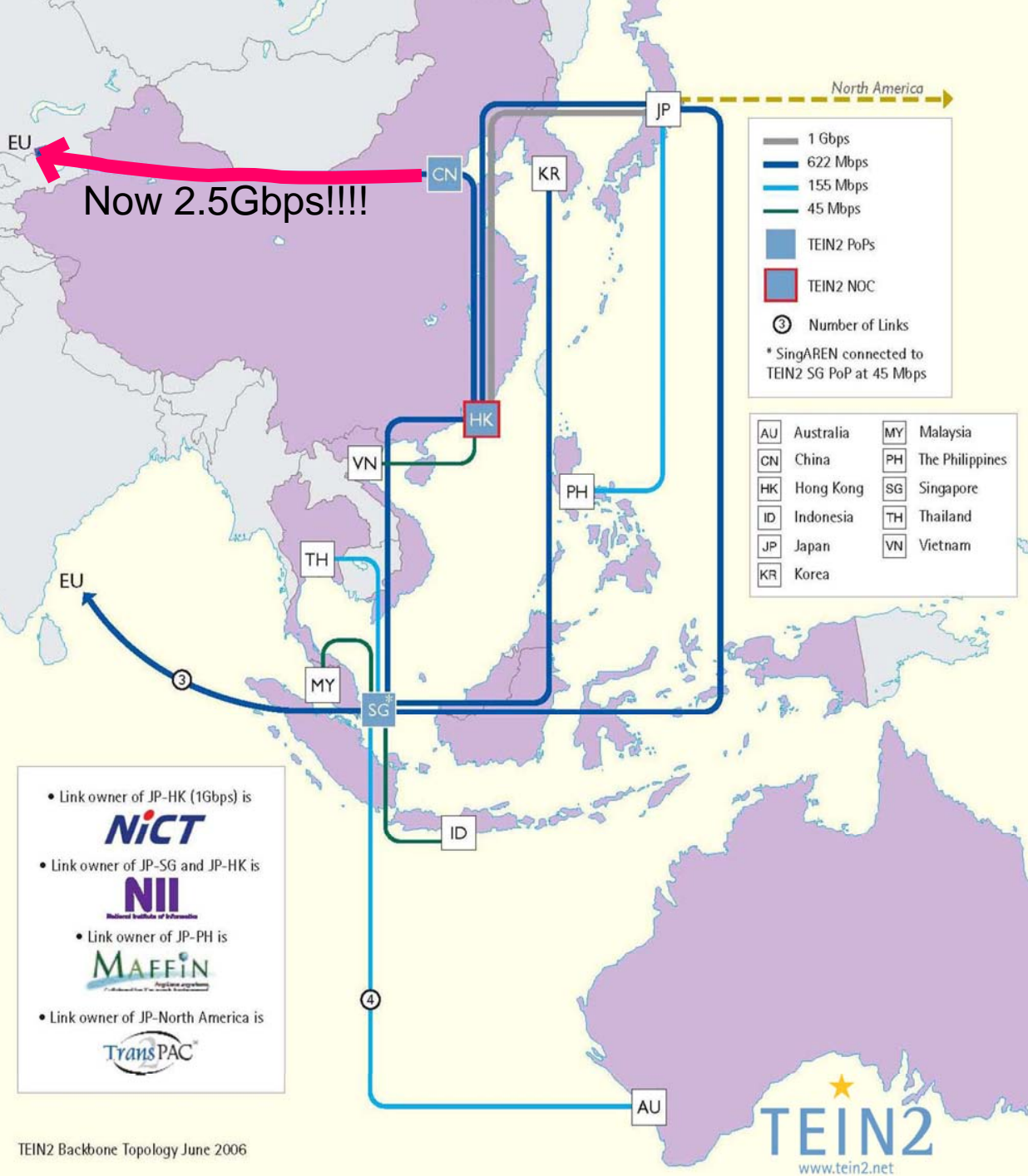
TEIN2: A regional network for Asia connected to Europe



