

KISTI activities and plans

Global experiment **S**cience **D**ata hub **C**enter

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Agenda

- KISTI GSDC
- GSDC system overview
- GSDC & network
 - Internal & External
- GLORIAD & TEIN
 - Test
- Submarine cable issue

KISTI GSDC

KISTI (Korea Institute of Science and Technology Information)

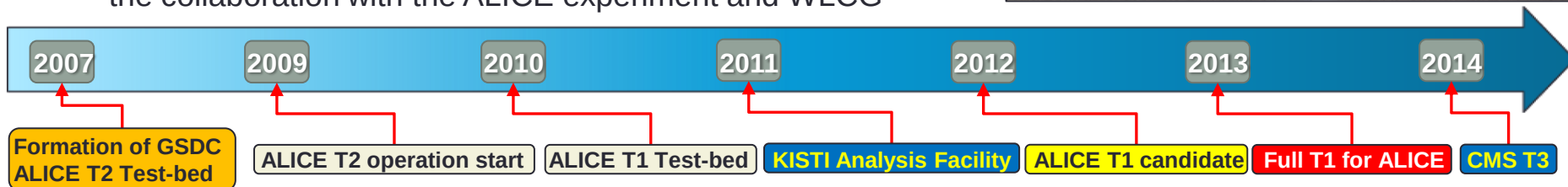
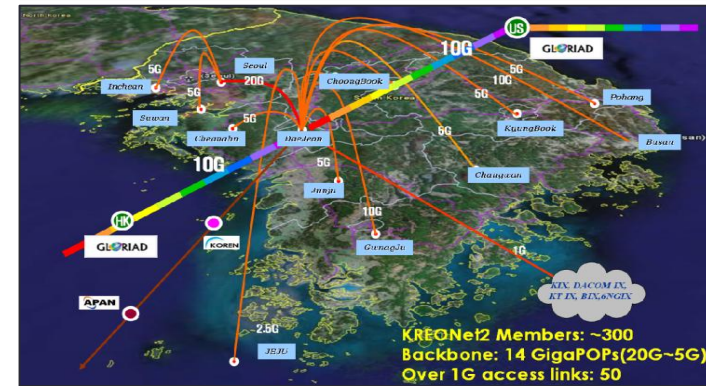
- Government funding research institute for IT founded in 1962
 - 600 people working for National Information Service(distribution & analysis),
Supercomputing and Networking
- Operating **Supercomputing** and **NREN Infrastructure**
 - Supercomputer: **307.4 TFlops** at peak(14th ranked at Top500 in 2009; 201st now)
 - NREN Infrastructure: KREONet2
 - Domestic: **Seoul** $\leftarrow$ (100G) $\rightarrow$ **Daejeon**
 - International: **HK** $\leftarrow$ (10G) $\rightarrow$ **Chicago/Seattle** (Member of GLORIAD)

GSDC (Global Science experiment Data hub Center)

- Government funding project to promote research experiment providing computing power and storage
 - HEP: ALICE, CMS, Belle, RENO
 - Others: LIGO, Bioinformatics, electronic telescope.
- Running **Data-Intensive Computing Facility**
 - 15 staffs: sysadmin, experiment support, external-relation, administration
 - Total 6,000 cores, 6,500 TB disk and 1,500 TB tape storage

History of GSDC

- 7 years of the experience running grid computing centre with the collaboration with the ALICE experiment and WLCG



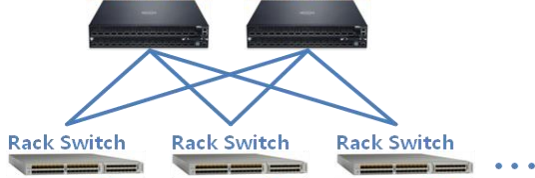
GSDC System Overview

Public

4 Spine switches
74 Leaf switches
500+ Servers in 22 racks
14 Storage racks
4 tape frames



Core Switch Core Switch



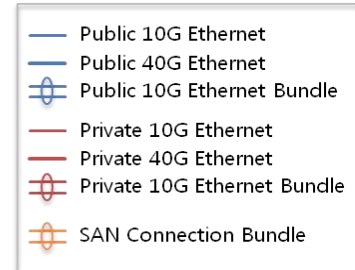
Private

Network Attached Storage

HITACHI HNAS
EMC ICILON



Core Switch Core Switch



HTCondor

High Throughput Computing

- HTCondor
- 2,500 slots
- CMS T3, LIGO, KIAF

Tape Storage



IBM TSM/GPFS

40 computing racks

N-C rksl Taipei



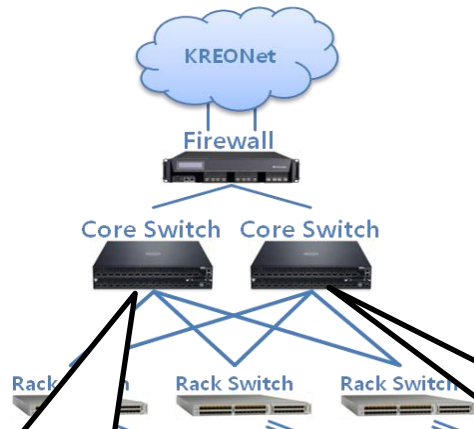
- Torque/MAUI
- 3,500 slots
- ALICE T1, Belle, RENO

