

Network Issues for LHC Collaboration from Thailand

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**Thailand Research and Education Network (ThaiREN)
Thailand National e-Science Infrastructure Consortium**

Topic

- A brief Introduction to Thailand Research and Education Network
- LHC related projects in Thailand
- Network Issues for LHC collaboration

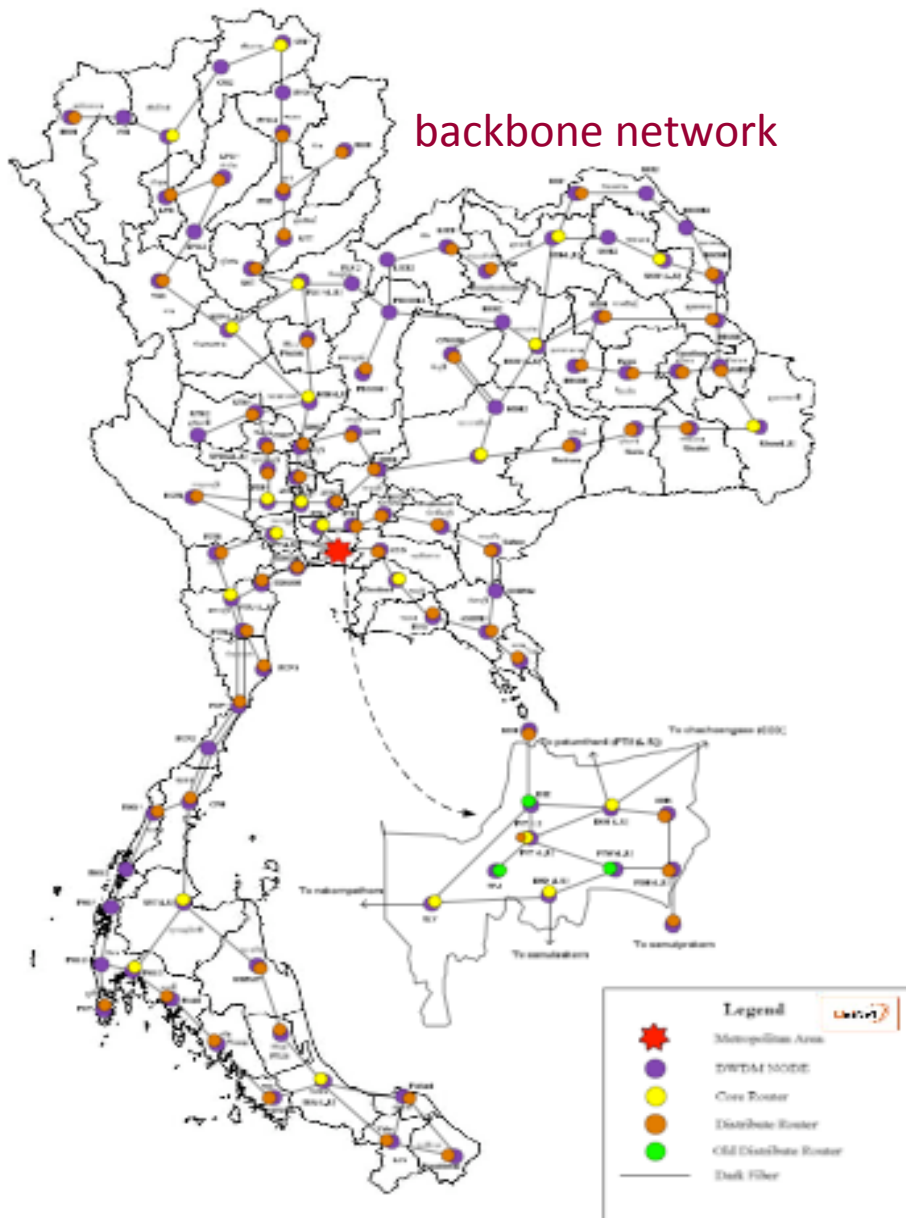
Thailand Research and Education Network (ThaiREN)

ThaiREN represents research and education networks consisting of ThaiSarn and UniNet for international research and education collaboration.

ThaiSarn connects government institutes for research activities and project collaborations.

UniNet currently connects most higher education universities as well as cover more than 7,000 basic education schools and vocational institutions in Thailand.

National R&E Backbone Network



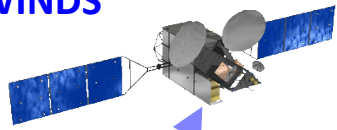
- Optical Network Backbone with DWDM @ N x 10Gbps
- Fiber to the University @ 1 - 2 Gbps
- Fiber to the school @ 10 – 100 Mbps
- Public libraries @ 10 – 100 Mbps

Members	# of Members
Universities/Institutes	194
Vocational Education	415
Educational Service Area	185
Basic Education	9,749
Public Library	151
Research and others	51
Total	10,745

