

GÉANT – Connecting Scientists Across the Globe

Cathrin Stöver

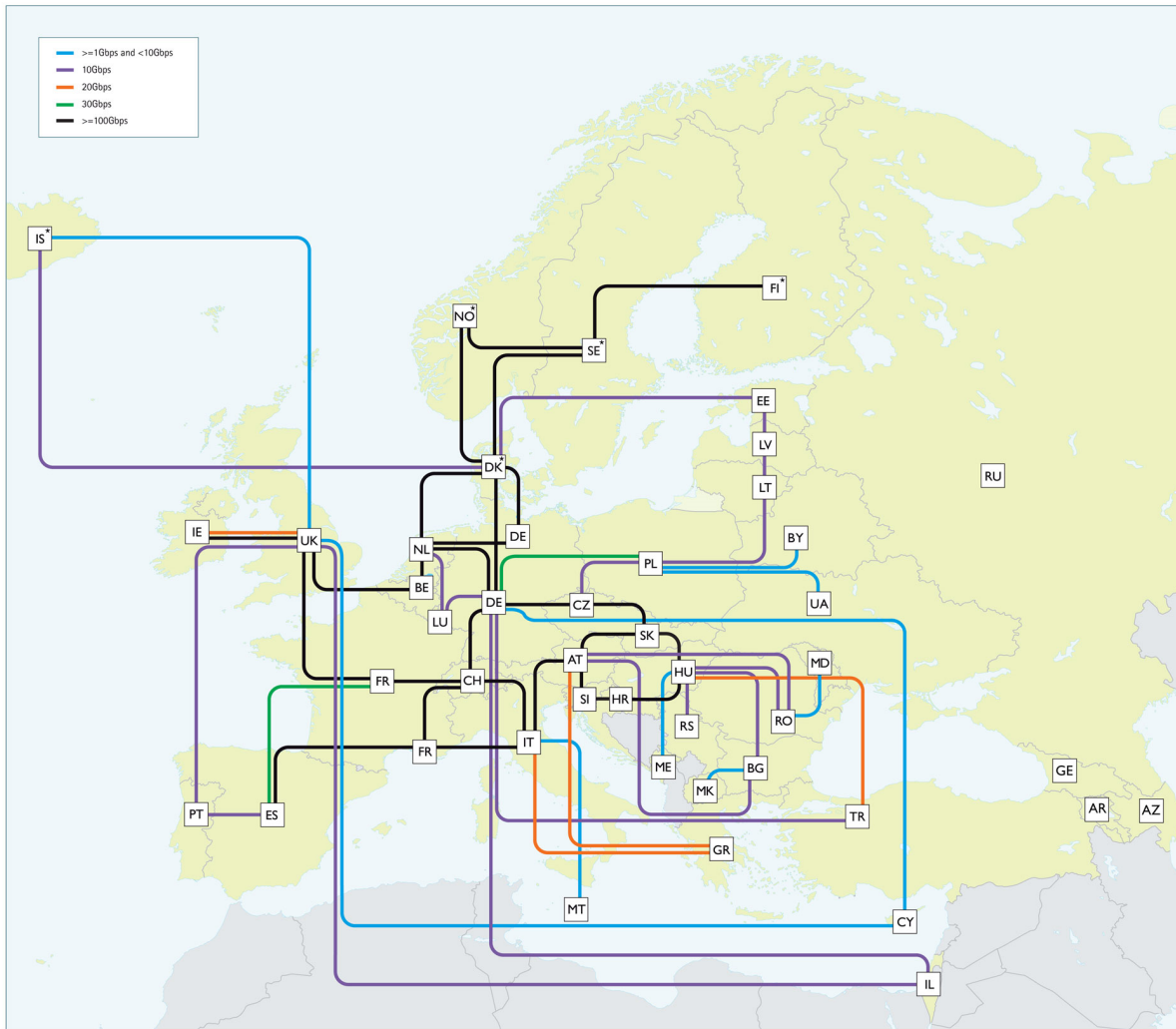
JANET Networkshop42

Leeds, 01 April 2014

cathrin@dante.net

Europe's 100Gbps Network

- *e-Infrastructure for the “data deluge”*



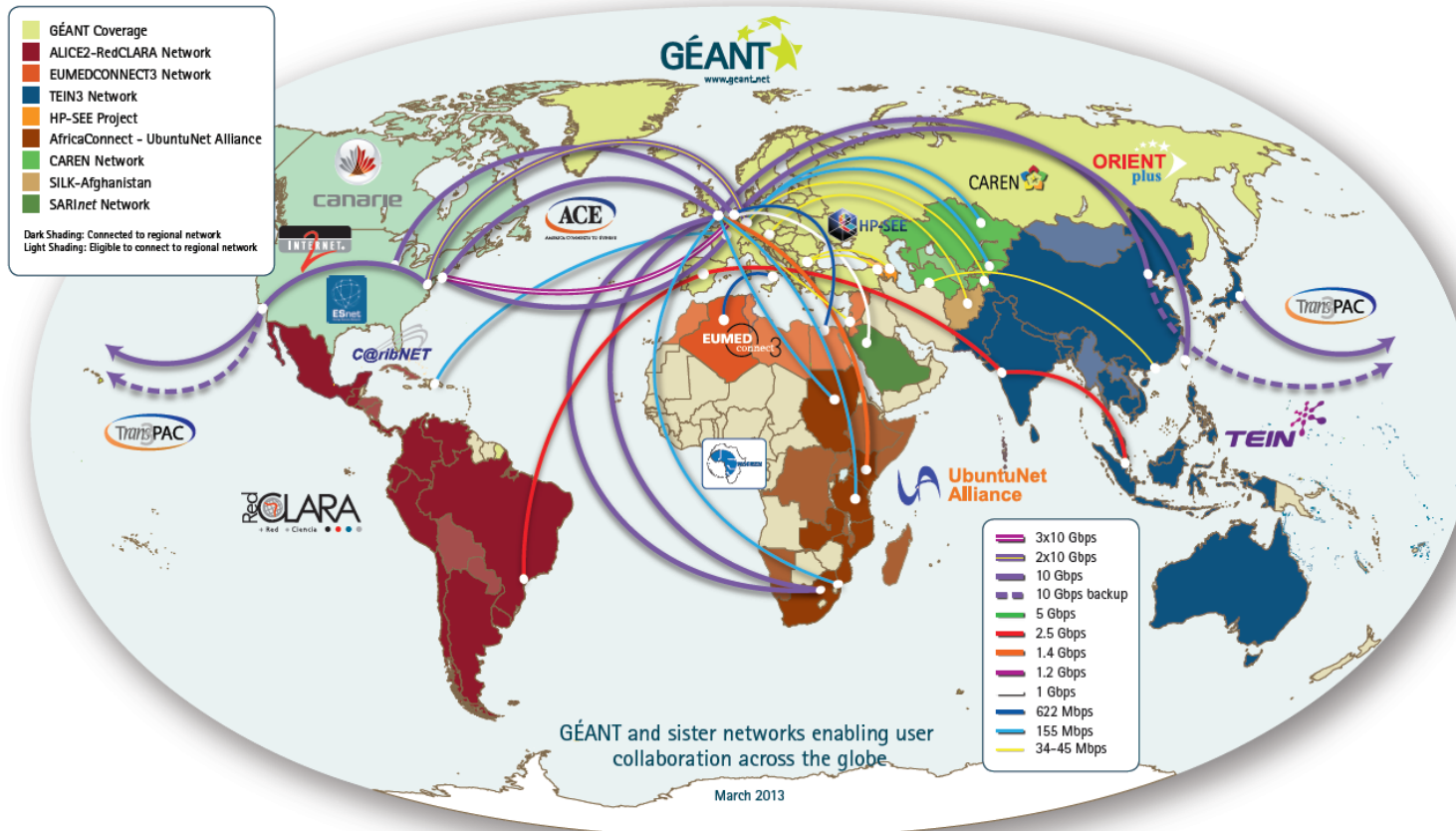
GÉANT connectivity as at January 2014. GÉANT is operated by DANTE on behalf of Europe's NRENs.

- Latest transmission and switching technology
- Routers with 100Gbps capability
- Optical transmission platform designed to provide 500Gbps super-channels
- 12,000km of dark fibre
- Over 100,000km of leased capacity (including transatlantic connections)
- 28 main sites covering European footprint

GÉANT: At the heart of the Global R&E Village



GÉANT At the Heart of Global Research Networking



connect • communicate • collaborate

GÉANT is co-funded by the European Union within its 7th R&D Framework Programme.

This document has been produced with the financial assistance of the European Union. The contents of this document are the sole responsibility of DANTE and can under no circumstances be regarded as reflecting the position of the European Union.



<http://global.geant.net/>

connect • communicate • collaborate

A few introductory words...



- Funding
 - All Global Connectivity receives generous funding Support from the European Commission
 - In the developing world this is done through Aid projects
 - Up to 80% of European Commission funding for the developing world
- Management
 - Global Connectivity is managed and coordinated in the DANTE International Relations Team, in line with GÉANT policy
 - *2 full time members of staff, 2 part-time*
 - This presentation has been brought together by the entire team

- GÉANT Interconnects with:

- CANARIE (Canada)
- ESnet (USA)
- Internet2 (USA)
- NISN (USA)



- Transatlantic Capacity:

