1. **TEIN, how it has progressed?**
   a. March 2018
   b. Changes since Singapore meeting
   c. July 2018
   d. Changes upcoming

2. **How to turn traffic volume up again?**
   a. Reality check
   b. Diagnosis
   c. One solution – incrementalism
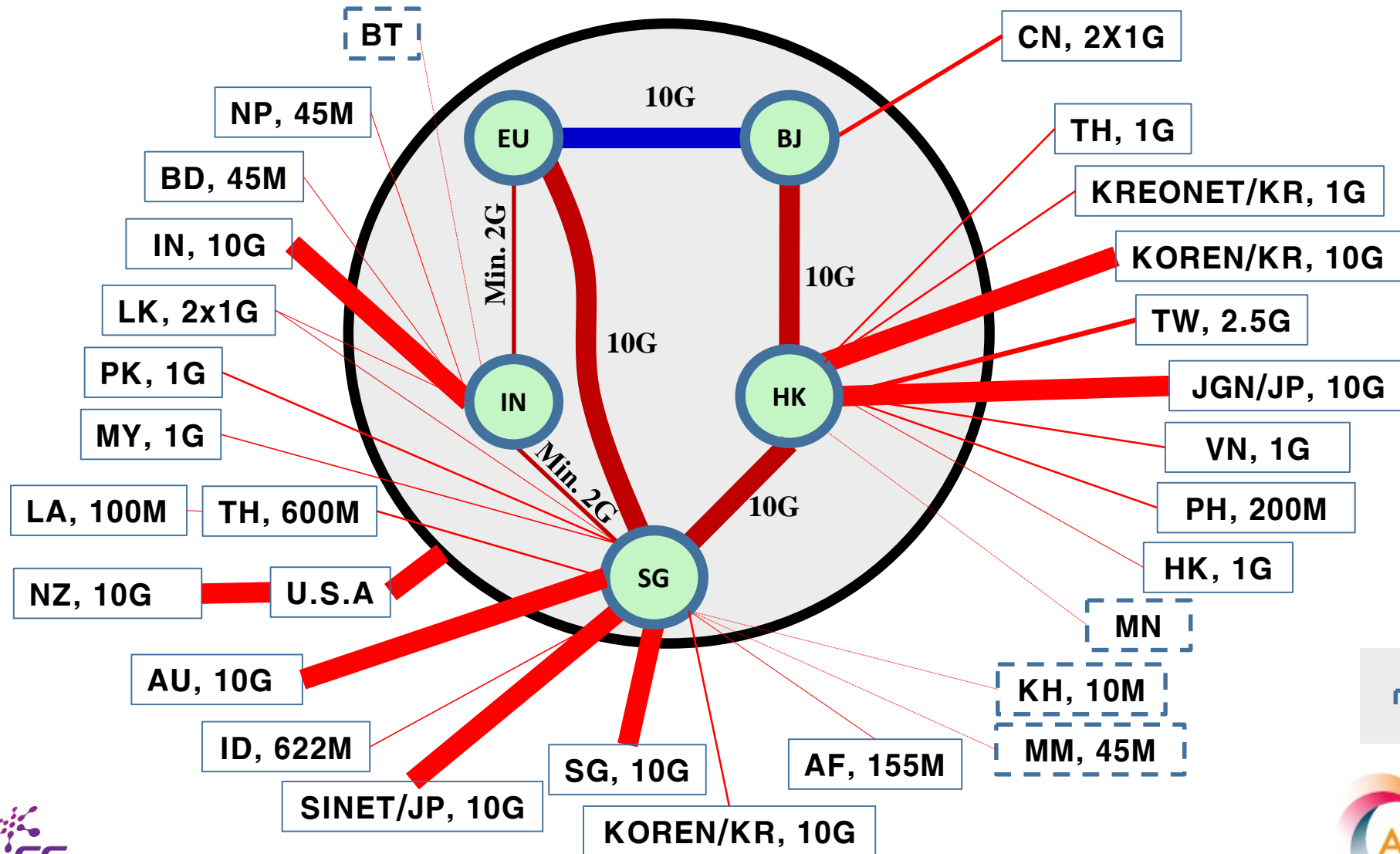   d. Issue on the scale up approach
   e. Set up of collaboration platform