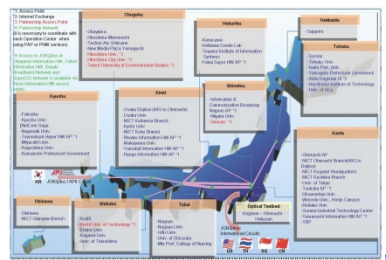
International R&E Network Collaboration



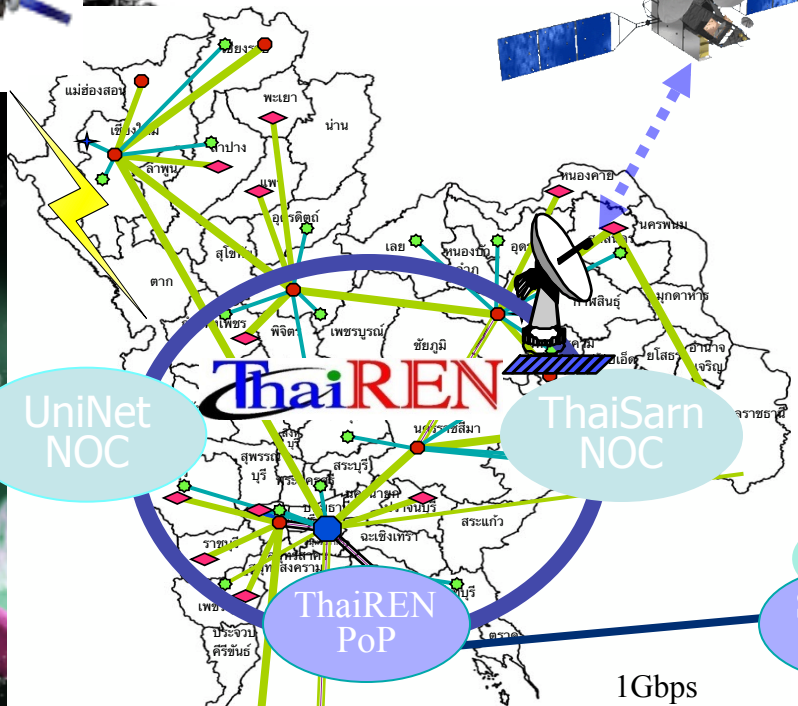
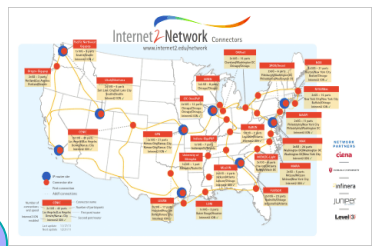
WINDS



JGN-X (JP)



Internet2 (USA)



