

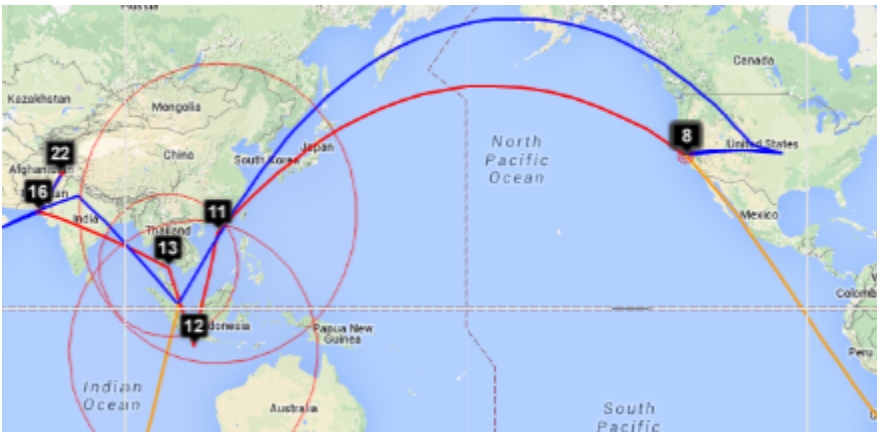
Change in Traceroute from SLAC to NUST

At the start of June 2014 year the route from SLAC to NUST appeared as below:



The blue lines are from the Maxmind database, the red lines are from Raja's et. al VTrace.

On 1/17/2015 it was found to go the other way around the world:



Initiating traceroute from www.wanmon.slac.stanford.edu to www.nust.edu.pk (111.68.101.101)

Hop #	Hostname	IP Address	ASNet	RTT	RTT bar	Coordinates	Hop Distance
1		134.79.197.131	AS3671	0.549 ms		37.4178,-122.2020 (cache)	0.1 km
2	rtr-core2-p2p-serv01-01.slac.stanford.edu	134.79.254.65	AS3671	0.425 ms		37.4178,-122.2020 (cache)	0.0 km
3	rtr-fwcore1-trust-p2p-core1.slac.stanford.edu	134.79.254.134	AS3671	0.764 ms		37.4178,-122.2020 (cache)	0.0 km
4	rtr-core1-p2p-fwcore1-untrust.slac.stanford.edu	134.79.254.137	AS3671	0.863 ms		37.4178,-122.2020 (cache)	0.0 km
6	slac-mr2-p2p-rtr-border1.slac.stanford.edu	192.68.191.245	AS3671	4.441 ms		37.4178,-122.2020 (cache)	0.0 km
8	eqxsjrt1-ip-a-sunnrc5.es.net	134.55.38.146	AS293	17.697 ms		37.3932,-122.1639 (cache)	4.3 km
9	xe-0.equinix.snjsca04.us.bb.gin.ntt.net	206.223.116.12	AS4637	2.538 ms		37.4097,-122.1973 (cache)	3.5 km
11	ae-2.r20.sngpsi05.sg.bb.gin.ntt.net	129.250.3.49	AS2914	174.648 ms		20.0860,114.2671 (cache)	11326.8 km
12	ae-2.r00.sngpsi02.sg.bb.gin.ntt.net	129.250.3.147	AS2914	171.432 ms		-9.5386,107.7970 (cache)	3373.4 km
13	116.51.27.226	116.51.27.226	AS2914	172.198 ms		10.9996,101.2258 (cache)	2399.5 km
15	125.18.117.254	125.18.117.254	AS9498	264.008 ms		Can't geolocate	-
16	82.178.32.22	82.178.32.22	AS8529	266.472 ms		24.8978,67.0747 (cache)	3918.4 km
19	tw23-static234.tw1.com	117.20.23.234	AS38193	302.758 ms		33.6827,73.0546 (cache)	1136.8 km
21	111.68.101.2.nust.edu.pk	111.68.101.2	AS38193	288.893 ms		33.6826,73.0549 (cache)	0.0 km
22	111.68.101.2.nust.edu.pk	111.68.101.2	AS38193	295.431 ms		33.6826,73.0549 (cache)	0.0 km

[Visual Traceroute took : 44secs | Total Hop Distance: 22162.8 km | Total End-to-end Distance: 11967.3 km | [Directivity](#) = 0.54]

The blue lines are from the Maxmind database, the red lines are from Raja's et. al VTrace.