Patch Lee

TEIN*CC
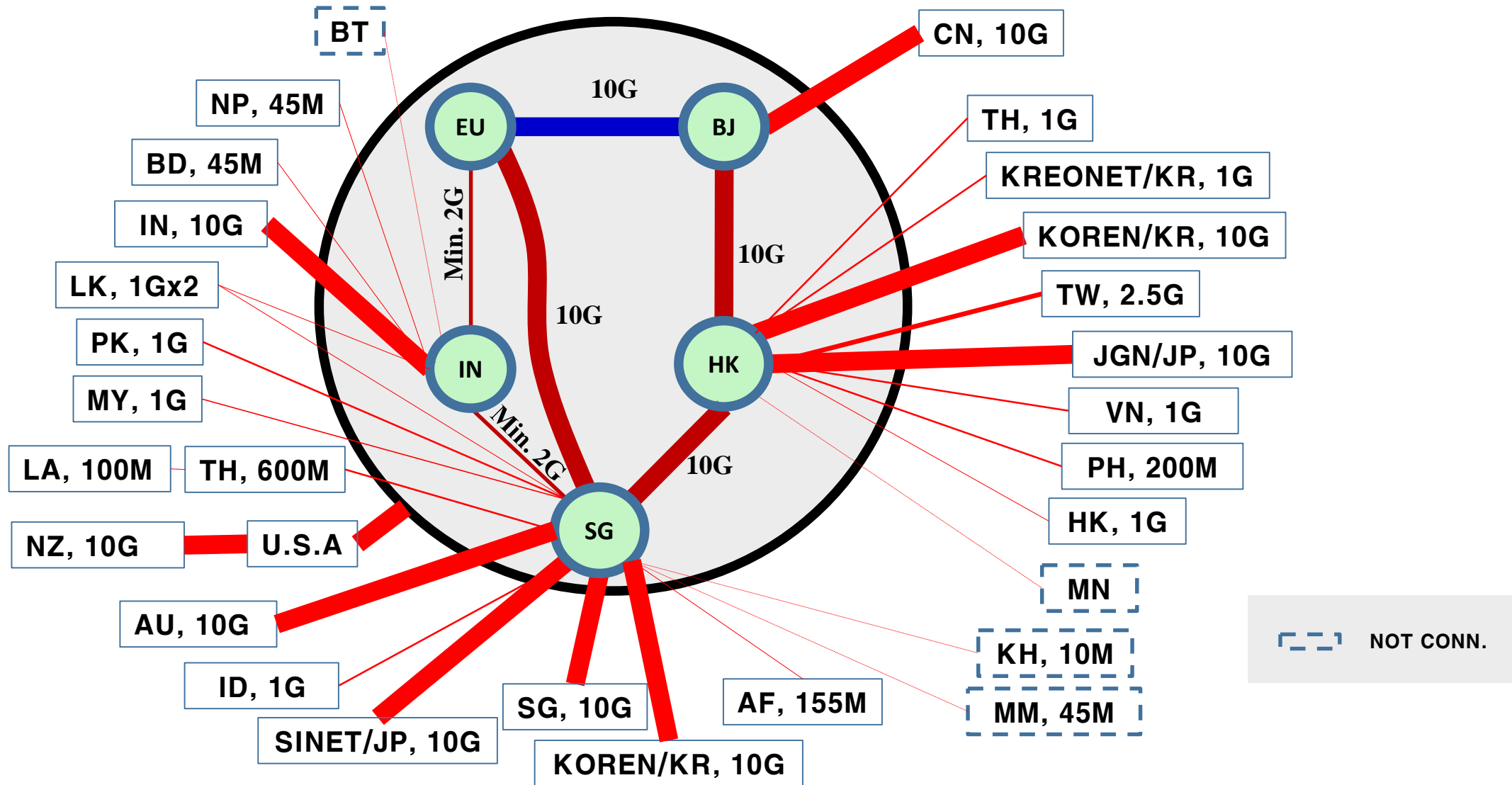
6 August 2018

a. TEIN topology as of March 2018

① b. Changes since Singapore meeting

| Type	Points/locations	Partner	Previous	Present	Completed
Connectivity	Singapore	KOREN	1G	10G	June
	Singapore - Indonesia	ITB	622M	1G	July
	Beijing	CERNET	2x1G	10G	July
Equipment (Routers)	Hong Kong, Singapore	-	Juniper M120	Juniper MX480	May/June

c. TEIN topology as of Jul. 2018

1 d. Changes upcoming

Type	Points/locations	Partner	Current	Planned	Timeline	Etc.
Connectivity	Asia – Europe	-	10G	**100G**	Dec.	Six party collaboration
	HK-KR, SG-KR	KOREN	10G	**2x100G**	Dec.	-
	HK	HKOX	1G	**10G**	Aug.	-
	HK	KREONET	1G	**10G**	Aug.	-
	SG	ASGC	2.5G	**10G**	Aug.	-
	HK-TH	ThaiREN	1G	**2G**	Aug.	-
	BT-IN	DrukREN	-	**1G**	Dec.	Funded by NKN
	BD-IN	BdREN	45M	**1G**	Sep.	Funded by NKN
	NP-IN	NREN	45M	**1G**	Dec.	Funded by NKN
	MM-SG	mmREN	-	**45M**	Sep.	-
	KH-SG	CamREN	-	**10M**	Sep.	-
	MY-SG	MYREN	1G	**10G**	Dec.	-

a. Reality check (2012 vs. 2018)

TOTAL VOLUME(TB)
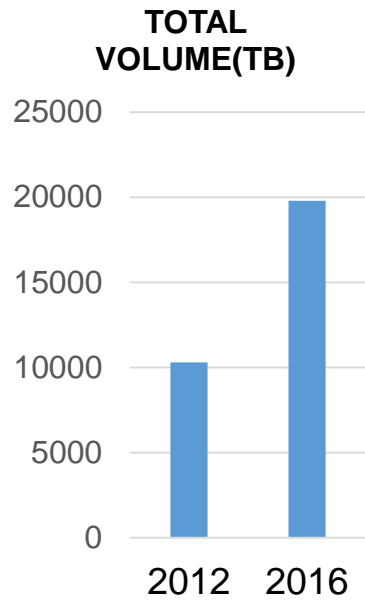
+ Bandwidth growth
+ New applications

≠ **Traffic growth**

Monthly Traffic VOLUME (TB, 2016 - 2018)
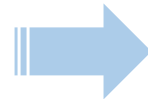
Bandwidths, Mbps