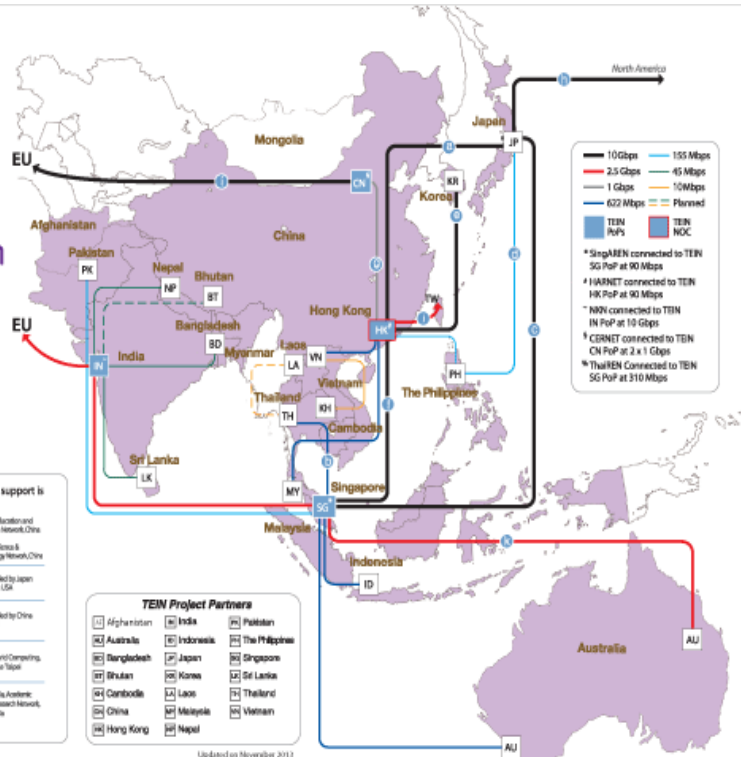
- 60Gbps for IP traffic
- 20Gbps for point-to-point connectivity
- Reciprocal funding for links from GÉANT and NSF funding



- Collaboration on Europe-North America services: e.g. performance monitoring, bandwidth-on-demand



Connecting
Asia and Europe's
Research and Education
Communities



- TEIN4 connects over 50 million users in 16 countries
- Connects to GÉANT at 2.5Gbps.
- Managed by TEIN*Cooperation Center (based in Korea), advised by DANTE

www.tein.asia

China: ORIENTplus



- Direct EU-China R&E connectivity since 2007 (for over 80 m users)
- 2nd phase: July 2011 – Dec 2014. Continuation plans being discussed
- Hybrid: high-capacity IP and point-to-point connectivity services
- London – Beijing link upgraded to 10 Gbps in January 2013 to meet increasing usage
- Major applications: (astrophysics, meteorology, genomics, radio-astronomy etc.)
- Enables transnational education (TNE) initiatives (facilitated by agreement between CERNET and JANET to obtain connectivity services on preferential terms for JANET's TNE locations in China)



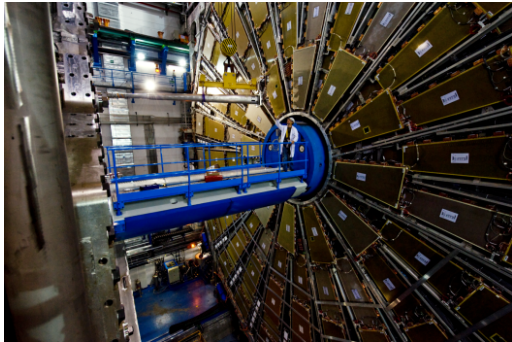
www.orientplus.eu

GÉANT connections to major Asian NREN networks



- Australia (AARNET) – 622Mbps via TEIN and 10Gbps via US
- China (CERNET and CSTNET) – 10Gbps via ORIENTplus with IP back up via US
- India (NKN) – 2.5Gbps via TEIN, plans for NKN links to GÉANT at 2 x 5Gbps this year
- Japan (JGN/NICT, SINET4/NII and MAFFIN) – 2.5Gbps via TEIN and 10Gbps via MANLAN (NII)
- Korea (KOREN) – 2.5Gbps via TEIN
- Malaysia (MYREN) - 155Mbps via TEIN, upgrade to 622Mbps or higher underway. DANTE and Janet liaising to support Educity campuses
- Pakistan (PERN) - - 155Mbps via TEIN, upgrade to 622Mbps or higher underway
- Singapore (SingAREN) 2.5Gbps via TEIN

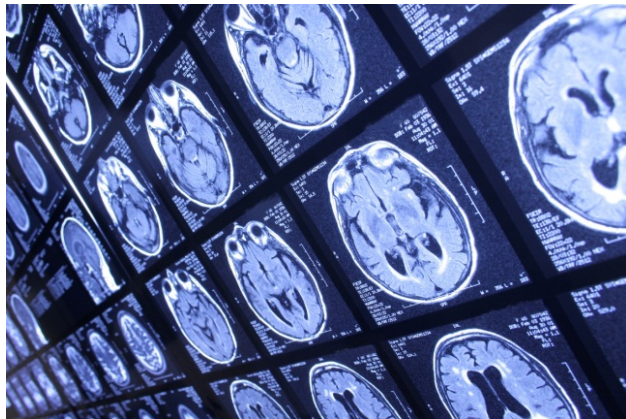
Supporting Global Collaboration (i)