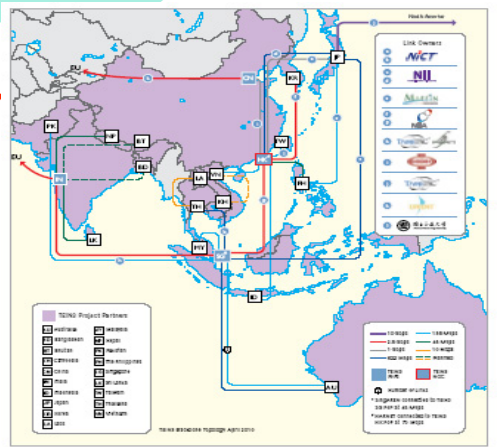
Global R&E Networks

APAN-JP PoP

Singapore PoP

310 Mbps

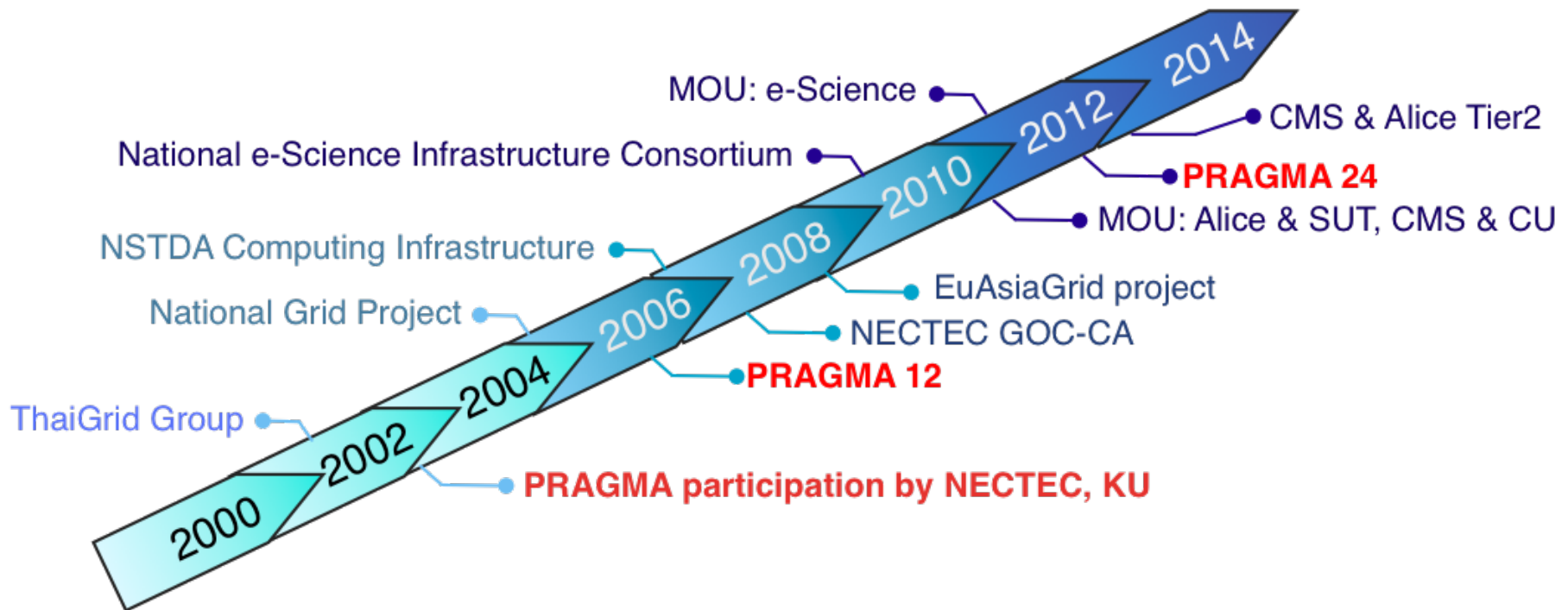
TEIN4



a Singapore

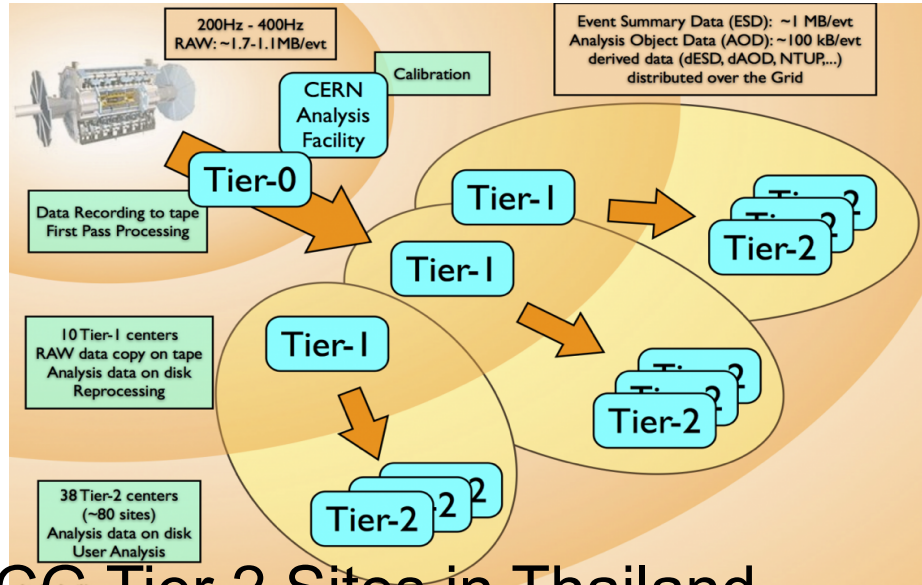
LHC Related Projects in Thailand

Thai Computing Development: 2000-Present



LHC Related Projects in Thailand

MoU signing ceremony between Chulalongkorn University, Suranaree University of Technology, NSTDA, and CERN (as host of the WLCG: Worldwide LHC Computing Grid) at Sra Patrum Palace on 10 October 2013



WLCG Tier 2 Sites in Thailand

NSTDA-
CU CMS

CPU 200 cores, storage 200 TB

SUT
ALICE

CPU 128 cores, storage 100 TB

NSTDA
ALICE

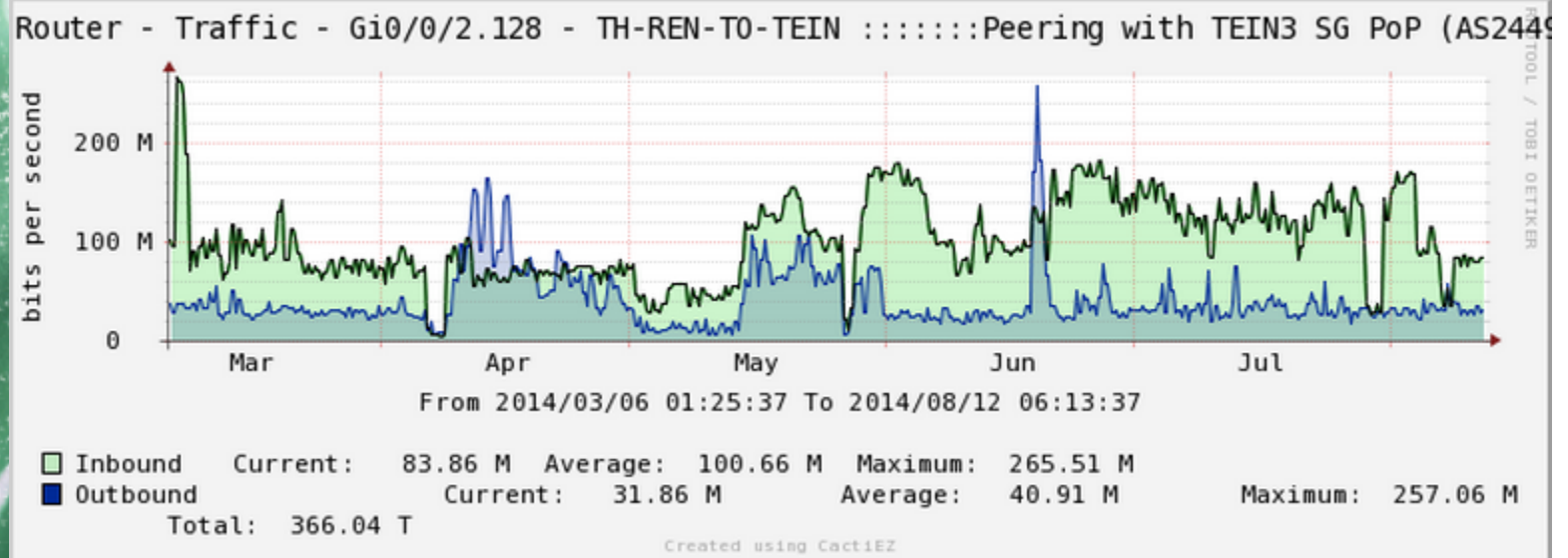
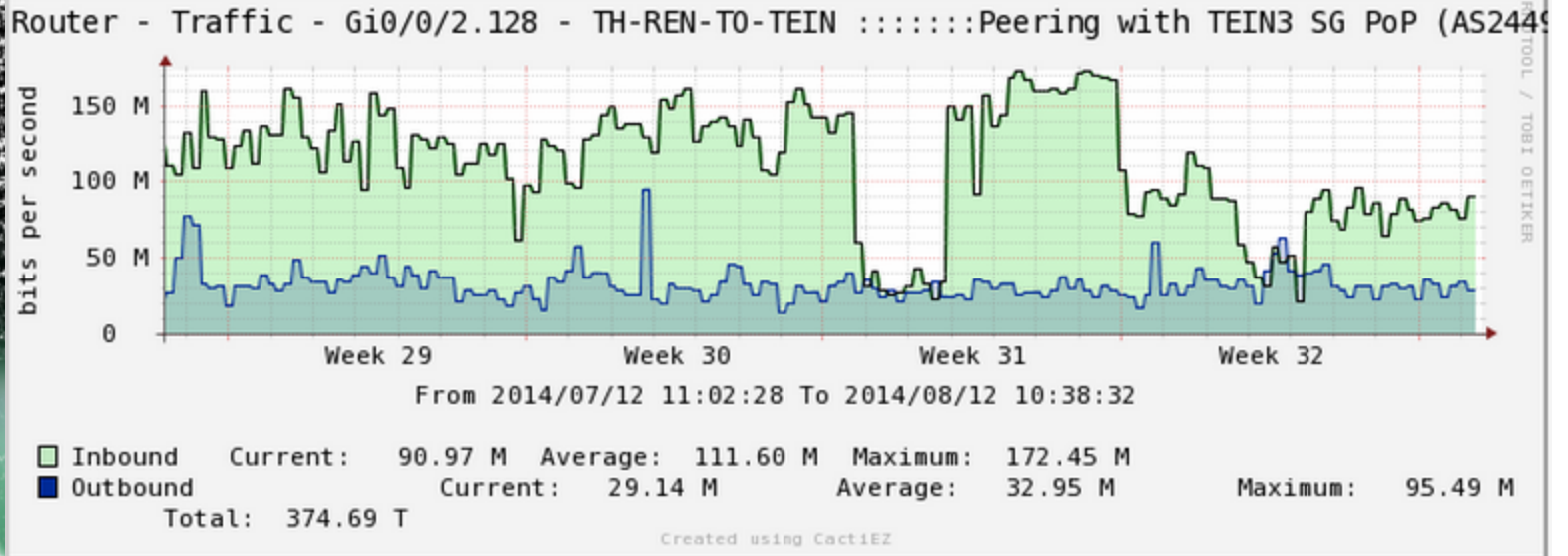
CPU 60 cores, storage 10 TB