	Jan. 2013	Jan. 2018	%(CAGR)
Backbone	6,000	32,000	**40**
Access	16,702	74,187	**35**
SUM	22,702	106,187	**36**
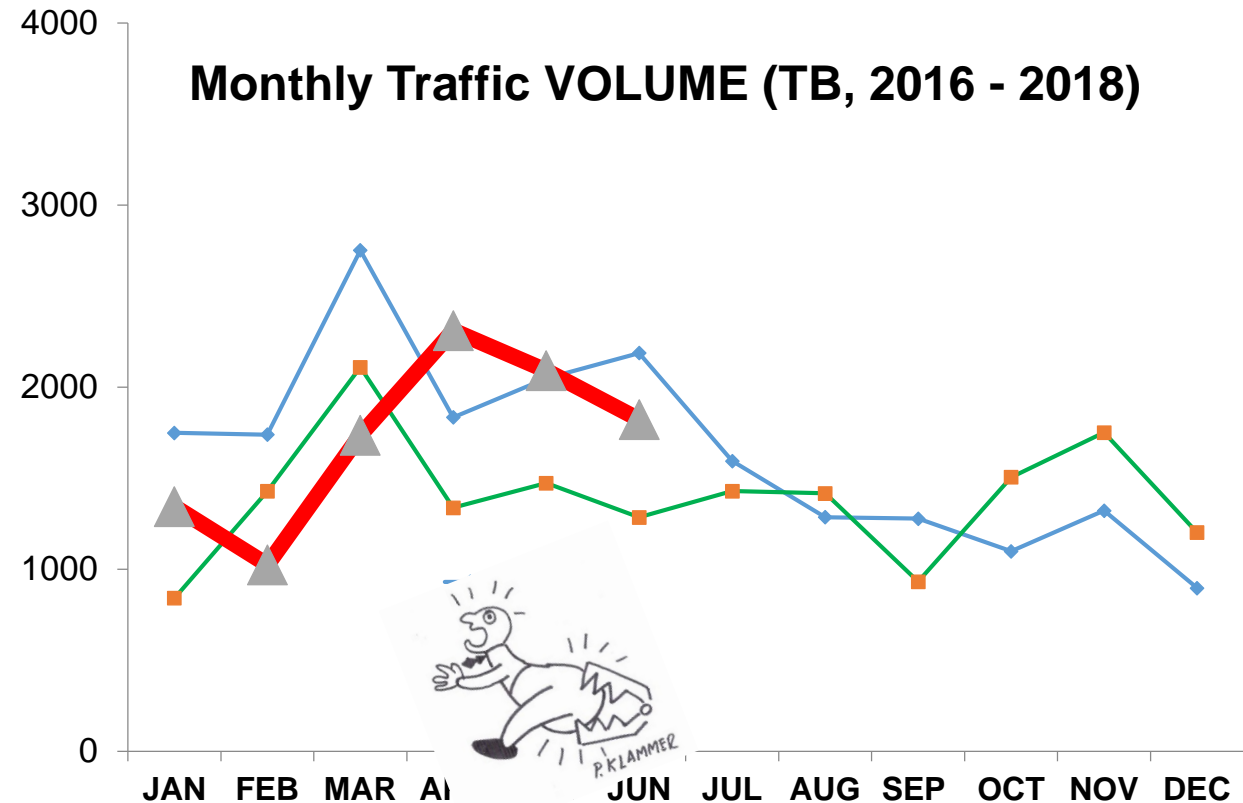
a. Reality check - are we trapped here? Excuses !!!

✓ There were **more lengthy outages** on the **TEIN** links …

✓ There was some of **re-routing of traffics** among TEIN networks …

✓ Singapore to Mumbai to Europe's Madrid 10 Gbps link was **decommissioned** …

HOWEVER, We expect that:
The trend of increase of volumes of traffics seen during TEIN4 period, is expected to **re-continue** throughout the Asi@Connect project. Because we are noticing **continued upgrades and newly installations** of TEIN connectivity, e.g. 100 Gbps upgrade between Asia and Europe...

Darn you !!!

By Frits Ahlefeldt

1. **Resources more on new ones**

2. **Not much attentions on existing ones**
- High energy
- Climate data (EUMETSAT)
- Agriculture
- supercomputing
- etc.

1st call – 1.7**M** €
2nd call – 2.7**M** €
3rd call – xxx **M** €

…

Incrementalism

TOTAL VOLUME(TB)

2012   2016

Monthly Traffic VOLUME (TB, 2016 - 2018)

Even though we were sluggish and s taggering;
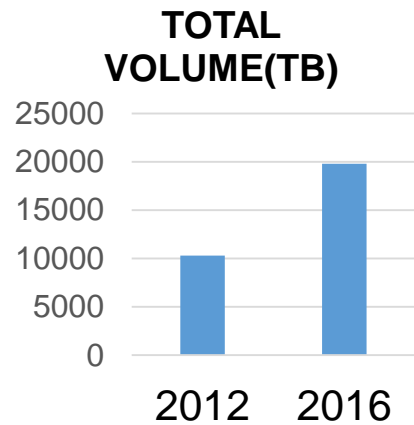
✓ We have not something, but many things here to further materialize & scale up !!!
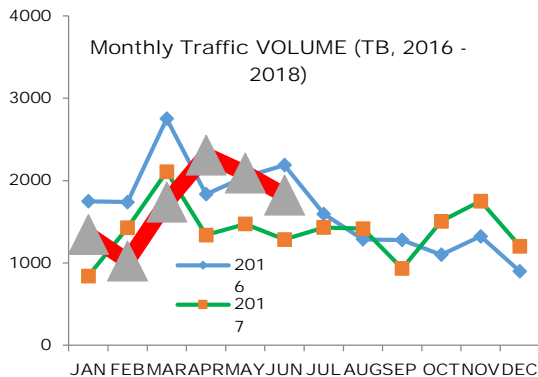
✓ This approach looks much easier and even cost effective.