SAN Storage

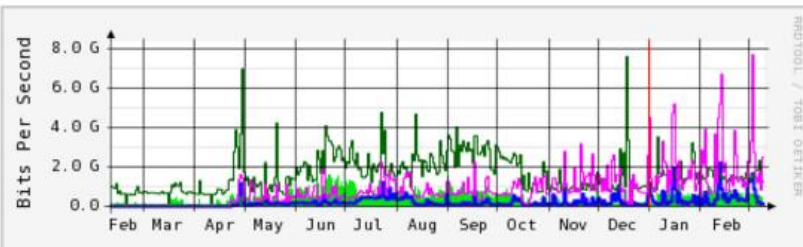


HITACHI USP/VSP
EMC Clariion/VNX

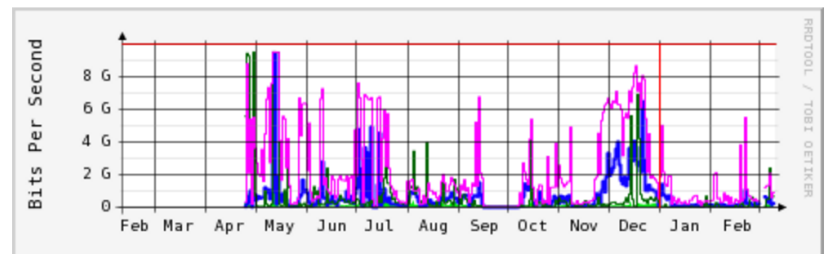
GSDC System Overview



'Yearly' Graph (1 Day Average)

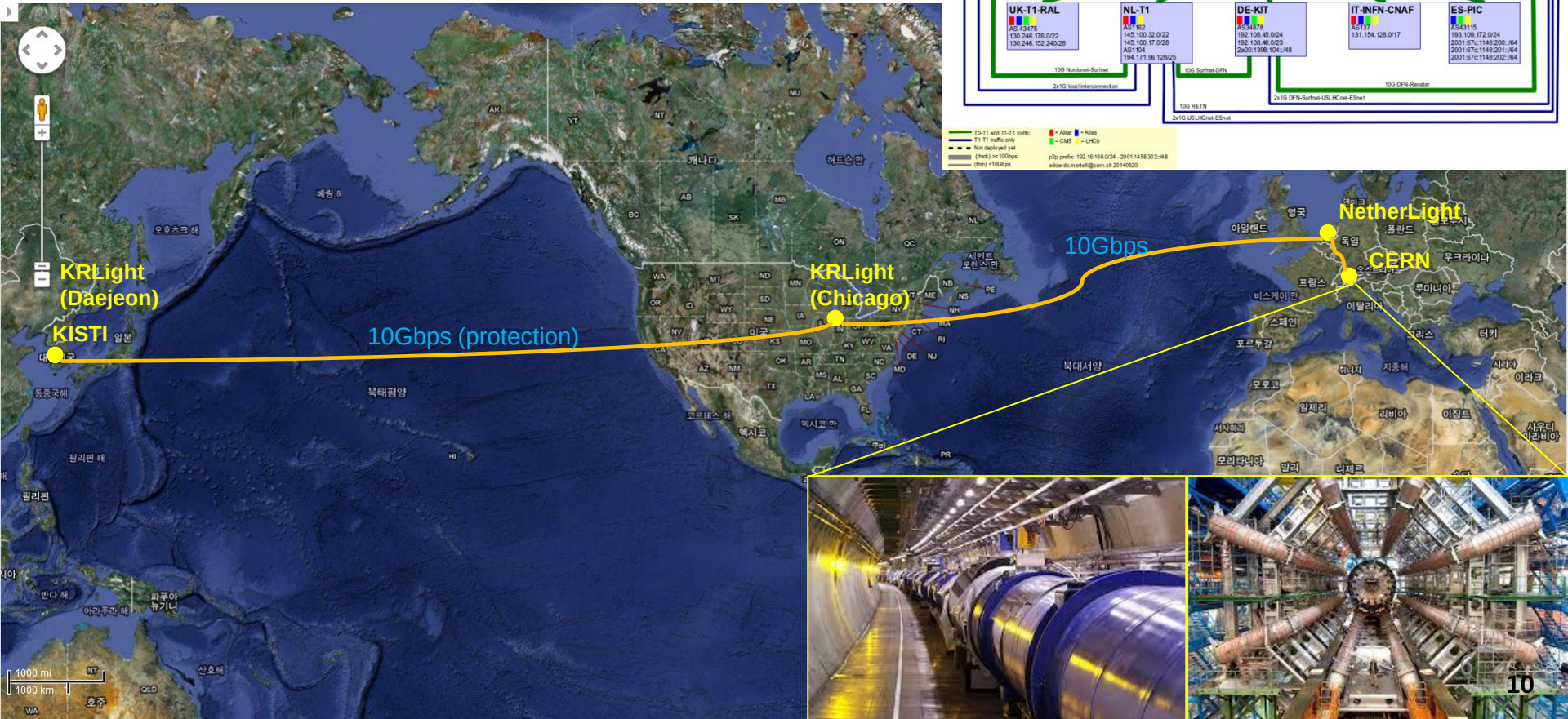
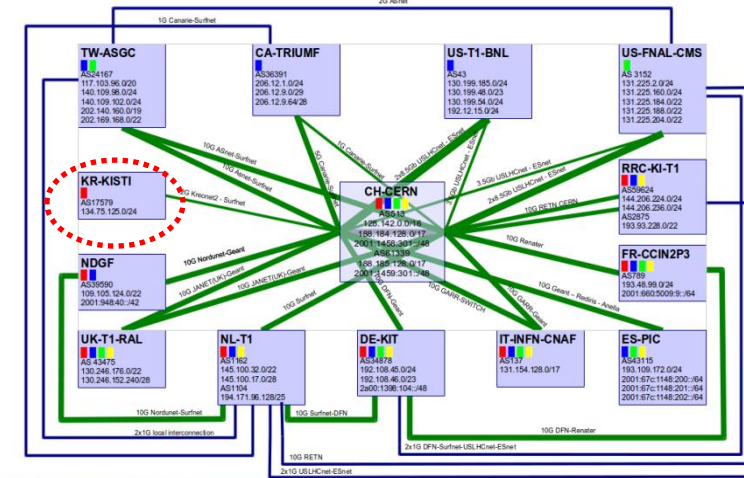


'Yearly' Graph (1 Day Average)



LHCOPN

GSDC (Global Science Data hub Center) in KISTI as CERN LHC Alice Tier 1 center Since 2013