Network Issues

- Network bandwidth
- Network routing



Network Bandwidth to TEIN4

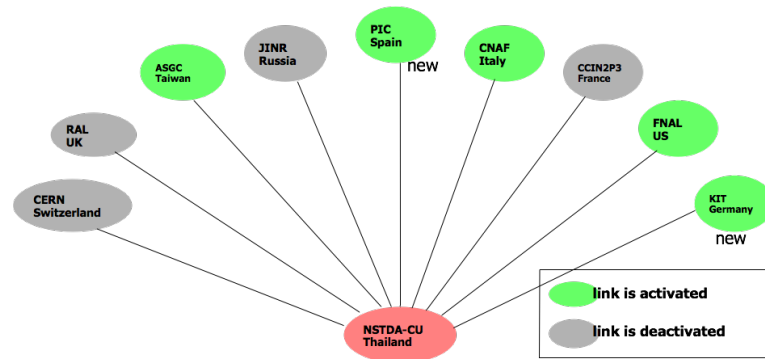
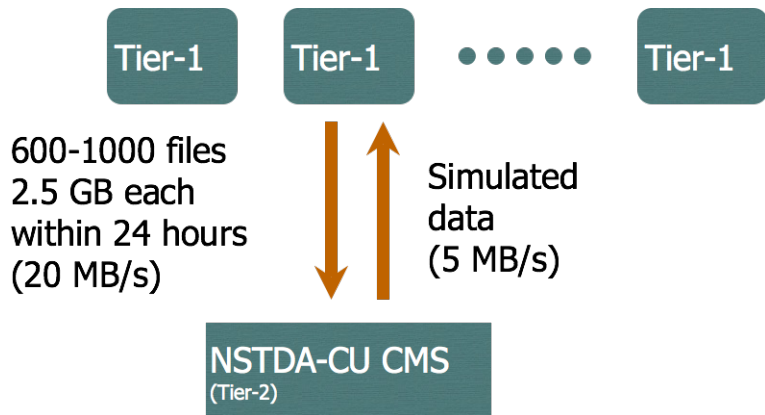


NSTDA CU CMS

Site Readiness Status: **NR NR NR NR NR NR NR NR NR NR NR NR NR NR R R R**

Daily Metric:	E E E E E					E E		E E E E E					E E		E E E O O O O							
Maintenance:	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up	Up		
HammerCloud:	98%	98%	95%	95%	100%	99%	99%	100%	99%	100%	94%	99%	97%	99%	97%	96%	98%	96%	94%	93%	99%	
SAM Availability:	27%	100%	97%	75%	100%	100%	100%	100%	79%	100%	100%	100%	100%	100%	96%	100%	91%	96%	100%	100%	100%	
Good T2 links from T1s:	4/8	6/15	4/15	2/15	2/15	4/15	4/15	5/15	6/15	8/15	6/15	6/15	5/15	6/15	6/15	6/15	6/15	15/15	16/15	12/15	12/15	
Good T2 links to T1s:	0/8	0/15	0/15	0/15	0/15	13/15	13/15	14/15	13/15	14/15	14/15	13/15	11/15	14/15	13/15	13/15	13/15	15/15	15/15	15/15	15/15	
Active T2 links from T1s:	6	6	6	6	6	6	6	6	6	6	7	7	7	7	7	7	7	7	7	7	7	
Active T2 links to T1s:	9	9	9	9	9	9	9	9	9	9	12	12	12	12	12	12	12	12	12	12	12	
SR Ranking (last 15 days):	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	13	
Waiting Room:	in	in	in	in	in	in	in	in	in	in	in	in	in	in	in	in	in	in	in	in	in	
	26	27	28	29	30	31	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
	May					Jun																

Report made on 2014-06-16 22:39:02 (UTC)



Network Route to CERN (Switzerland)