The Large Hadron Collider

- **BIG SCIENCE**

Radio astronomy



- **E-HEALTH AND THE BIOMEDICAL SCIENCES**

- **E-LEARNING**

Benefits teachers,
lecturers and
students



Supporting Global Collaboration (ii)



- **EARTH OBSERVATION**



- **TELEMEDICINE**



Environmental monitoring

- **THE ARTS**

Musicians have new ways to create music, rehearse and perform together.



Disaster warning and recovery

- CAREN connects GÉANT with Central Asia:
 - Kazakhstan: 622Mbps
 - Kyrgyzstan: 600Mbps
 - Tajikistan: 155Mbps
 - Turkmenistan: 155Mbps
- CAREN hubs in Frankfurt and Hong Kong



<http://caren.dante.net>

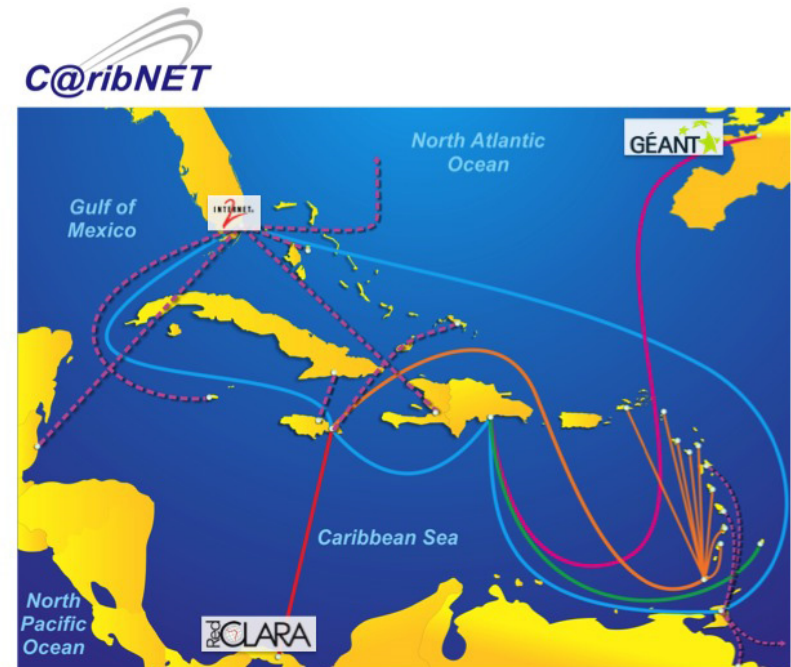
- Also, Afghanistan connects at 155Mbps to GÉANT in Vienna via NATO-funded SILK-Afghanistan project.

- RedCLARA is the regional R&E Network for Latin America:
 - RedCLARA connects 13 Latin American NRENs
 - Interconnects with GÉANT at 2.5Gbps
 - Upgrade to 5Gbps to be implemented by May 2014
- ELCIRA Project:
 - Collaboration to extend eduroam & eduGAIN in Latin America
 - Create pilot of collaboration tools (webconferencing, large file transfer)

RedCLARA Network Topology
November, 2013

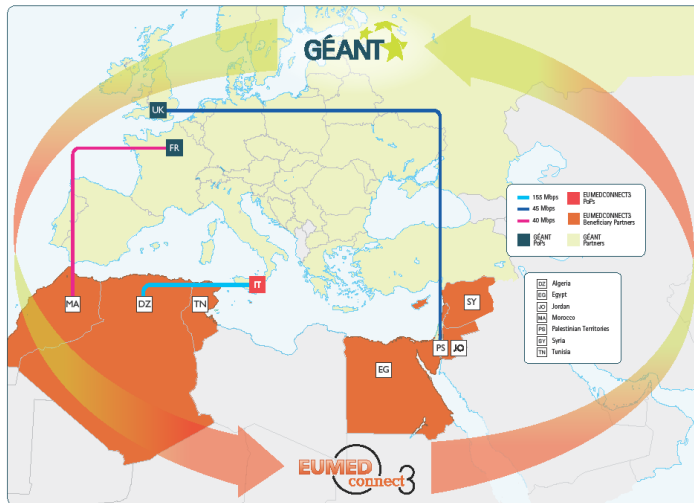


- C@ribNET is the regional R&E Network for the Caribbean:
 - Connects 13 Caribbean countries
 - Interconnects with GÉANT at 155Mbps



- C@ribNET was officially launched in February 2013
- Event involved steel drum master class including UK participation via Janet and GÉANT.