SG->EU(Source IP address)		COUNTRY
AS10052	KNU-AS Kyungpook National University, KR	KR
AS9270	APAN-KR-AS National Information Society Agency, KR	KR
AS7575	AARNET-AS-AP AARNet, AU	AU
AS23767	A-STAR-AS-AP A-STAR, SG	SG
AS9419	NTU-AS-AP Nanyang Technological University, SG	SG
AS23855	SINGAREN-GIX-AS-AP SingAREN, SG	SG
AS7472	NUS-AS-AP Computer Centre, SG	SG
AS10148	UNIMELB-AS-AP The University of Melbourne, Victoria, AU	AU
AS45773	HECPERN-AS-PK PERN AS, Islamabad, Pakistan, PK	PK
AS3661	ERX-CUHKNET The Chinese University of Hong Kong, HK	HK
AS17862	KWNU-AS-KR Kangwon National University, KR	KR
AS4158	CITYU-AS-HK City University of Hong Kong, HK	HK
AS51946	NEWCASTLE-UNI-NUSAJAYA-CAMPUS, GB	
AS24090	UNISAINS-AS-AP Universiti Sains Malaysia (USM), MY	MY
AS24437	UWA-AS-AP University of Western Australia, AU	AU
AS9821	DOST-PH-AP Department of Science and Technology, PH	PH
AS9686	SKKUNET-AS SungKyunKwan University (SKKU), KR	KR
AS55824	NKN-CORE-NW NKN Core Network, IN	IN

Relevant information can be acquired partially, however rough road ahead to achieve such as the below

✓ Who talks to Whom?

✓ With what subject/topic?

✓ How long/much?