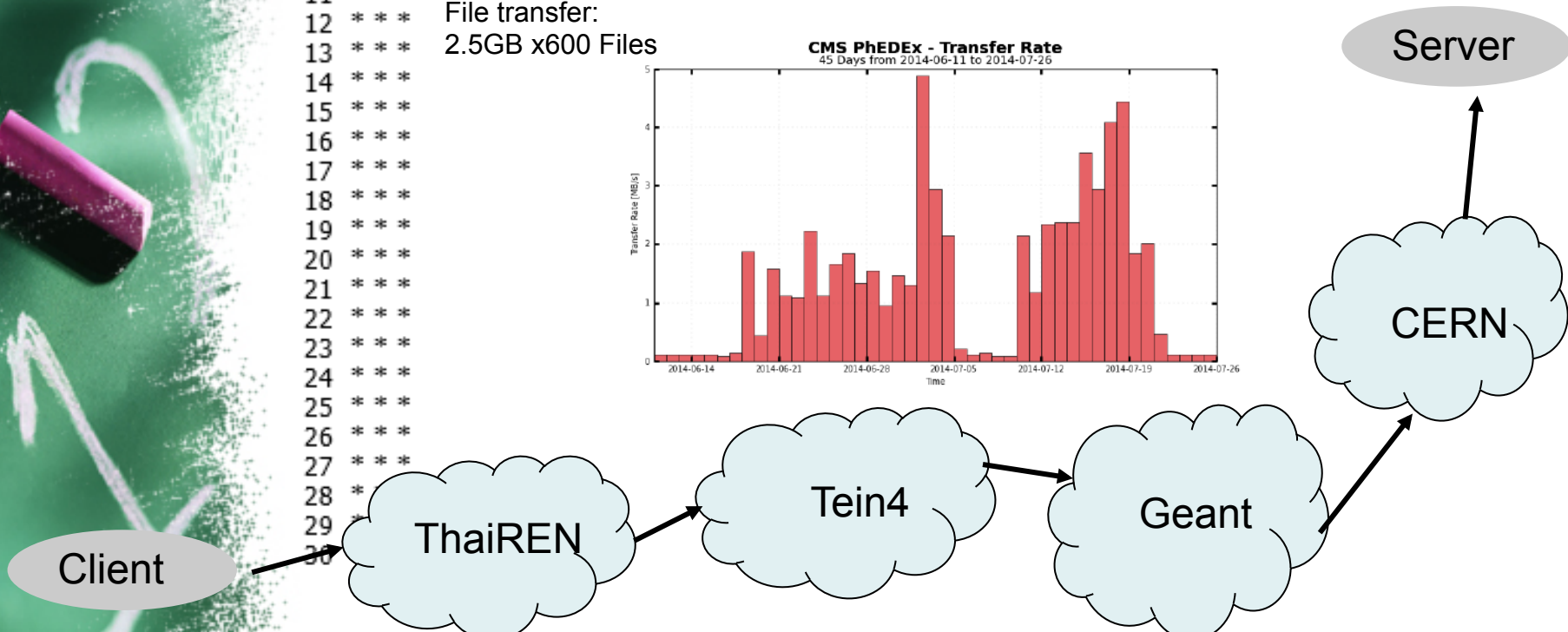
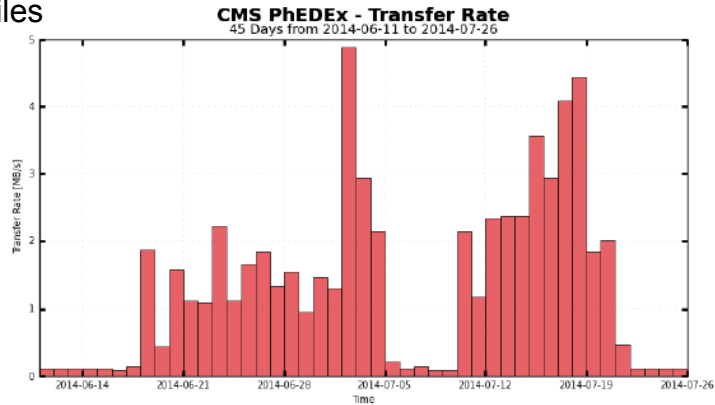
to CERN

```

11 192.168.1.100 -> 192.168.1.1: 1.000 ms
12 192.168.1.1 -> 192.168.1.1: 0.000 ms
13 192.168.1.1 -> 192.168.1.1: 0.000 ms
14 192.168.1.1 -> 192.168.1.1: 0.000 ms
15 192.168.1.1 -> 192.168.1.1: 0.000 ms
16 192.168.1.1 -> 192.168.1.1: 0.000 ms
17 192.168.1.1 -> 192.168.1.1: 0.000 ms
18 192.168.1.1 -> 192.168.1.1: 0.000 ms
19 192.168.1.1 -> 192.168.1.1: 0.000 ms
20 192.168.1.1 -> 192.168.1.1: 0.000 ms
21 192.168.1.1 -> 192.168.1.1: 0.000 ms
22 192.168.1.1 -> 192.168.1.1: 0.000 ms
23 192.168.1.1 -> 192.168.1.1: 0.000 ms
24 192.168.1.1 -> 192.168.1.1: 0.000 ms
25 192.168.1.1 -> 192.168.1.1: 0.000 ms
26 192.168.1.1 -> 192.168.1.1: 0.000 ms
27 192.168.1.1 -> 192.168.1.1: 0.000 ms
28 192.168.1.1 -> 192.168.1.1: 0.000 ms
29 192.168.1.1 -> 192.168.1.1: 0.000 ms
30 192.168.1.1 -> 192.168.1.1: 0.000 ms

```

11 * * *
12 * * * File transfer:
13 * * * 2.5GB x600 Files
14 * * *
15 * * *
16 * * *
17 * * *
18 * * *
19 * * *
20 * * *
21 * * *
22 * * *
23 * * *
24 * * *
25 * * *
26 * * *
27 * * *
28 * * *
29 * * *
30 * * *



Network route to KIT (Germany)