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- Beneficiaries: China (CERNET), Indonesia (ITB), Malaysia (MDC), Philippines (ASTI), Thailand (ThaiREN), Vietnam (MOST)
- Non Beneficiaries: Japan (APAN-JP, MAFFIN, NICT, NII), Korea (KISDI), Singapore (SingAREN)
- Third Parties: AARNet, TransPac2
- European: France (RENATER), Netherlands (SURFnet), UK (UKERNA)
- Contracting Partner: DANTE



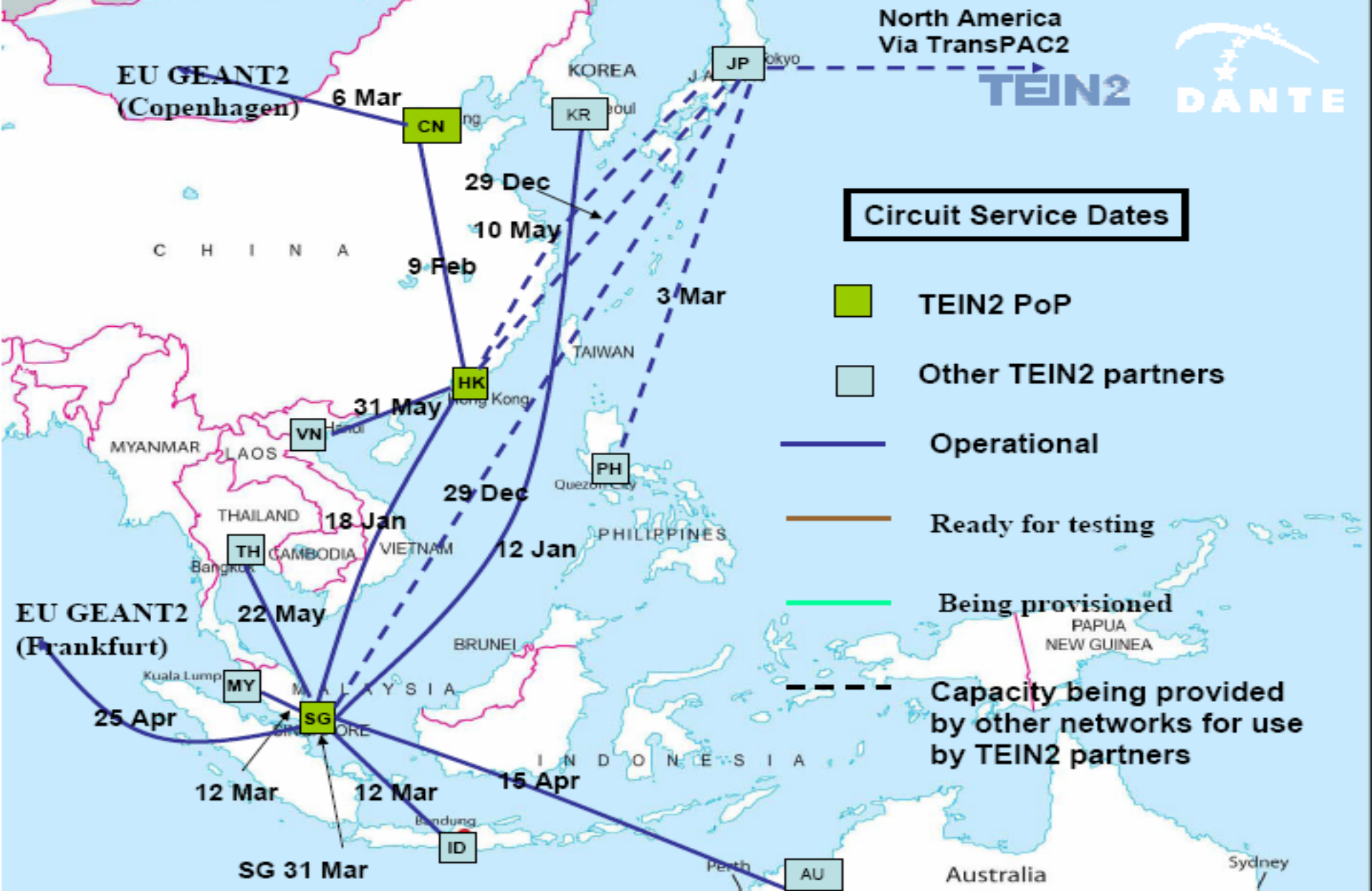


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TEIN2: a research backbone for Asia