Maintain the LHCOPN

- Report by ISP (SKB) once in a month
- Latency check every hour

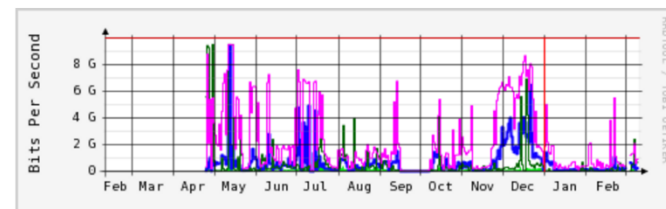
K-LHCOPN 대전(KISTI)~시카고(StarLight) 전용 회선 운영결과 보고



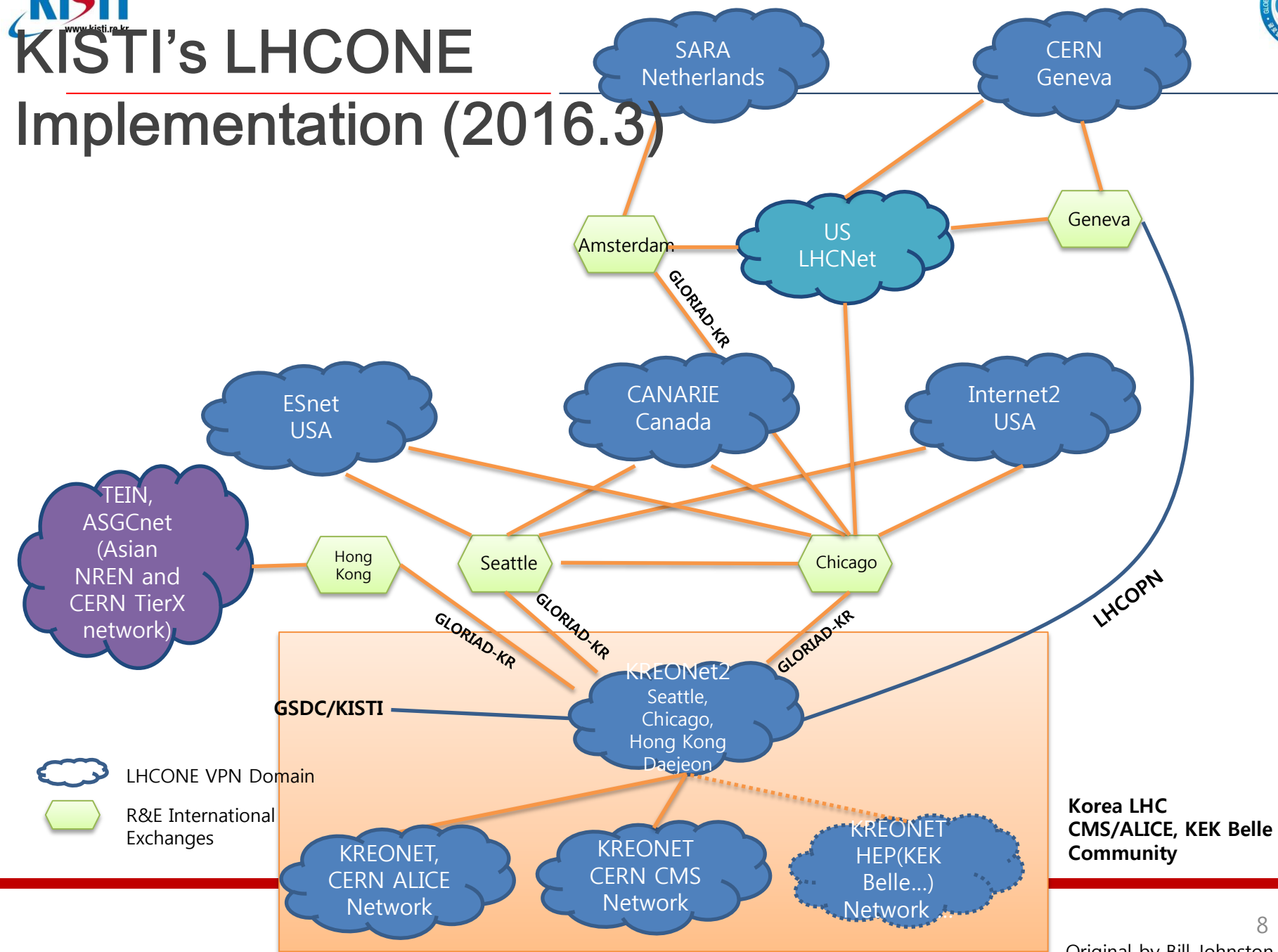
Disable is occurred

- MRTG graph check
 - Chicago and KISTI backbone

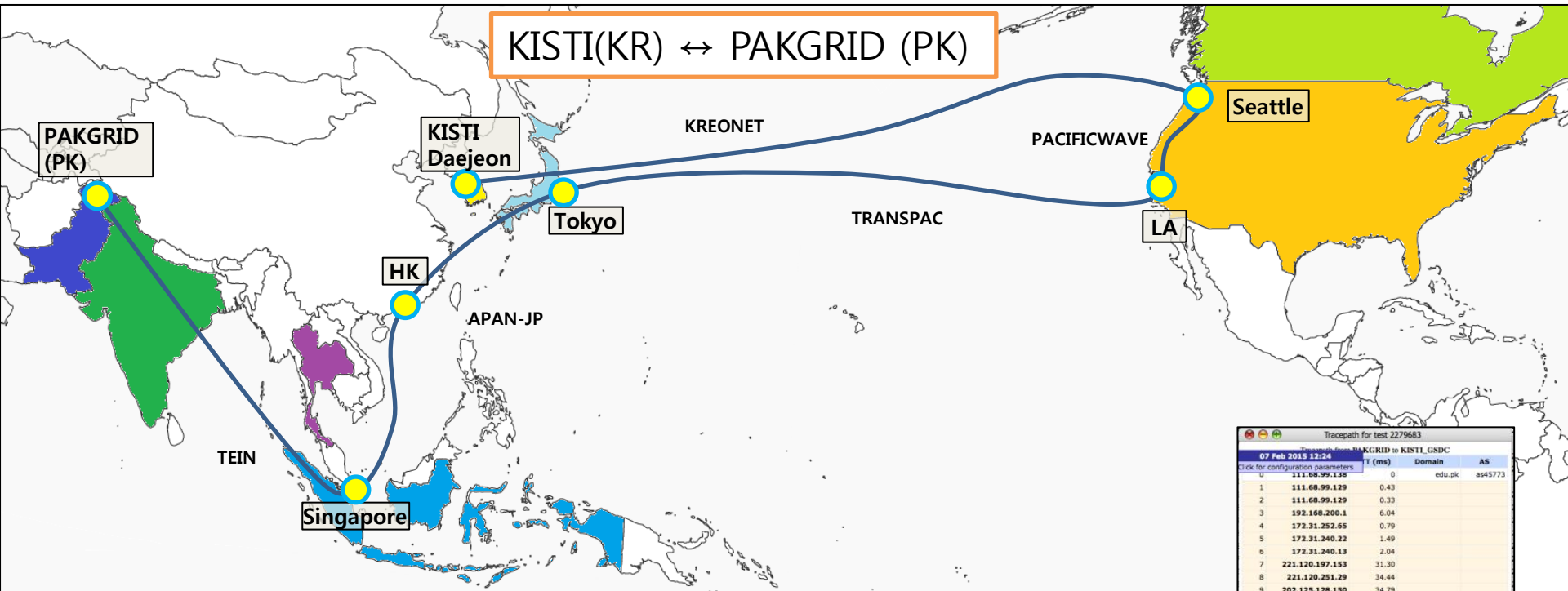
'Yearly' Graph (1 Day Average)