to KIT Germany

```

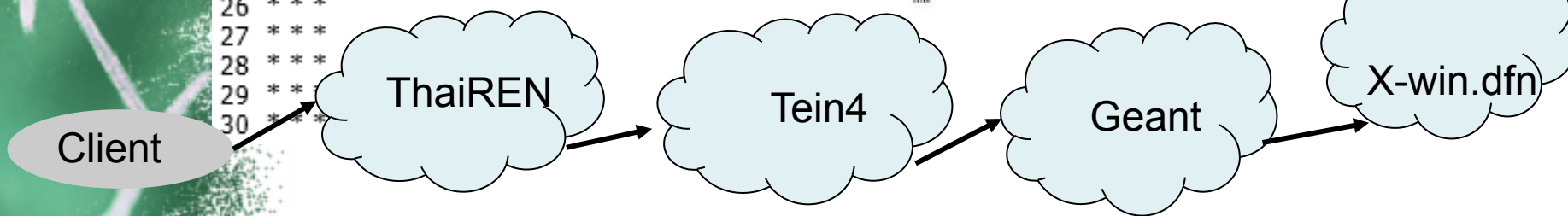
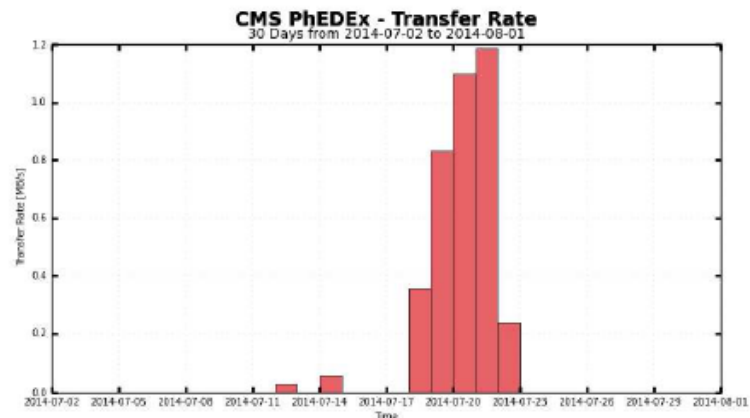
13 192.168.1.100 -> 192.168.1.1 [100.100.15.100] 60.100.100.100
14 192.168.1.100 -> 192.168.1.1 [100.100.15.100] 60.100.100.100
15 192.168.1.100 -> 192.168.1.1 [100.100.15.100] 60.100.100.100
16 192.168.1.100 -> 192.168.1.1 [100.100.15.100] 60.100.100.100
17 192.168.1.100 -> 192.168.1.1 [100.100.15.100] 60.100.100.100
18 192.168.1.100 -> 192.168.1.1 [100.100.15.100] 60.100.100.100
19 192.168.1.100 -> 192.168.1.1 [100.100.15.100] 60.100.100.100
20 192.168.1.100 -> 192.168.1.1 [100.100.15.100] 60.100.100.100
21 192.168.1.100 -> 192.168.1.1 [100.100.15.100] 60.100.100.100
22 192.168.1.100 -> 192.168.1.1 [100.100.15.100] 60.100.100.100
23 192.168.1.100 -> 192.168.1.1 [100.100.15.100] 60.100.100.100
24 192.168.1.100 -> 192.168.1.1 [100.100.15.100] 60.100.100.100
25 192.168.1.100 -> 192.168.1.1 [100.100.15.100] 60.100.100.100
26 192.168.1.100 -> 192.168.1.1 [100.100.15.100] 60.100.100.100
27 192.168.1.100 -> 192.168.1.1 [100.100.15.100] 60.100.100.100
28 192.168.1.100 -> 192.168.1.1 [100.100.15.100] 60.100.100.100
29 192.168.1.100 -> 192.168.1.1 [100.100.15.100] 60.100.100.100
30 192.168.1.100 -> 192.168.1.1 [100.100.15.100] 60.100.100.100

```

```

13
14 * * *
15 * * * File transfer:
16 * * * 2.5GB x600 Files
17 * * *
18 * * *
19 * * *
20 * * *
21 * * *
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29 * * *
30 * * *

```



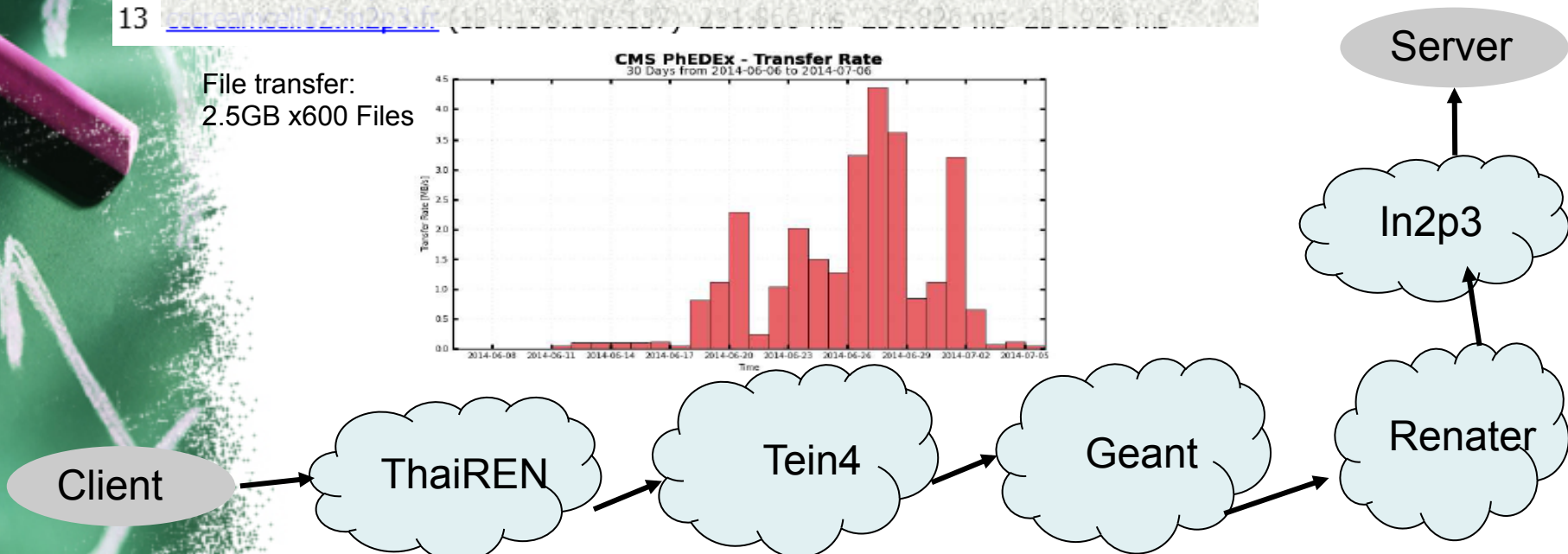
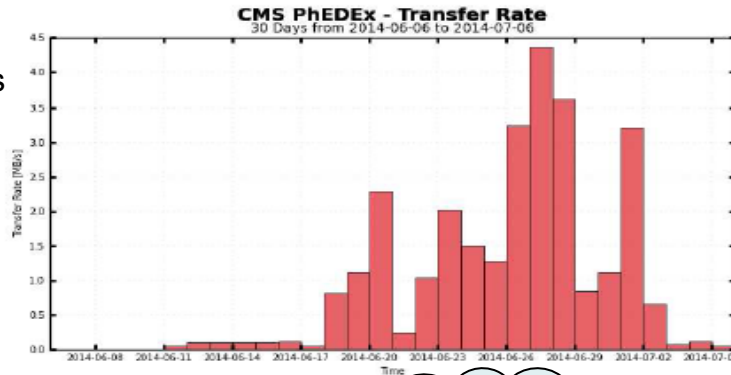
Network route to CCIN2P3 (France)