- TEIN2 connects 10 countries across Asia
- Provides connections to Europe over three separate routes
- Resilience to failure proven
- With ORIENT connects to EU at 2.5 Gbps

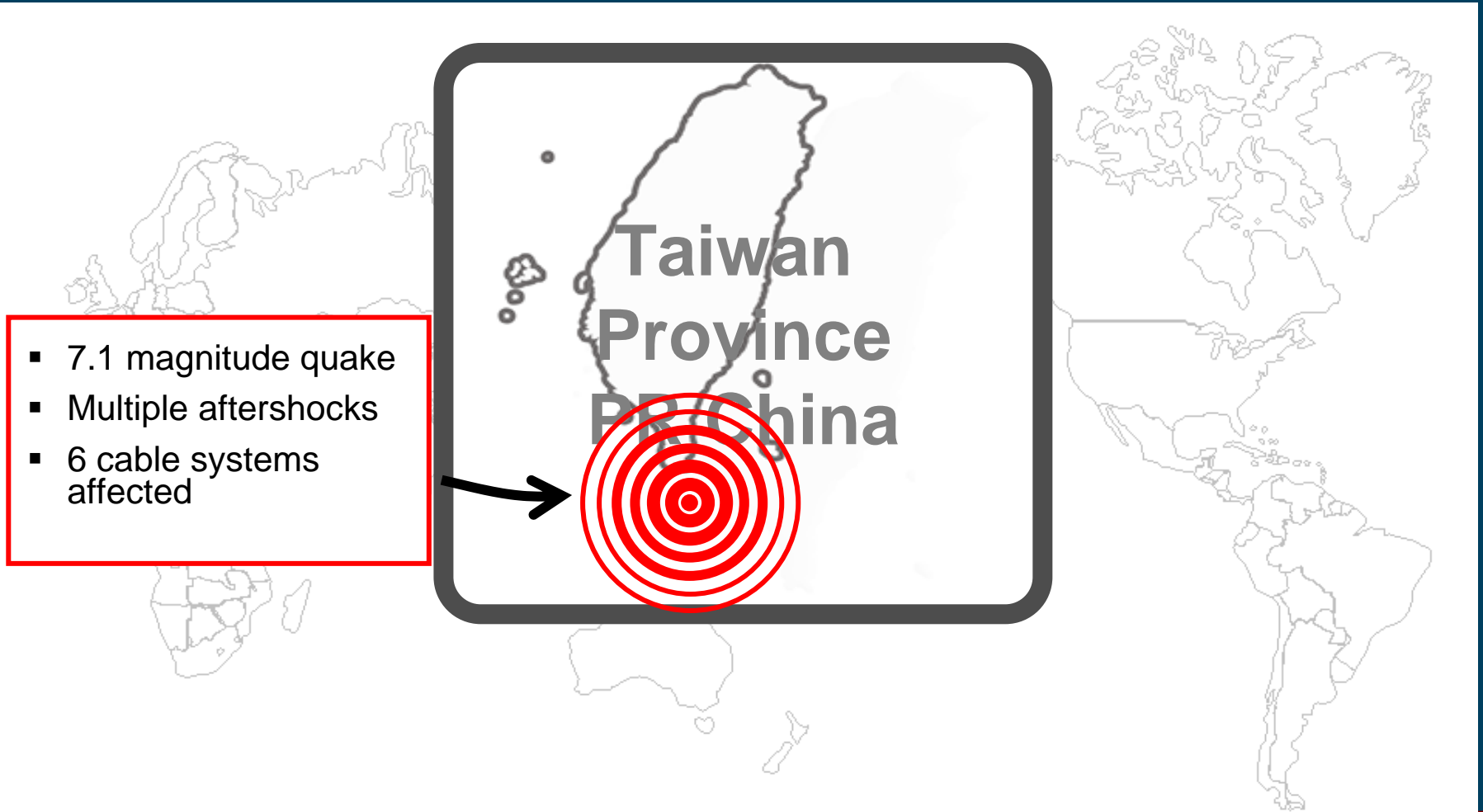