North Africa and Middle East: EUMEDCONNECT3



www.eumedconnect3.net



- Regional network since 2004
- Network reach affected by Arab Spring
- Currently connects Algeria at 622Mbps
- Egypt connects to GÉANT at 622Mbps via own link
- Work to re-build the network underway, focusing on Morocco, Tunisia, Jordan and Palestine
- Actively supports the Arab States Research and education Network (ASREN) to develop Pan-Arab network including EUMEDCONNECT
- DANTE working with JANET to support UAE Campuses

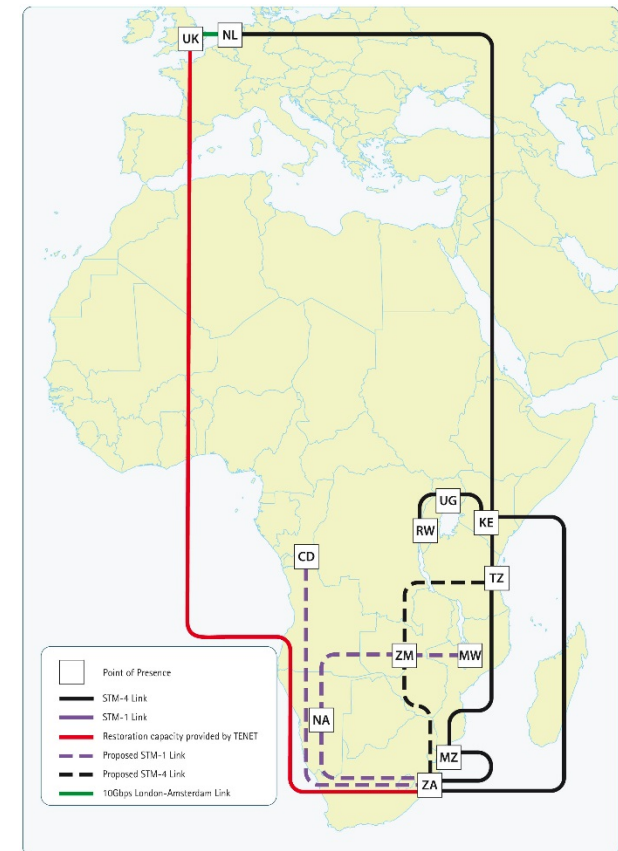
Sub-Saharan Africa:



- UbuntuNet Alliance is regional organisation for Southern and Eastern Africa
- UbuntuNet PoPs in London & Amsterdam with connectivity from:
 - Kenya, Mozambique, Tanzania, South Africa, Sudan & Zambia
- First AfricaConnect operational links implemented in March 2014:
 - 622Mbps interconnecting South Africa, Mozambique, Tanzania, Kenya, Rwanda and Uganda, and to Europe
 - Procurement on-going for DRC, Malawi, Namibia, Zambia.

www.africaconnect.eu

www.ubuntunet.net



GÉANT: The Best-connected R&E Network



65 countries outside Europe connected to GÉANT

Americas & the Caribbean

- CANARIE Canada
- C@ribNET Anguilla, Antigua, Barbados, BVI, Dominica, Dominican Rep., Grenada, Jamaica, Montserrat, St. Kitts, St. Lucia, St. Vincent, Trinidad
- CEDIA Ecuador
- CUDI Mexico
- ESNet USA
- INNOVA|RED Argentina
- Internet2 USA
- NISN (NASA) USA
- NLR USA
- RAAP Peru
- RAGIE Guatemala
- RAICES El Salvador
- RAU2 Uruguay
- REACCIUN2 Venezuela
- Red CoNARE Costa Rica
- RedCyT Panama
- RENATA Colombia
- REUNA Chile
- RNP Brazil
- USLHCNet USA

Middle East & Africa

- ANKABUT United Arab Emirates
- ARN Algeria
- ENSTINET Egypt
- EUN Egypt
- KENET Kenya
- MoRENet Mozambique
- Qatar Foundation Qatar
- RENU Uganda
- RwEdNet Rwanda
- SARInet Saudi Arabia
- SUIN Sudan
- TENET South Africa
- TERNET Tanzania
- ZAMREN Zambia

Asia & Oceania

- AARNet Australia
- AfRENA Afghanistan
- ASGC Taiwan
- BdREN Bangladesh
- CamREN Cambodia
- CERNET China
- CSTNET China
- INHERENT/ITB Indonesia

Asia & Oceania (cont.)