I think they might be related to
- High energy
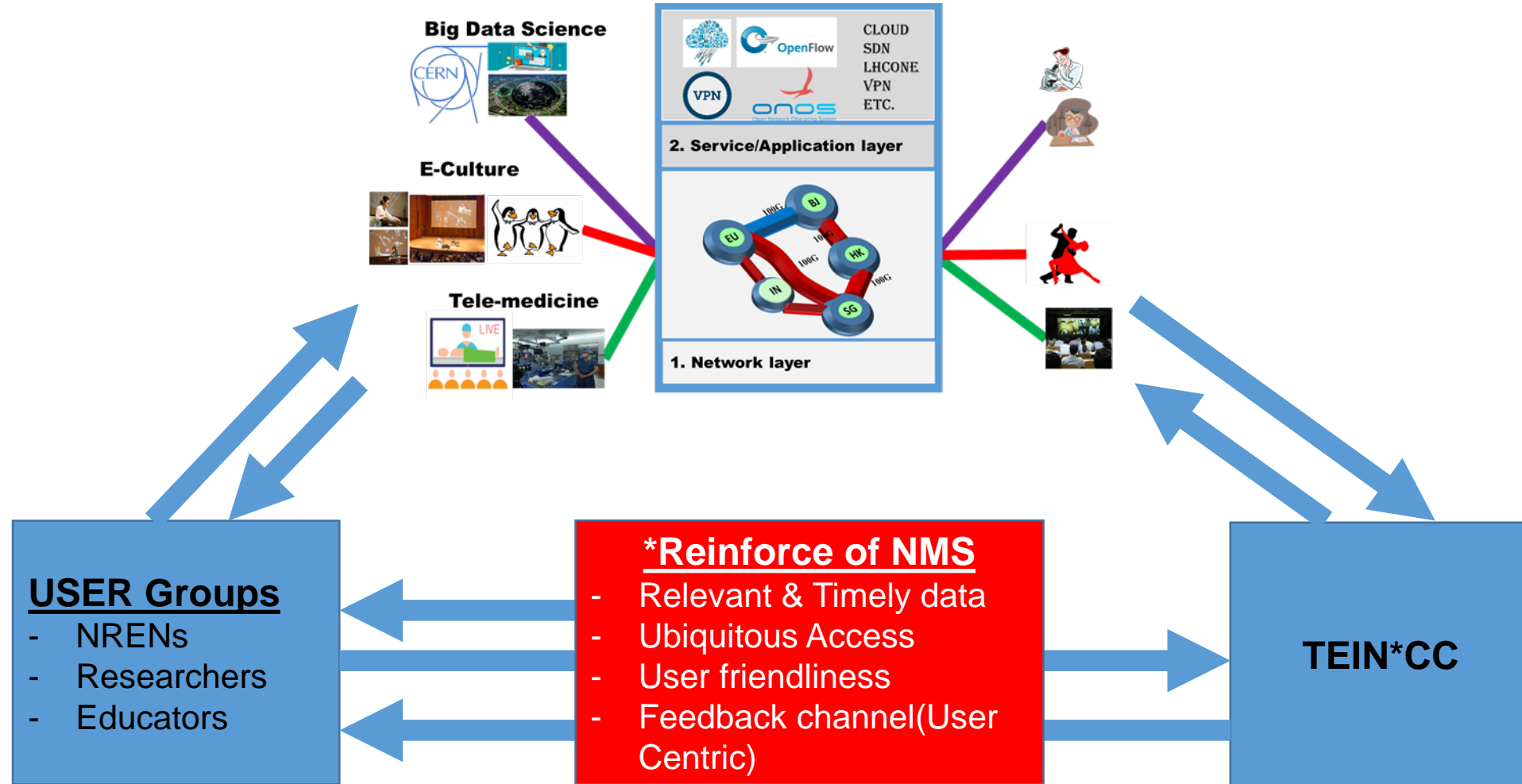- Super computing
- um ... however not that sure

ID->outside(Source IP address)	ID->outside(Destination IP address)
AS4796 BANDUNG-NET-AS-AP Institute of Technology Bandung, ID	AS7575 AARNET-AS-AP Australian Academic and Reasearch Network (AARNet), AU
AS3382 ERX-JUITA-UINET University of Indonesia, ID	AS55824 NKN-CORE-NW NKN Core Network, IN
AS23456 -Reserved AS-, ZZ	AS5408 GR-NET http://www.grnet.gr, GR
AS45705 PPTIK-UGM-AS-ID PPTIK - UNIVERSITAS GADJAH MADA, ID	AS19679 DROPBOX - Dropbox, Inc., US
AS55697 USU-AS-ID Universitas Sumatera Utara, ID	AS680 DFN Verein zur Foerderung eines Deutschen Forschungsnetzes e.V., DE
AS46019 UNIBRAW-AS-ID Universitas Brawijaya, ID	AS23456 -Reserved AS-, ZZ
AS38142 UNAIR-AS-ID Universitas Airlangga, ID	AS4538 ERX-CERNET-BKB China Education and Research Network Center, CN
AS17553 IPBNET-AS-AP Bogor Agricultural University, ID	AS786 JANET Jisc Services Limited, GB
AS63510 UNSYIAH-AS-ID Syiah Kuala University (Unsyiah), ID	AS1103 SURFNET-NL SURFnet, The Netherlands, NL