KISTI's LHCONE Implementation (2016.3)



Example: Previous Status



```
[root@vobox11 ~]# tracepath 111.68.99.138
17: [LOCALHOST] pmtu 1500
1: 134.75.125.2 (134.75.125.2) 9.817ms
1: 134.75.125.2 (134.75.125.2) 0.286ms
2: 203.250.102.5 (203.250.102.5) 0.308ms
3: rtr.seat.kreonet2.net (134.75.105.50) 120.033ms
4: abilene-1-lo-jmb-706.sttlwa.pacificwave.net (207.231.240.8) 120.118ms
5: et-10-0-0-114.rtr.losa.net.internet2.edu (198.71.45.26) 144.286ms
6: transpac-1-lo-jmb-702.lsanca.pacificwave.net (207.231.240.136) 150.037ms asymm 7
7: tokyo-losa-tp2.transpac.org (192.203.116.146) 149.931ms asymm 6
8: kote-dc-gm1-xe2-2-1-4005.jp.apan.net (203.181.248.249) 150.228ms asymm 7
9: sg-xe-01-v4.bb.tein3.net (202.179.249.77) 343.952ms asymm 13
10: 202.179.249.38 (202.179.249.38) 414.595ms asymm 24
11: no reply
12: no reply
13: no reply
14: no reply
15: no reply
16: no reply
17: no reply
18: no reply
19: pcncp25.ncp.edu.pk (111.68.99.138) 442.810ms reached
Resume: pmtu 1500 hops 19 back 37
```

30 hops

Tracepath
over 400ms latency

KISTI-CERN 250ms latency

COPN-ONE Workshop in Taipei

Tracepath for test 2279683

07 Feb 2015 12:24 PAKGRID to KISTI_GSDC

Click for configuration parameters

	IP (ms)	Domain	AS
0	111.68.99.138	0	edu.pk
1	111.68.99.129	0.43	
2	111.68.99.129	0.33	
3	192.168.200.1	6.04	
4	172.31.252.65	0.79	
5	172.31.240.22	1.49	
6	172.31.240.13	2.04	
7	221.120.197.153	31.30	
8	221.120.251.29	34.44	
9	202.125.128.150	34.79	
10	149.6.155.25	146.42	
11	154.54.38.170	146.32	
12	154.54.38.173	146.83	
13	130.117.1.197	157.20	
14	154.54.29.117	227.96	
15	154.54.42.85	233.25	
16	154.54.31.125	239.56	
17	154.54.28.130	259.28	
18	154.54.28.70	264.92	
19	154.54.7.54	295.67	
20	38.104.84.190	317.27	
21	38.104.84.190	320.64	
22	112.174.87.233	423.92	
23	112.174.83.17	325.33	
24	203.234.255.166	443.79	
25	134.75.5.209	443.42	
26	134.75.5.209	448.22	
27	134.75.2.2	447.84	
28	134.75.105.114	448.33	kreonet2.net
29	203.250.102.2	452.02	
30	134.75.125.244	446.94	sdarm.kr

Tracepath OK, target reached

LHCONE in Asia

A consensus for LHCONE inter-VRF connection among KREONet2/GLORIAD-KR(KISTI), ASGC and TEIN



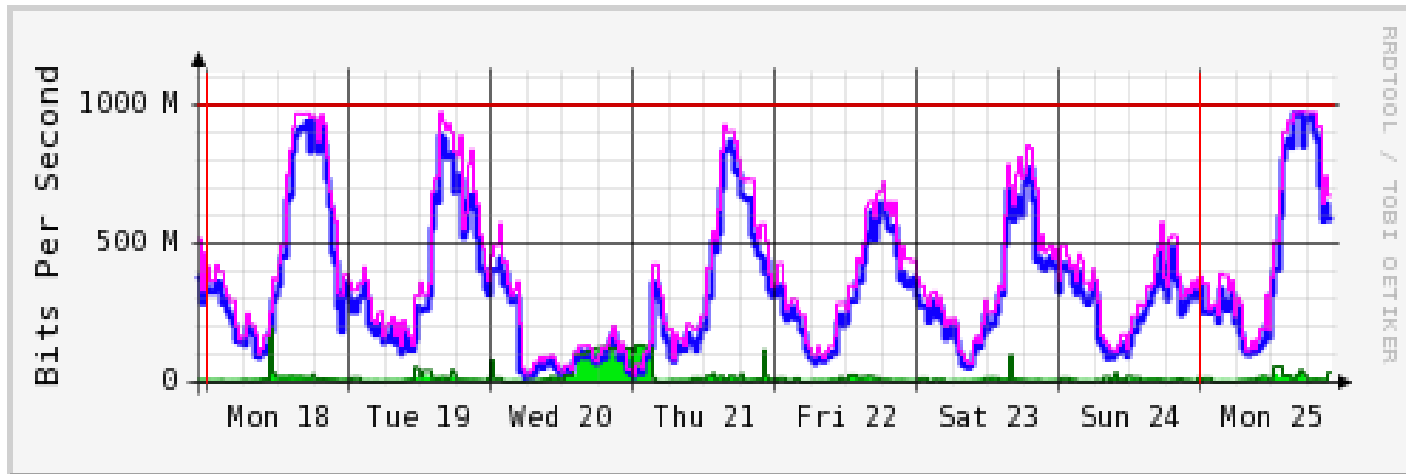
In the context fo LHCONE VRF rules and inter-VRF connections