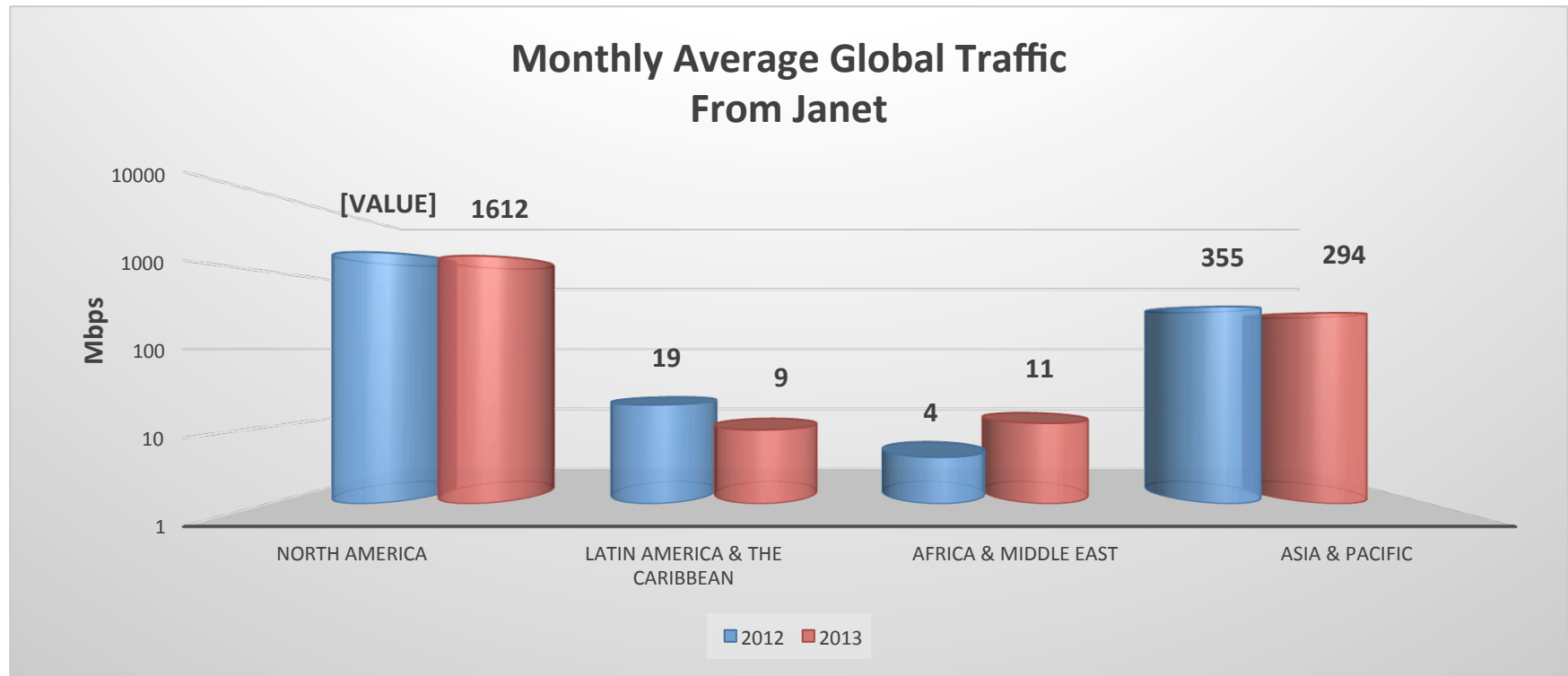
- JGN-X Japan
- HARNET Hong Kong
- KazRENA Kazakhstan
- KOREN/NIA Korea
- KRENA-AKNET Kyrgyzstan
- LEARN Sri Lanka
- MAFFIN Japan
- MYREN Malaysia
- NKN India
- NREN Nepal
- PERN2 Pakistan
- PREGINET Philippines
- REANNZ New Zealand
- SINET3/NII Japan
- SingAREN Singapore
- TARENA Tajikistan
- ThaiREN/ThaiSARN Thailand
- ThaiREN/UniNet Thailand
- TuRENA Turkmenistan
- TWAREN Taiwan
- VINAREN Vietnam