AS55684 UNS-AS-ID Universitas Sebelas Maret, ID	AS33011 BOXNET - Box.com, US
AS55674 PUSKOM-UNY-AS-ID Universitas Negeri Yogyakarta, ID	AS1653 SUNET SUNET Swedish University Network, SE
AS55680 KSI-UAJY-AS-ID Kantor Sistem Informasi Universitas Atma Jaya Yogyakarta, ID	AS8517 ULAKNET, TR
AS38331 ITS-AS-ID-AP Institut Teknologi Sepuluh Nopember, ID	AS1101 IP-EEND-AS IP-EEND BV, NL
AS58375 UNUD-AS-ID Universitas Udayana, ID	AS137 ASGARR Consortium GARR, IT
AS46049 UNDIP-AS-ID Universitas Diponegoro, ID	AS559 SWITCH Peering requests: (peering@switch.ch), CH
AS58475 UNLAM-AS-ID Universitas Lambung Mangkurat, ID	AS2200 FR-RENATER Reseau National de telecommunications pour la Technologie, FR
AS55695 UIN-AS-ID Universitas Islam Negeri Sunan Kalijaga Yogyakarta, ID	AS1853 ACONET ACOnet Backbone, AT
AS63876 IDNIC-ISI-AS-ID Institut Seni Indonesia Yogyakarta, ID	AS2907 SINET-AS National Institute of Informatics, JP
AS45304 PETRA-AS-ID PetraNet, Surabaya, Indonesia, ID	AS8664 ICM-PUB public network services, PL
AS18394 UPI-AS-ID Universitas Pendidikan Indonesia, ID	AS36040 YOUTUBE - Google LLC, US