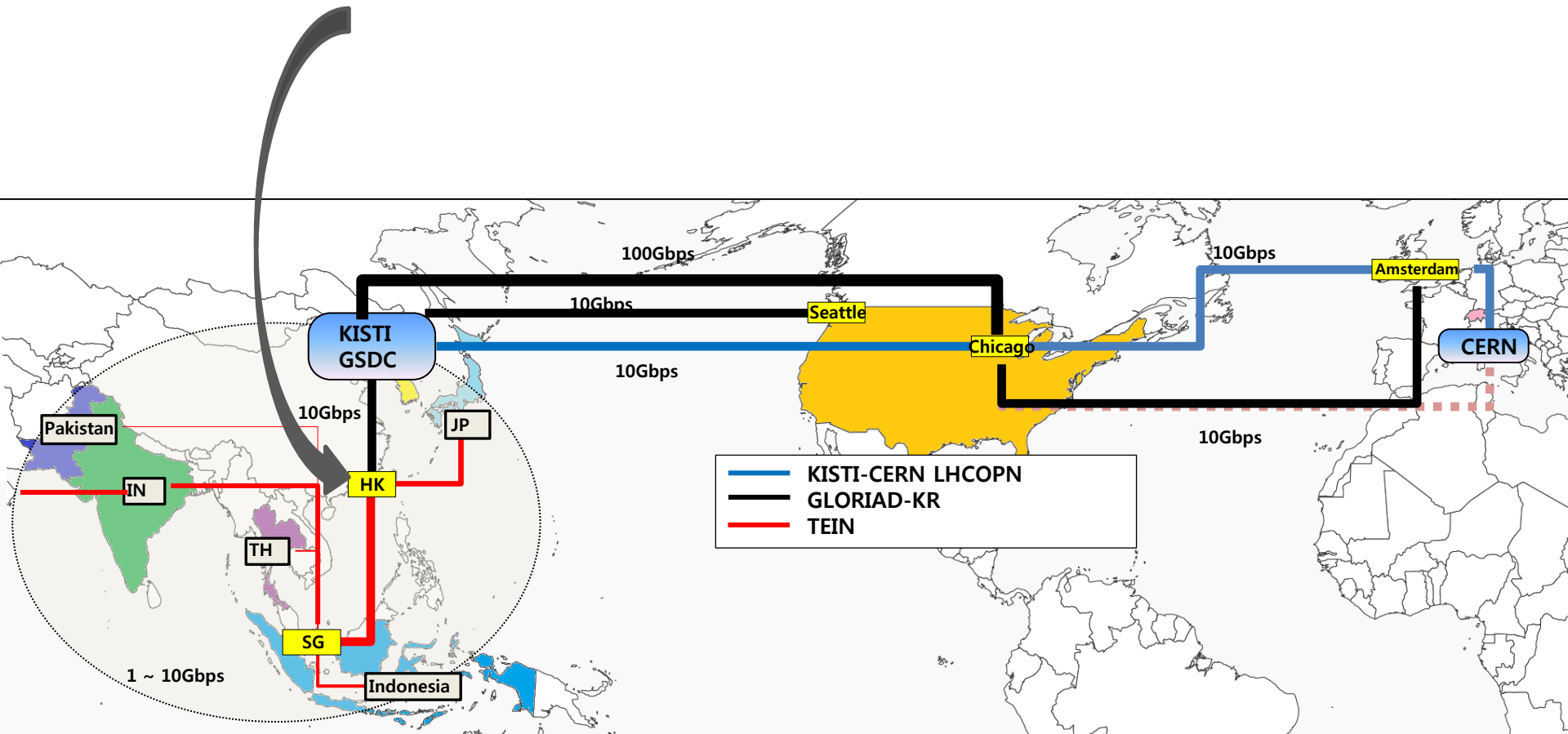
Asia Tier Center Forum,
KISTI 22-24 September 2015

TEIN-GLORIAD-KR (KREONet2) Interconnection

- Both are col-located in Megai-advantage
 - ✓ GLORIAD-KR MX960: MEGA-TOP(32/F)
 - ✓ TEIN M120: 8/F
- Interconnection : 1G -> 10G
 - ✓ Short-term: 1G



TEIN-GLORIAD-KR Interconnection



Traceroute test

Test

- alice-t1-vobox.sdfarm.kr
 - IP : 134.75.125.152
 - VM Host IP : 134.75.125.27 (alice-prd-ovirt-03.sdfarm.kr)
- tracepath to Asian ALICE sites
 - SUT (TH)
 - COMSATS, PAKGRID (PK)
 - Kolkata (IN)
 - Cibinong, Bandung (ID)

Test Summary

- Thailand
 - SUT : 202.28.43.133
 - Latency = 157.702 ms
 - Hops = 10
- Pakistan
 - PAKGRID : 111.68.99.138
 - Latency = 287.264 ms (over 400ms)
 - Hop = 10 (-9)
 - COMSATS : 210.56.24.242
 - Latency = 424.073 ms
 - Hop = 21
- India
 - Kolkata : 144.16.112.13
 - Latency = 305.338 ms
 - Hop = 11
- Indonesia
 - Bandung : 203.160.128.98
 - Latency = 127.573 ms
 - Hop = 19
 - Cibinong : 203.160.128.89
 - Latency = 109.401 ms
 - Hop = 16