to CCIN2P3 France

```

traceroute to CCIN2P3 France (193.50.130.201), 30 hops max, 60 byte packets
 1  103.145.43.45 (103.145.43.45) 0.458 ms 0.479 ms 0.561 ms
 2  193.185.127.253 (193.185.127.253) 1.246 ms 1.242 ms 1.039 ms
 3  193.23.12.17 (193.23.12.17) 1.082 ms 1.076 ms 1.078 ms
 4  ge-de-02.v4.bf.telnor.net (202.279.249.65) 37.776 ms 37.292 ms 37.762 ms
 5  193.51.31.14.bb.femib.net (202.179.249.54) 99.581 ms 99.639 ms 99.679 ms
 6  fr-par01.v4.bb.femib.net (202.179.249.116) 134.900 ms 134.364 ms 134.353 ms
 7  fr-2-01.mx1.gen.chuclat.net (62.49.33.67) 224.544 ms 224.544 ms 224.539 ms
 8
 9  fr-51-143-201 (193.51.130.201) 229.576 ms 229.841 ms 229.851 ms
10  fr-51-143-201 (193.51.130.201) 227.325 ms 226.854 ms 226.846 ms
11  fr-51-143-201 (193.51.130.201) 232.437 ms 233.295 ms 233.283 ms
12  fr-51-143-201 (193.51.130.201) 254.517 ms 254.544 ms
13  fr-51-143-201 (193.51.130.201) 257.826 ms 257.926 ms
  
```

File transfer:
2.5GB x600 Files



Network route to JINR (Russia)

to JINR Russia

```

route to 131.111.11.11 (150.22.222.21) 30 hops, 60.1 ms total
 0 103.195.127.255 (203.187.196.65) 0.062 ms 0.725 ms 0.749 ms
 1 103.195.127.255 (203.187.197.255) 2.076 ms 1.140 ms 1.145 ms
 2 202.29.12.12 (202.29.12.17) 4.050 ms 0.994 ms 1.043 ms
 3 ar-ae-03-v4-bb.tand.net (202.179.249.65) 37.725 ms 37.706 ms 37.702 ms
 4 mb-ae-03-v4-bb-feil2.net (202.179.249.54) 25.953 ms 95.935 ms 35.941 ms
 5 ex-nwd-pr-v4-bb-feil3.net (202.179.249.118) 204.475 ms 204.363 ms 204.305 ms
 6 xe-2-0-b-nw1-ben.ch.geant.net (62.40.93.67) 224.304 ms 224.284 ms 224.227 ms
 7 as1-nwd.frx.de.geant.net (62.40.93.109) 232.709 ms 232.681 ms 232.655 ms
 8 as1-nwd1.amn.fr.geant.net (62.40.93.119) 239.446 ms 239.421 ms 239.640 ms
 9 nordinet-bksp2-gw-nwd1-amn.fr.geant.net (62.40.112.206) 239.586 ms 239.527 ms
10 dk-af5.nordu.net 250.135.97.26 250.467 ms 250.639 ms 250.565 ms
11 se-af6.nordu.net 259.195.97.5 259.574 ms 259.062 ms 259.570 ms
12 se-af5.nordu.net 259.195.97.20 259.329 ms 259.670 ms 259.057 ms
13 nwd-gw1.rinnet.ru (109.105.102.46) 260.040 ms 260.371 ms 260.650 ms
14 nwd-2-pr.rinnet.ru (109.105.102.46) 260.040 ms 260.371 ms 260.650 ms
15 rin.rinnet.ru (109.105.102.46) 260.040 ms 260.371 ms 260.650 ms
16 rin-2-pr.rinnet.ru (109.105.102.46) 260.040 ms 260.371 ms 260.650 ms
17 rin-2-pr.rinnet.ru (109.105.102.46) 260.040 ms 260.371 ms 260.650 ms
18 rin-2-pr.rinnet.ru (109.105.102.46) 260.040 ms 260.371 ms 260.650 ms
19 rin-2-pr.rinnet.ru (109.105.102.46) 260.040 ms 260.371 ms 260.650 ms
20 rin-2-pr.rinnet.ru (109.105.102.46) 260.040 ms 260.371 ms 260.650 ms
  
```

ms
ms

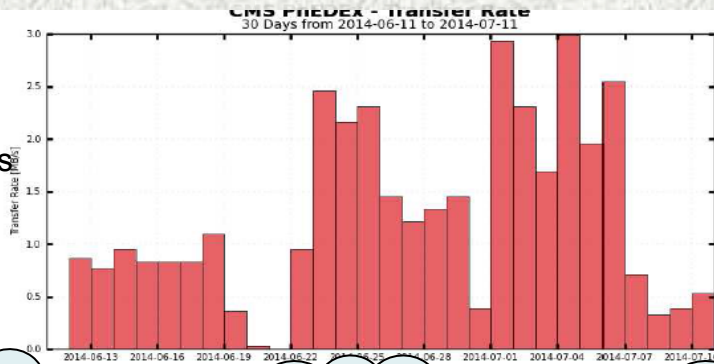
ms 239.512 ms

Server

Runnet

Nordu

File transfer:
2.5GB x600 Files



Client

ThaiREN

Tein4

Geant

Nordu



Network route to RAL (UK)