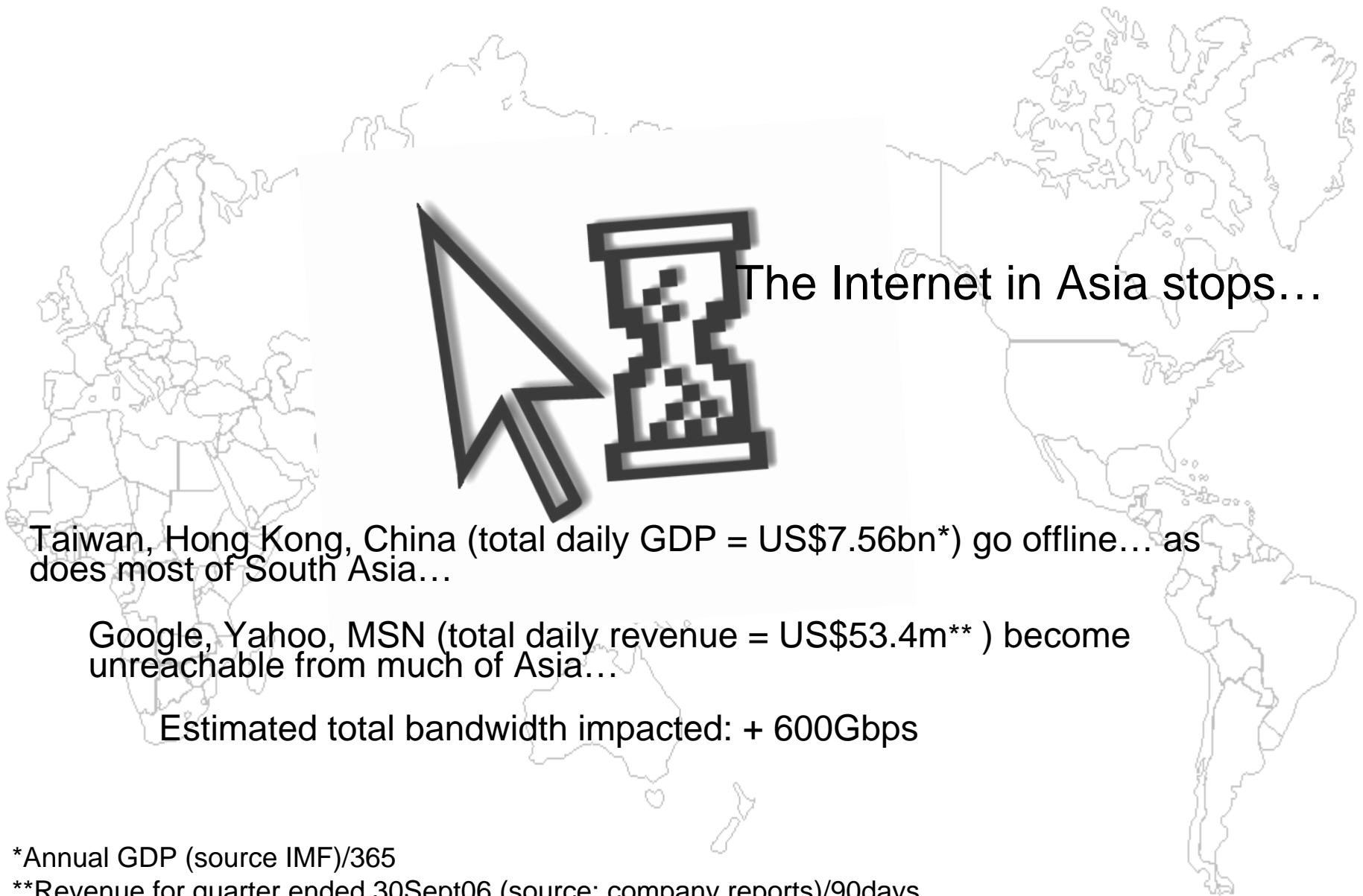


GMT 12:26:01, 26 December
2006



International Research Networking





The Internet in Asia stops...

Taiwan, Hong Kong, China (total daily GDP = US\$7.56bn*) go offline... as does most of South Asia...