<http://global.geant.net/>

connect • communicate • collaborate

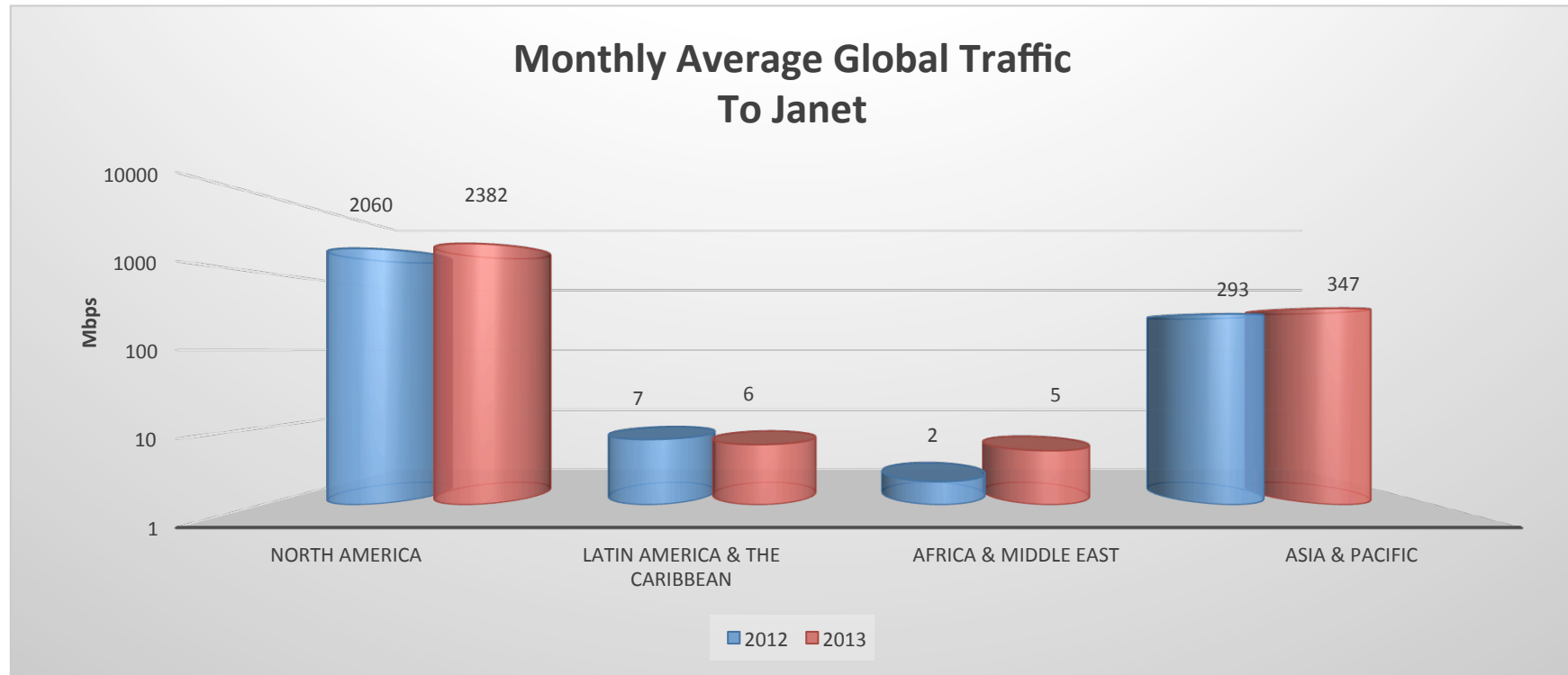
Global R&E Traffic Levels

Monthly Averages from Janet



Global R&E Traffic Levels

Monthly Averages to Janet

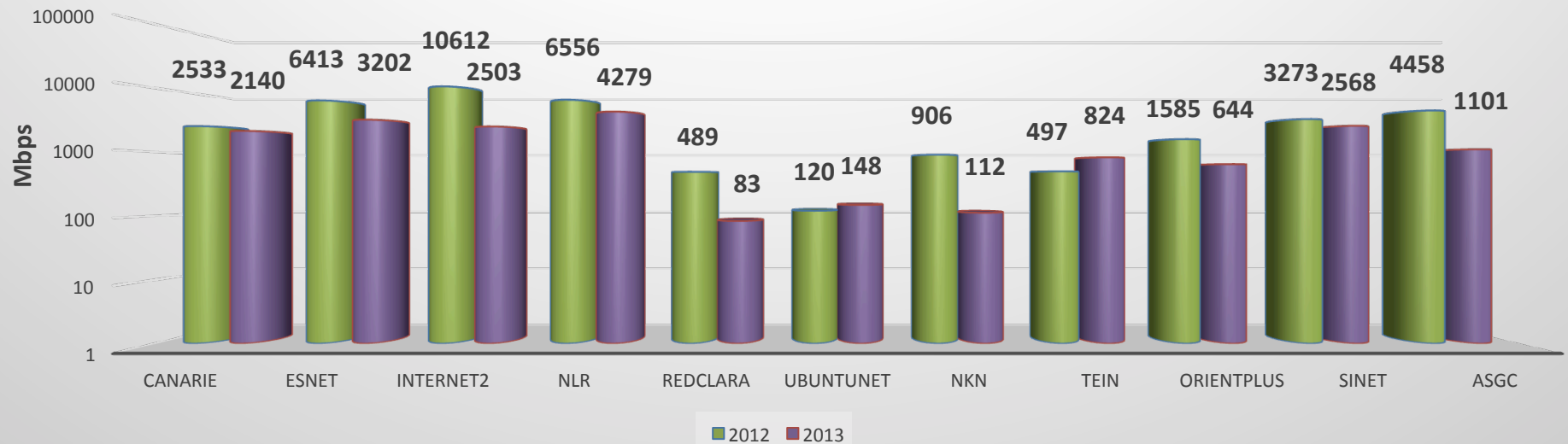


Global R&E Traffic Levels

Annual Peaks from Janet



Monthly Global Traffic Peaks
From Janet

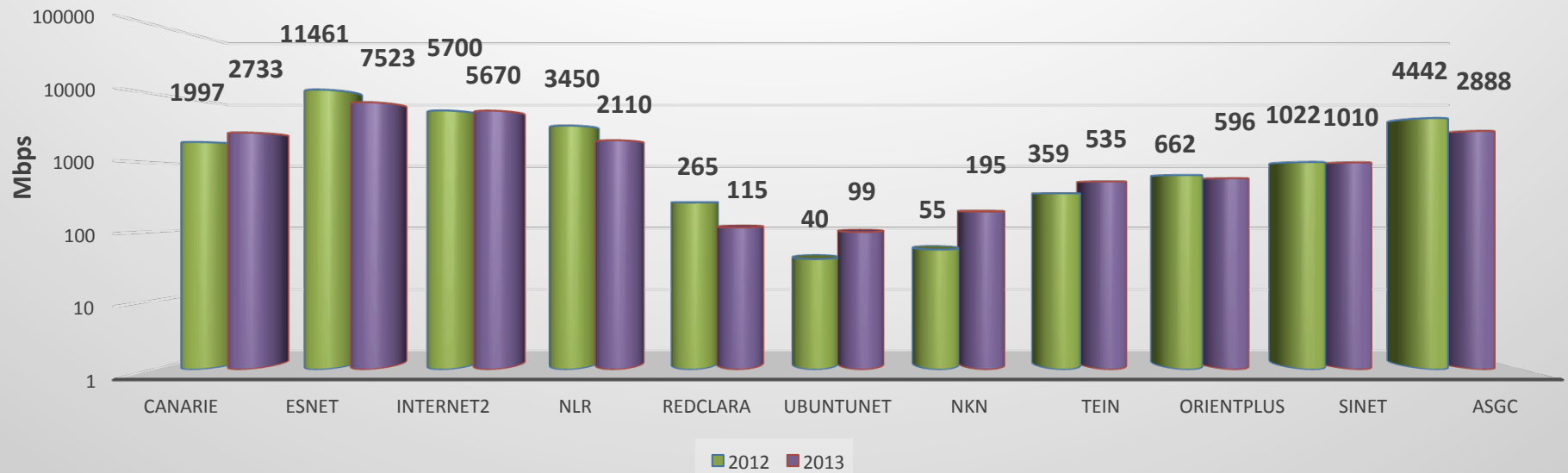


Global R&E Traffic Levels

Annual Peaks to Janet



Annual Global Traffic Peaks
To Janet



Janet Global R&E Traffic Levels

Monthly Averages



World Region	From Janet		To Janet	
	2012	2013	2012	2013
North America	1797 Mbps	1612 Mbps	2060 Mbps	2382 Mbps
Latin America & Caribbean	19 Mbps	9 Mbps	7 Mbps	6 Mbps
Africa & Middle East	4 Mbps	11 Mbps	2 Mbps	5 Mbps
Asia & Pacific	355 Mbps	294 Mbps	293 Mbps	347 Mbps
Total	2175 Mbps	1926 Mbps	2362 Mbps	2740 Mbps

Janet Global R&E Traffic Levels

Annual Peaks by Network



Network	Country / Region	From Janet		To Janet	