No idea !!!

e. How to bridge the gap? Set up collaboration platform

Big Data Science

E-Culture

Tele-medicine

CLOUD
SDN
LHCONE
VPN
ETC.

2. Service/Application layer

1. Network layer

USER Groups
- NRENs
- Researchers
- Educators

*Reinforce of NMS
- Relevant & Timely data
- Ubiquitous Access
- User friendliness
- Feedback channel(User Centric)

TEIN*CC

e. Core in the collaboration platform - NMS

Revamp Requirements
- **Intelligent display/estimation of collaborations**
- Anywhere, Anytime & Fast Access
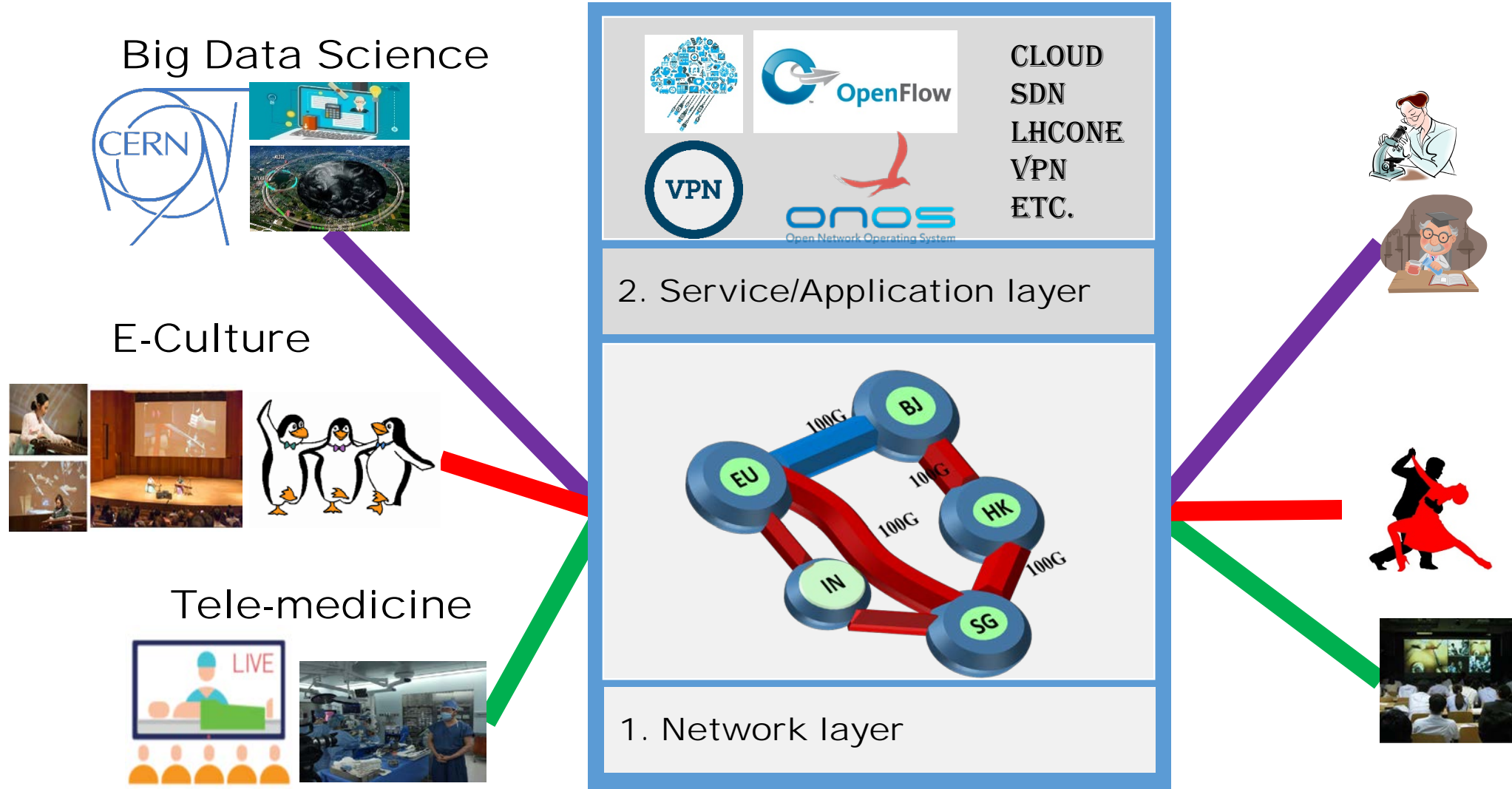- Direct feedback channel to TEIN*CC
- User friendly graphics