Thailand		Pakistan		India	Indonesia		
Site		SUT	PAKGRID	COMSATS	Kolkata	Bandung	Chibinong
Latency	Now	157.702	194.064	424.073	305.338	127.573	109.401
	pre		450		450.04	351.38	289.84
Hops		10	10	21	11	19	16

Thailand

SUT : 202.28.43.133

- Latency = 157.702 ms
- Hops = 10

```
[root@alice-t1-vobox ~]# tracepath 202.28.43.133
1?: [LOCALHOST] pmtu 1500
1: 134.75.125.3 (134.75.125.3) 7.690ms
1: 134.75.125.3 (134.75.125.3) 6.067ms
2: 203.250.102.1 (203.250.102.1) 0.329ms
3: 134.75.105.18 (134.75.105.18) 34.983ms
4: 202.179.241.109 (202.179.241.109) 114.062ms asymm 5
5: sg-xe-03-v4.bb.tein3.net (202.179.241.102) 152.323ms asymm 6
6: th-pr-v4.bb.tein3.net (202.179.249.66) 149.275ms asymm 9
7: pyt-to-02-bdr-pyt-link-2.uni.net.th (202.29.12.14) 153.500ms asymm 10
8: 100.64.253.1 (100.64.253.1) 157.589ms asymm 14
9: nrm-cr-01-bundle-ether-10-to-sut.uni.net.th (202.28.208.18) 153.005ms asymm 14
10: alice.sut.ac.th (202.28.43.133) 157.702ms reached
Resume: pmtu 1500 hops 10 back 13
```

Pakistan

PAKGRID : 111.68.99.138

- Latency = 287.264 ms (over 400ms)
- Hop = 10 (-9)

COMSATS : 210.56.24.242

- Latency = 424.073 ms
- Hop = 21

```
[root@alice-t1-vobox ~]# tracepath 111.68.99.138
1?: [LOCALHOST] pmtu 1500
1: 134.75.125.3 (134.75.125.3) 0.424ms
1: 134.75.125.3 (134.75.125.3) 5.670ms
2: 203.250.102.1 (203.250.102.1) 0.479ms
3: 134.75.105.18 (134.75.105.18) 35.183ms
4: 202.179.241.109 (202.179.241.109) 100.635ms asymm 5
5: sg-xe-03-v4.bb.tein3.net (202.179.241.102) 139.148ms asymm 6
6: pk-pr-v4.bb.tein3.net (202.179.249.46) 234.701ms
7: 172.31.254.65 (172.31.254.65) 276.455ms
8: 172.31.254.66 (172.31.254.66) 282.080ms
9: no reply
10: pcncp25.ncp.edu.pk (111.68.99.138) 287.264ms reached
Resume: pmtu 1500 hops 10 back 10
```

```
[root@alice-t1-vobox ~]# tracepath 210.56.24.242
1?: [LOCALHOST] pmtu 1500
1: 134.75.125.3 (134.75.125.3) 0.418ms
1: 134.75.125.3 (134.75.125.3) 0.439ms
2: 203.250.102.1 (203.250.102.1) 0.526ms
3: 134.75.105.113 (134.75.105.113) 0.402ms
4: 134.75.2.1 (134.75.2.1) 3.190ms
5: 134.75.5.210 (134.75.5.210) 3.500ms
6: 203.234.255.165 (203.234.255.165) 13.010ms asymm 7
7: 112.174.83.121 (112.174.83.121) 7.214ms
8: 112.174.84.106 (112.174.84.106) 4.648ms asymm 9
9: 112.174.87.222 (112.174.87.222) 139.409ms asymm 10
10: 121.189.2.98 (121.189.2.98) 162.902ms asymm 11
11: ae1-xcr2.nyk.cw.net (195.2.30.38) 269.966ms asymm 17
12: ae0-xcr1.nyh.cw.net (195.2.25.70) 270.266ms asymm 16
13: et-10-3-0-xcr1.ptl.cw.net (195.2.24.242) 288.357ms asymm 12
14: ae5-xcr1.mar.cw.net (195.2.30.214) 311.381ms asymm 13
15: ptcl-gw.prp.cw.net (195.10.54.222) 429.265ms asymm 24
16: static-10GE-KHI275-P01-Sw8.pie.net.pk (202.125.128.156) 406.853ms asymm 24
17: rwp44.pie.net.pk (221.120.254.13) 431.267ms asymm 22
18: rwp44.pie.net.pk (221.120.253.34) 445.429ms asymm 23
19: 210.56.8.129 (210.56.8.129) 430.091ms asymm 28
20: 210.56.8.129 (210.56.8.129) 437.199ms asymm 28
21: cern-56-24-242.comsats.edu.pk (210.56.24.242) 424.073ms reached
Resume: pmtu 1500 hops 21 back 27
```


India

Kolkata : 144.16.112.13

- Latency = 305.338 ms 450.04 ms
- Hop = 11

```
[root@alice-t1-vobox ~]# tracepath 144.16.112.13
1?: [LOCALHOST]      pmtu 1500
 1:  134.75.125.3 (134.75.125.3)           0.396ms
 1:  134.75.125.3 (134.75.125.3)           8.539ms
 2:  203.250.102.1 (203.250.102.1)         0.436ms
 3:  134.75.105.18 (134.75.105.18)        35.044ms
 4:  202.179.241.109 (202.179.241.109)    108.333ms asymm  5
 5:  sg-xe-03-v4.bb.tein3.net (202.179.241.102) 139.646ms asymm  6
 6:  202.179.249.2 (202.179.249.2)        145.190ms
 7:  202.179.249.14 (202.179.249.14)      203.584ms
 8:  in-pr-v4.bb.tein3.net (202.179.249.42) 209.447ms
 9:  no reply
10:  144.16.112.28 (144.16.112.28)        296.045ms asymm 12
11:  grid01.tier2-kol.res.in (144.16.112.13) 305.338ms reached
Resume: pmtu 1500 hops 11 back 13
```