Google, Yahoo, MSN (total daily revenue = US\$53.4m**) become unreachable from much of Asia...

Estimated total bandwidth impacted: + 600Gbps

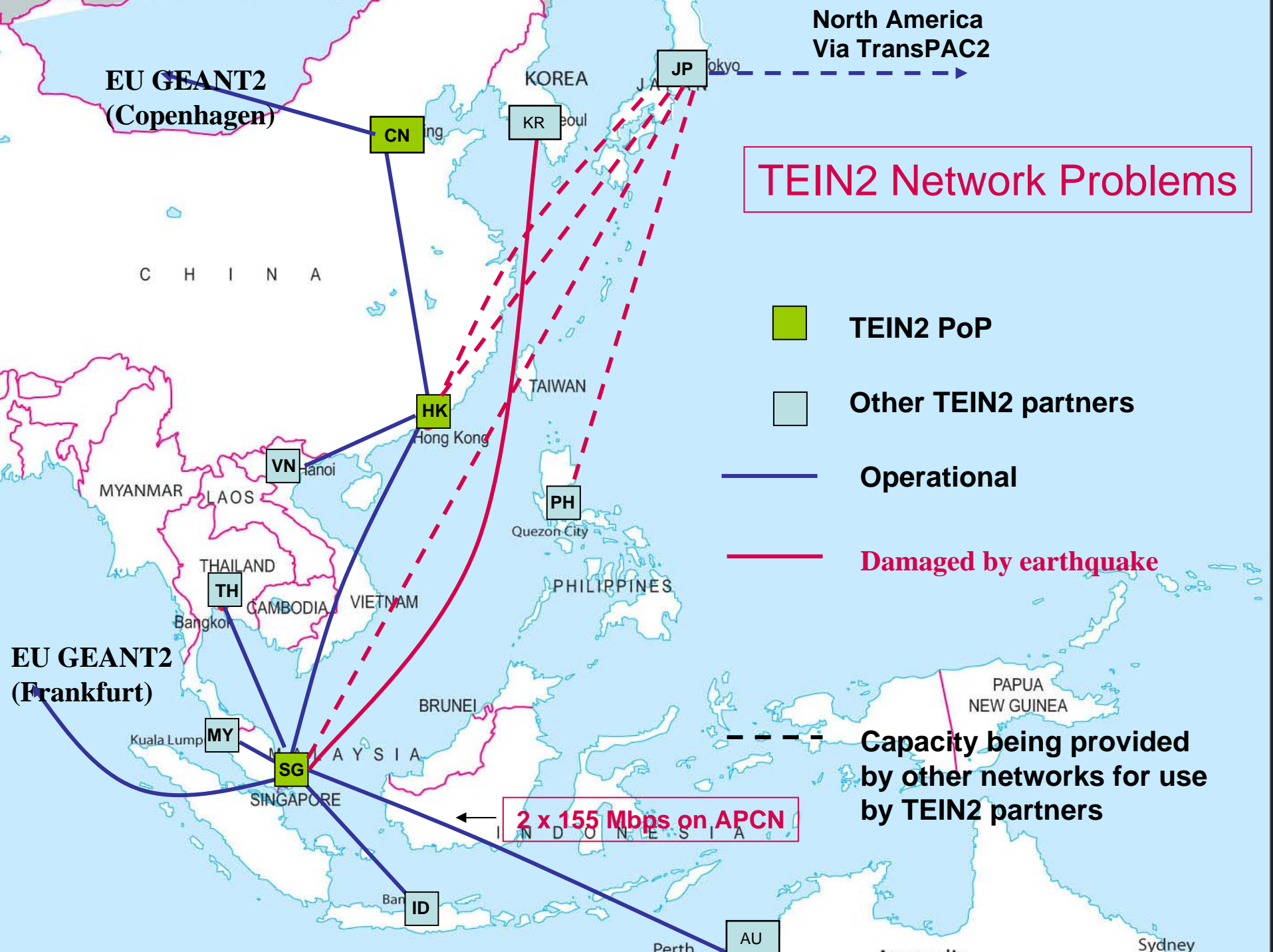
*Annual GDP (source IMF)/365

**Revenue for quarter ended 30Sept06 (source: company