Based on currently available tech
nology such as **netflow**

netsage

- Map IP addresses to:
  - AS Numbers
  - Universities
  - Project name
  - Science type

UNINETT's NAV system

Appendix 1. Platformitization - future of the project

Big Data Science

E-Culture

Tele-medicine

CLOUD
SDN
LHCONE
VPN
ETC.

2. Service/Application layer

100G
BJ
100G
EU
100G
HK
IN
100G
SG

1. Network layer

Appendix 2. IRU collaboration - Asia to Europe 100G

- Subject
  - ✓ Procurement of long-term lease (IRU, min. 15 years) for the link Asia to Europe with min. 100G capacity
- Purpose
  - ✓ Meet the increased demands for the capacity between Asia and Europe (currently 10G) areas such as environmental science, high energy physics and radio astronomy, including the new Square Kilometre Array facility (SKA) facility
  - ✓ Cash contribution from the other collaborating parties could provide good opportunity to fund other activities in Asi@Connect project
- Collaborating Parties
  - ✓ TEIN*CC, AARNet, SingAREN, GEANT, NORDUnet & SURFnet
- Commercial model
  - ✓ Not fixed yet, basically equal funding contribution & equal share of bandwidth, so we cannot assume that all mentioned parties will end up as partners in this project.
  - ✓ However, TEIN*CC's idea is that it bears initial 54% costs of the plan and in retrospect it gets cash contribution (refund) to Asi@Connect project from the other parties as well as taking care of maintenance charges by them.
- Impacts on Asi@Connect
  - ✓ 100G will NOT bring any impact to the current NREN payments
  - ✓ Since IRU methodology requires upfront payment min. 50% of TCO and the contract period surpasses that of Asi@Connect, TEIN*CC needs to have sort of approval from the EC
- Timeline
  - ✓ Procurement tender launched as of 2 August 2018, Target to complete the delivery by early 2019

- Last resort
  - ✓ If current approach is not feasible, either because the other parties do not accept or because the EC cannot accept it, then withdraw from the 100G collaboration and instead arrange agreements with SingAREN and AARNet to use part of their capacity for Asi@Connect project.

Thank you!!!