Indonesia

Bandung : 203.160.128.98

- Latency = 127.573 ms 351.38 ms
- Hop = 19

Cibinong : 203.160.128.89

- Latency = 109.401 ms 289.84 ms
- Hop = 17

```
[root@alice-t1-vobox ~]# tracepath 203.160.128.98
1?: [LOCALHOST] pmtu 1500
1: 134.75.125.3 (134.75.125.3) 2.422ms
1: 134.75.125.3 (134.75.125.3) 0.357ms
2: 203.250.102.1 (203.250.102.1) 0.393ms
3: 134.75.105.113 (134.75.105.113) 0.411ms
4: 134.75.2.1 (134.75.2.1) 3.050ms
5: 134.75.5.210 (134.75.5.210) 4.044ms
6: 203.234.255.165 (203.234.255.165) 4.420ms asymm 7
7: 121.189.2.114 (121.189.2.114) 37.710ms asymm 10
8: ae-1.r31.tokyo.jp05.jp.bb.gin.ntt.net (129.250.2.153) 31.292ms asymm 11
10: ae-5.r21.sngpsi05.sg.bb.gin.ntt.net (129.250.7.39) 102.870ms asymm 12
11: ae-13.r00.sngpsi02.sg.bb.gin.ntt.net (129.250.4.74) 108.859ms asymm 13
12: 116.51.26.38 (116.51.26.38) 353.523ms asymm 14
13: 118.98.61.142 (118.98.61.142) 343.776ms asymm 13
15: 61.94.114.54 (61.94.114.54) 332.970ms asymm 16
16: 58.subnet118-98-84.astinet.telkom.net.id (118.98.84.58) 350.293ms asymm 14
17: 203.160.128.130 (203.160.128.130) 345.513ms
18: 172.31.2.14 (172.31.2.14) 366.111ms
19: kotak.bdg.grid.lipi.go.id (203.160.128.98) 363.206ms
Resume: pmtu 1500 hops 19 back 17
```

```
[root@alice-t1-vobox ~]# tracepath 203.160.128.89
1?: [LOCALHOST] pmtu 1500
1: 134.75.125.2 (134.75.125.2) 0.475ms
1: 134.75.125.2 (134.75.125.2) 0.339ms
2: 203.250.102.5 (203.250.102.5) 0.429ms
3: 134.75.105.113 (134.75.105.113) 0.384ms
4: 134.75.2.1 (134.75.2.1) 3.068ms
5: 134.75.5.210 (134.75.5.210) 5.154ms
6: 203.234.255.165 (203.234.255.165) 4.420ms asymm 7
7: 121.189.2.114 (121.189.2.114) 37.710ms asymm 10
8: ae-1.r31.tokyo.jp05.jp.bb.gin.ntt.net (129.250.2.153) 31.292ms asymm 11
9: ae-5.r21.sngpsi05.sg.bb.gin.ntt.net (129.250.7.39) 102.870ms asymm 12
10: ae-13.r00.sngpsi02.sg.bb.gin.ntt.net (129.250.4.74) 108.859ms asymm 13
11: 116.51.26.38 (116.51.26.38) 353.523ms asymm 14
12: 118.98.61.142 (118.98.61.142) 343.776ms asymm 13
13: 180.240.192.129 (180.240.192.129) 341.129ms asymm 11
14: 61.94.171.177 (61.94.171.177) 339.889ms asymm 12
15: 58.subnet118-98-84.astinet.telkom.net.id (118.98.84.58) 350.293ms asymm 14
16: 203.160.128.130 (203.160.128.130) 345.513ms
17: kotak.bdg.grid.lipi.go.id (203.160.128.89) 340.950ms reached
Resume: pmtu 1500 hops 17 back 15
```