reports)/90days



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Source: Telegeography



North America
Via TransPAC2

TEIN2 Network Problems

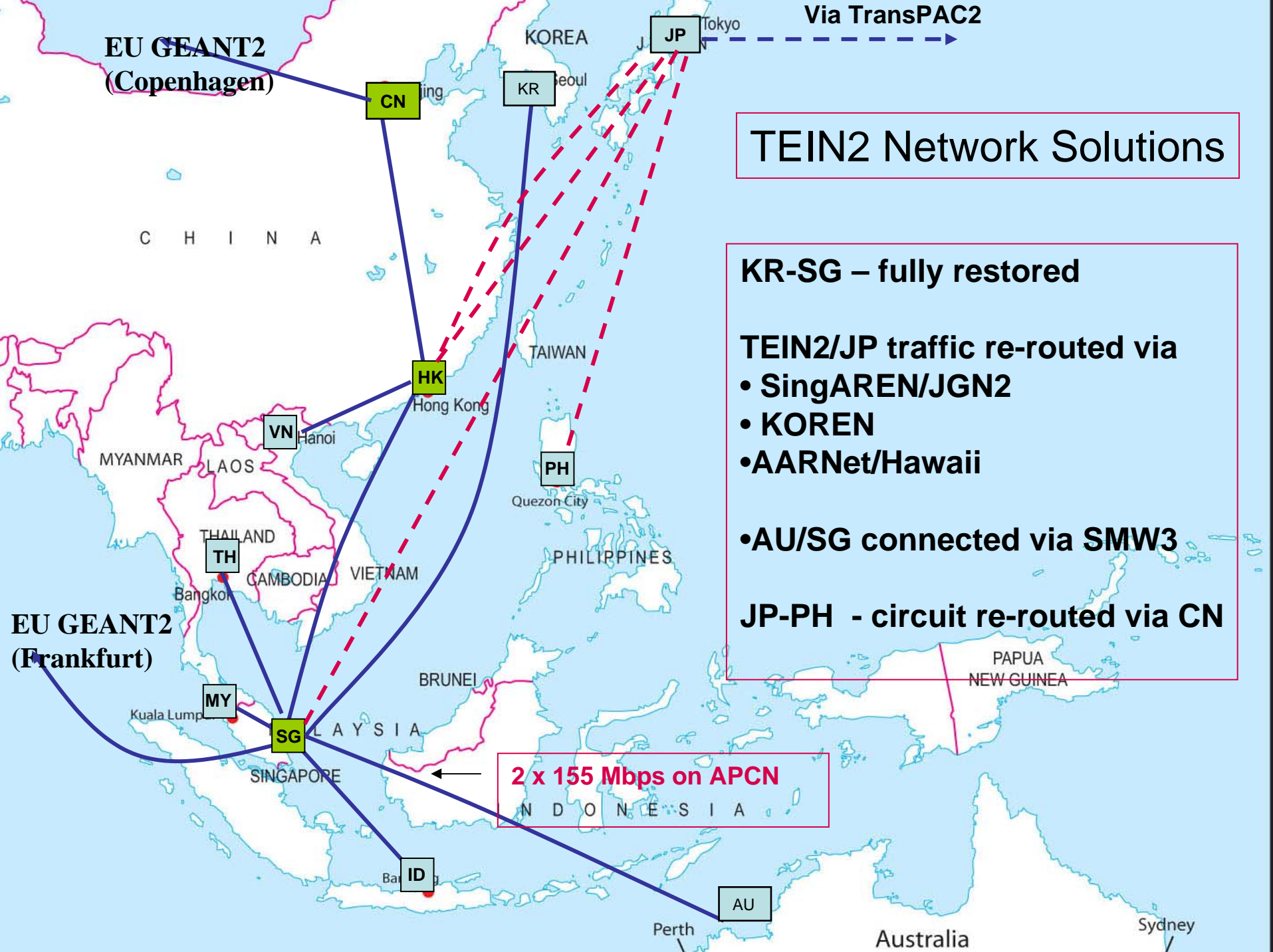
- TEIN2 PoP
- Other TEIN2 partners
- Operational
- Damaged by earthquake