		2012	2013	2012	2013
CANARIE	Canada	2533 Mbps	2140 Mbps	1997 Mbps	2733 Mbps
ESnet	USA	6413 Mbps	3202 Mbps	11461 Mbps	7523 Mbps
Internet2	USA	10612 Mbps	2503 Mbps	5700 Mbps	5670 Mbps
NLR	USA	6556 Mbps	4279 Mbps	3450 Mbps	2110 Mbps
RedCLARA	Latin America	489 Mbps	83 Mbps	265 Mbps	115 Mbps
UbuntuNet	S&E Africa	120 Mbps	148 Mbps	40 Mbps	99 Mbps
NKN	India	906 Mbps	112 Mbps	55 Mbps	195 Mbps
TEIN	Asia-Pacific	497 Mbps	824 Mbps	359 Mbps	535 Mbps
ORIENTplus	China	1585 Mbps	644 Mbps	662 Mbps	596 Mbps
SINET	Japan	3273 Mbps	2568 Mbps	1022 Mbps	1010 Mbps
ASGC	Taiwan	4458 Mbps	1101 Mbps	4442 Mbps	2888 Mbps

Let us know!



- We are always interested to find out how the global connectivity is used!
- Development of case study material
- irc@dante.net
- Check out the Global section on the GÉANT website at <http://global.geant.net/>

Thank you!



Connect | Communicate | Collaborate

www.geant.net

www.twitter.com/GEANTnews | www.facebook.com/GEANTnetwork | www.youtube.com/GEANTtv