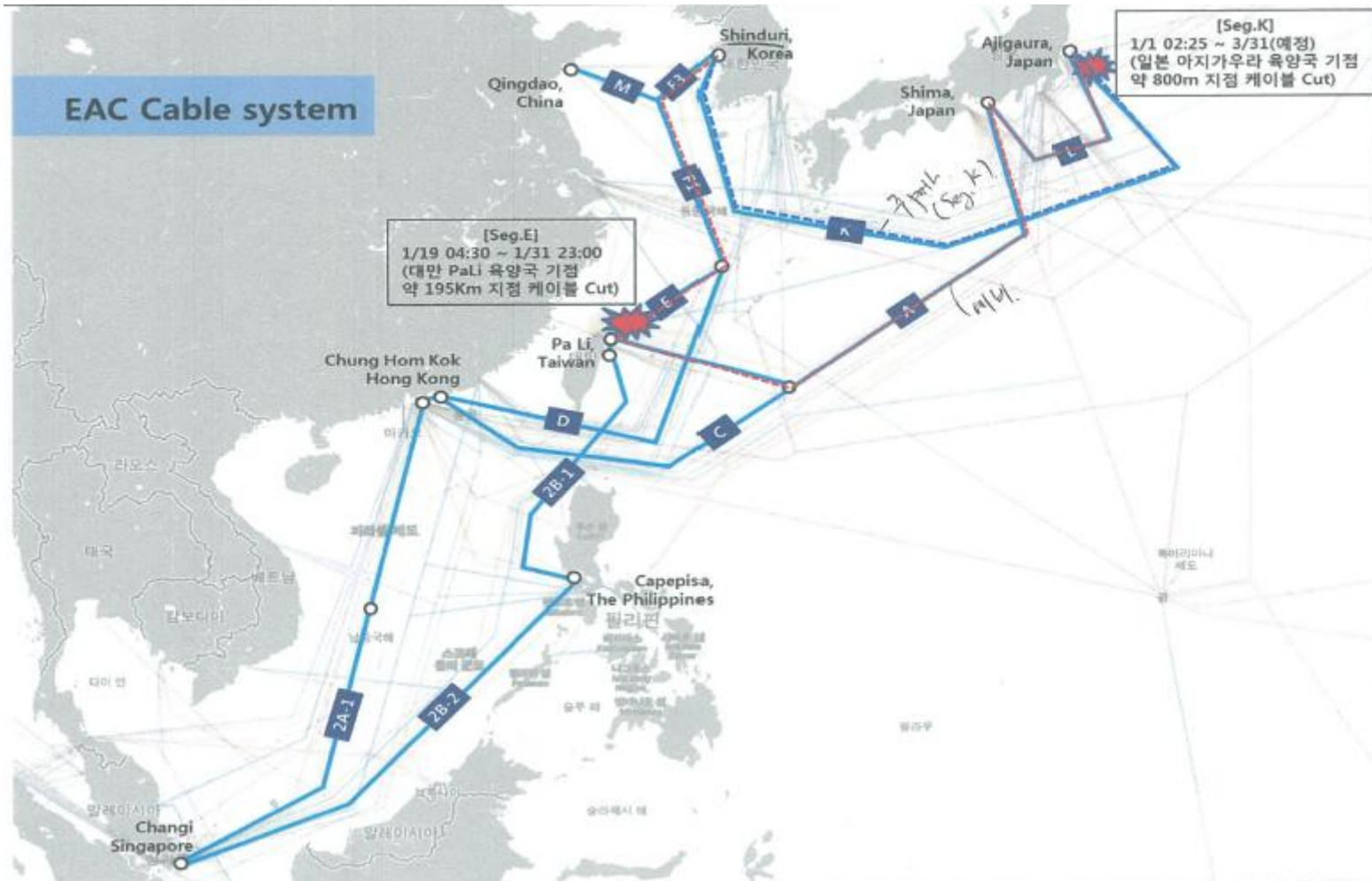
KR-JP-SG

Submarine cable issue

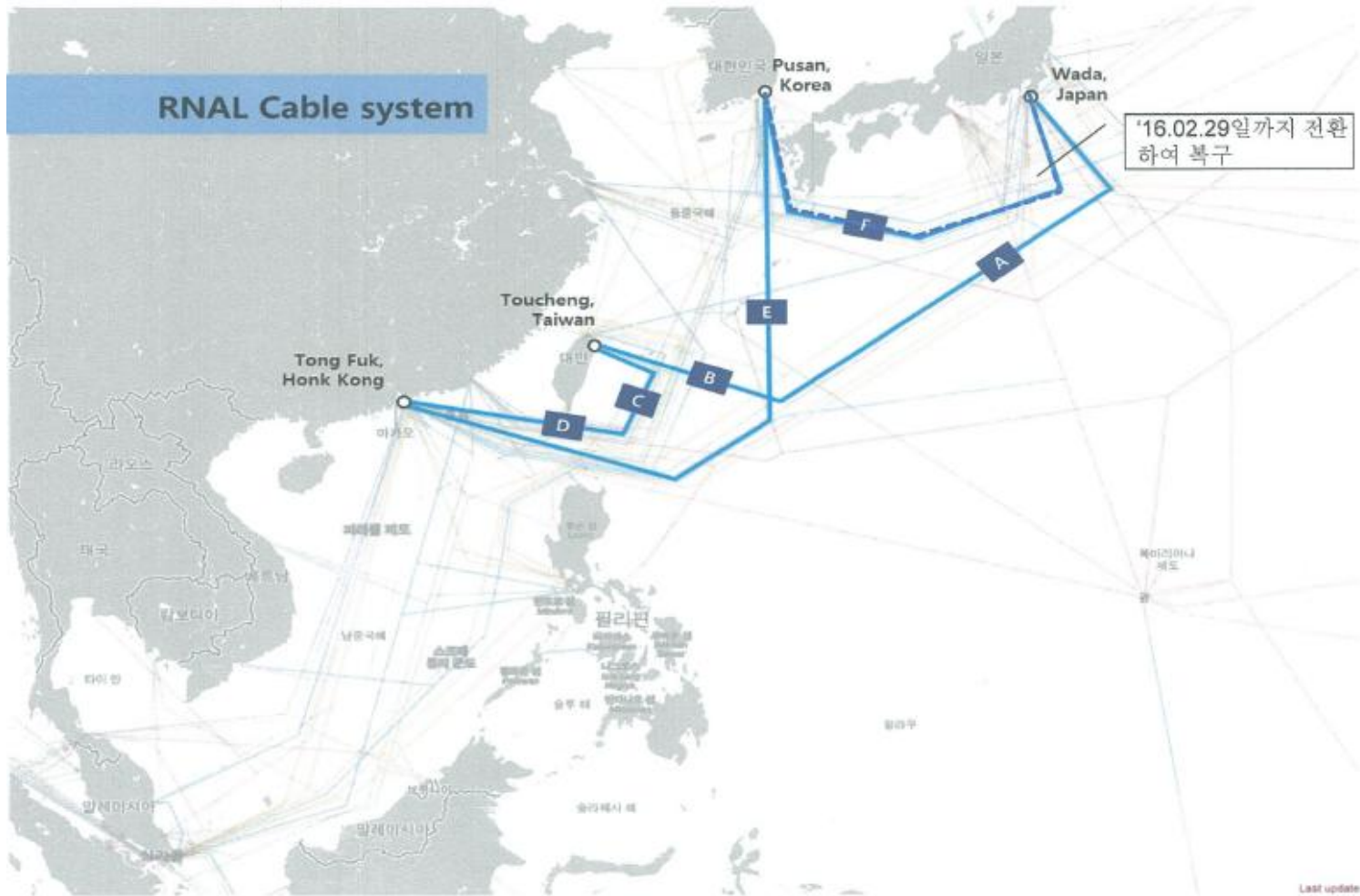
Submarine cable Disable

- First disable
 - 2015. 8. 14 sub-cable cut (HK-Taiwan)
 - 2015. 9. 19 main-cable cut (Kor – Jap)
 - Total disable time: 29H 56M
- Second disable
 - 2016. 1. 1 main-cable cut (Kor-Jap)
 - 2016. 1. 19 sub-cable cut (HK-Taiwan)
 - Total disable time: 9H 14M

Submarine cable Issue (1/2)



Submarine cable Issue (2/2)



Thank You (Q or C)