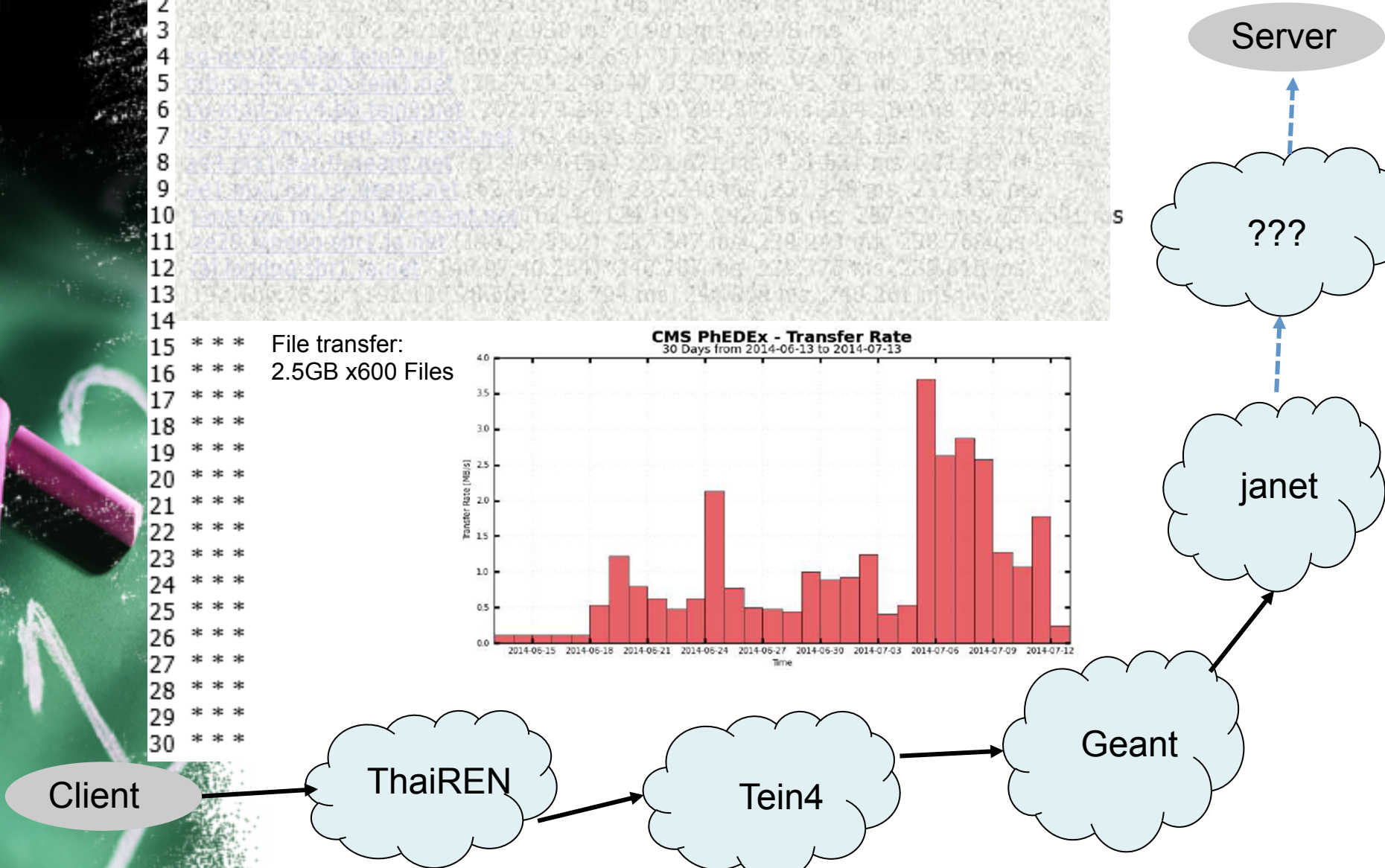
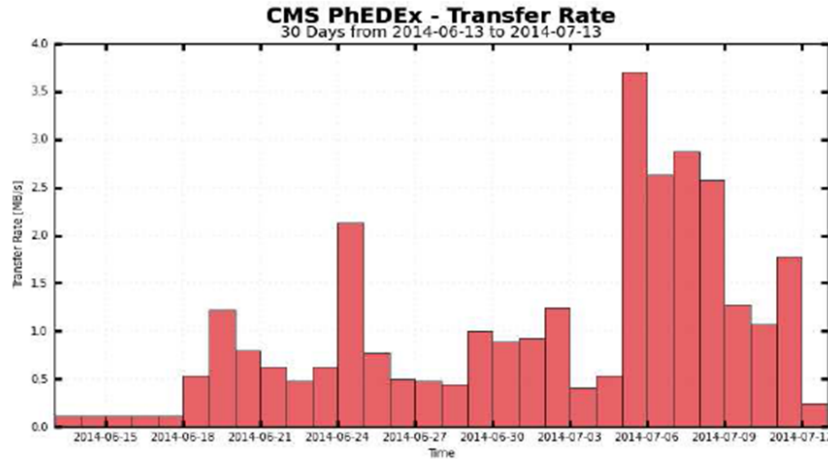
to RAL UK

```

tra 1 10.0.0.0/24 -> 10.0.0.1 [REDACTED]
2 10.0.0.1 -> 10.0.0.2 [REDACTED]
3 10.0.0.2 -> 10.0.0.3 [REDACTED]
4 10.0.0.3 -> 10.0.0.4 [REDACTED]
5 10.0.0.4 -> 10.0.0.5 [REDACTED]
6 10.0.0.5 -> 10.0.0.6 [REDACTED]
7 10.0.0.6 -> 10.0.0.7 [REDACTED]
8 10.0.0.7 -> 10.0.0.8 [REDACTED]
9 10.0.0.8 -> 10.0.0.9 [REDACTED]
10 10.0.0.9 -> 10.0.0.10 [REDACTED]
11 10.0.0.10 -> 10.0.0.11 [REDACTED]
12 10.0.0.11 -> 10.0.0.12 [REDACTED]
13 10.0.0.12 -> 10.0.0.13 [REDACTED]
14 10.0.0.13 -> 10.0.0.14 [REDACTED]

```

*** File transfer:
2.5GB x600 Files



Thank You
Sawatdee



E-Mail: noc@thairen.net.th