2 x 155 Mbps on APCN

Capacity being provided
by other networks for use
by TEIN2 partners

EU GEANT2
(Copenhagen)

EU GEANT2
(Frankfurt)



**EU GEANT2
(Copenhagen)**

JP
Tokyo

Via TransPAC2

TEIN2 Network Solutions

- KR-SG – fully restored**
- TEIN2/JP traffic re-routed via**
 - SingAREN/JGN2
 - KOREN
 - AARNet/Hawaii
- AU/SG connected via SMW3
- JP-PH - circuit re-routed via CN**

2 x 155 Mbps on APCN

**EU GEANT2
(Frankfurt)**

SG
SINGAPORE

AU
Perth

Australia

Sydney

C H I N A

KOREA

KR
Seoul

TAIWAN

PH
Quezon City

PHILIPPINES

INDONESIA

PAPUA
NEW GUINEA

MYANMAR

LAOS

VN
Hanoi

VIETNAM

THAILAND

TH
Bangkok

CAMBODIA

Kuala Lumpur

MY

MALAYSIA

BRUNEI

ID
Batavia



TEIN2 Achievements

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- First R&E network for Asia-Pacific
- Fast and cost-effective deployment
- Stimulated development of national networks
- 2 direct links to Europe's GÉANT2 network, for world-class collaboration
- First ever high capacity trans-China, trans-Russia route to Europe
- Many Asia-Europe research projects supported
- Proven resilience and responsiveness to unexpected events



ORIENT

ORIENTAL RESEARCH INFRASTRUCTURE TO EUROPEAN NETWORKS



International Research Networking

- A project linking academic networks in China (CERNET and CSTnet) and Europe (GÉANT2 Partners)
 - Currently only connects CERNET
 - Need to resolve issues to allow CSTnet customers to benefit (meeting today!)
- Funded by the Chinese Government (MoST and MoE), the European Commission and the European NRENs
 - Meeting with MoST and MoE to confirm commitment (01/02/07)
- Partners:
DANTE (Co-ordinator), CERNET (China), GARR (Italy), DFN (Germany), RENATER (France), UKERNA (UK), CESNET (Czech Rep), GRNET (Greece)
- Aim is to provide a dedicated high-bandwidth link for the many projects involving collaboration between European and Chinese institutions
 - Achieved! 2.5Gbps circuit is now operational



ORIENT and TEIN2: a synergistic relationship – now working!



International Research Networking

- Projects have distinct objectives:
 - TEIN2 provides an intra-regional Asian-Pacific network with links to Europe
 - ORIENT provides a dedicated link to China
 - ORIENT capacity increase has now been achieved and is of real benefit to Chinese researchers and student
- BUT they have common aims and work together:
 - ORIENT has provided proven resiliency for TEIN2 capacity damaged in the recent earthquake
 - TEIN2 would likewise provide alternative capacity in the event of ORIENT disruption
- **Most importantly...**
 - We need to ensure that the researchers who can benefit most from this unique infrastructure have access to it!





ORIENT Status

International Research Networking

Achievements:

- ORIENT upgrade now achieved: 2.5 Gbps between Beijing and Copenhagen
- ORIENT has provided extra resilient capacity for TEIN2 partners after the Asian Earthquake
- ORIENT/TEIN2 has provided temporary restoration of CSTnet international capacity –free of charge

Future Objectives:

- Still hope to achieve full connectivity with CSTnet –negotiations are continuing
- To resolve outstanding funding issues
- To ensure that support is provided to the many potential users of the circuit



Conclusions



International Research Networking

- ORIENT now offers by far the highest capacity direct link between China and Europe2.5 Gbps!
- The first substantial intra-Asian network is fully operational: TEIN2....and has proven its resilient design in the face of significant circuit losses
- Negotiations regarding connecting CSTNET are underway...ORIENT still hopes serve **both** of the two large Chinese R&E networks
- Need to consider sustainability –EC has suggested an ORIENT2 for FP7





We are hopeful that you will be able to benefit from the increased capacity and low latency of the ORIENT circuit

Questions?

See also:

www.dante.net/orient

www.tein2.net

www.geant2.net/users