It appears the change in direction happened between Jun 10 and Jun 11 2014. See the traceroutes below for the 2 days:

Note the 2014-07-11 traceroute that goes West from California is different from today's. The visualization of the 2014-07-11 route appears below:

It appears the change in direction happened between Jun 10 and Jun 11 2014. See the traceroutes below for the 2 days:

From: To:
 Select any 3 dates to view traceroutes and number of differences:

2014_07_10 7:0:3 17

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1 rtr-servcore1-serv01-webserv.slac.stanford.edu (134.79.197.130) [AS3671] 0.417 ms
2 rtr-core2-p2p-serv01-01.slac.stanford.edu (134.79.254.65) [AS3671] 0.282 ms
3 rtr-border1-p2p-core1.slac.stanford.edu (134.79.252.133) [AS3671] 0.429 ms
4 slac-mr2-p2p-rtr-border1.slac.stanford.edu (192.68.191.245) [AS3671] 0.218 ms
5 *
6 sacrcr5-ip-a-sunnocr5.es.net (134.55.40.5) [AS293] 3.762 ms
7 denivr5-ip-a-sacrcr5.es.net (134.55.50.202) [AS293] 24.741 ms
8 kanscr5-ip-a-denivr5.es.net (134.55.49.58) [AS293] 35.303 ms
9 chiccr5-ip-a-kanscr5.es.net (134.55.43.81) [AS293] 46.292 ms
10 starcr5-ip-a-chiccr5.es.net (134.55.42.42) [AS293] 46.534 ms
11 *
12 tengige0-4-4-0.nytkr2.NewYork.opentransit.net (193.251.243.205) [AS5511] 69.795 ms
13 tengige0-14-0-5.nytkr1.NewYork.opentransit.net (193.251.240.20) [AS5511] 70.525 ms
14 tengige0-13-0-9.suvtr1.Aubervilliers.opentransit.net (193.251.240.225) [AS5511] 144.051 ms
15 xe-3-1-1.marcr3.Marseille.opentransit.net (193.251.133.121) [AS5511] 162.657 ms
16 gigabitethernet5-0-3.marcr2.Marseille.opentransit.net (193.251.151.37) [AS5511] 157.230 ms
17 *
18 static-10GE-KHI275-P01-SwA.pie.net.pk (202.125.128.173) [AS17557] 287.185 ms
19 (221.120.251.30) [AS17557] 285.450 ms
20 (221.120.236.190) [AS17557] 301.137 ms
21 *
22 *
23 *
24 *
25 *
26 *
27 *
28 *
29 *
30 *
  
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2014_07_11 7:0:3 5

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1 rtr-servcore1-serv01-webserv.slac.stanford.edu (134.79.197.130) [AS3671] 0.585 ms
2 rtr-core2-p2p-serv01-01.slac.stanford.edu (134.79.254.65) [AS3671] 0.267 ms
3 rtr-border2-p2p-core2.slac.stanford.edu (134.79.252.145) [AS3671] 0.440 ms
4 slac-mr2-p2p-rtr-border2.slac.stanford.edu (192.68.191.249) [AS3671] 0.226 ms
5 *
6 paixpart3-ip-a-sunnocr5.es.net (134.55.218.133) [AS293] 12.229 ms
7 g5-0-0.plapx-dr1.ix.singtel.com (198.32.176.50) [AS4637] 1.496 ms
8 203.208.173.129 (203.208.173.129) [AS7473] 1.496 ms
9 203.208.149.241 (203.208.149.241) [AS7473] 197.305 ms
10 203.208.182.85 (203.208.182.85) [AS7473] 173.844 ms
11 203.208.183.57 (203.208.183.57) [AS7473] 172.134 ms
12 203.208.182.134 (203.208.182.134) [AS7473] 179.119 ms
13 *
14 203.208.175.150 (203.208.175.150) [AS7473] 269.987 ms
15 *
16 tw23-static234.tw1.com (117.20.23.234) [AS38193] 368.232 ms
17 *
18 tw23-static234.tw1.com (117.20.23.234) [AS38193] 330.810 ms
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Note the 2014-07-11 traceroute that goes West from California is different from today's. The visualization of the 2014-07-11 route appears below:



Explanation

The answer is the HEC's use of its secondary service provider transworld. Transworld is linked to outside world through France, hence the path that was being used before June 2014.

When the internal backbone connection is switched back to the main provider (Partially owned by HEC and partially PTCL), the normal link from Singapore is used. In general, International traffic from Pakistan follows through Singapore route that is now being used. some service providers also use Dubai link, however, I do not think that is the case with for PERN data.

The question is: When HEC uses Transworld link and for which universities? There is no definite answer. Probably because of the upgrade to PERN 2 or load balancing, I am not sure. If you remember, this Transworld link was first discovered when Faisalabad pop had exceptionally high RTT when pinged from within Pakistan. This was documented in October 2012 report and shared with HEC. At that time, Faisalabad pop was on Transworld backbone and because of absence of interISP switching gateway, traffic from other pops to faisalabad was being routed internationally (Karachi to US to UK to France to Faisalabad). Hence very high RTT. When HEC was inquired about it, they simply switched Faisalabad on primary service provider and did not explain why it was put on secondary service provider.

What are the effects of being on Secondary Service Provider?

High RTT values when that specific node is accessed from other nodes within Pakistan.

Different RTT compared to other pakistani nodes when that node is accessed from outside world (for example SLAC). Higher or lower is not a discrete matter. Apparently link capacities are same, Which international nodes gets shorter path when a specific link is used makes the difference.

What can we do?

I believe its not a healthy trend when certain nodes are put on the secondary service provider network and others on the primary network.

It can be a very good research study with good potential of publication. Someone will need to sit down and study all impacts of this link switch. In case of faisalabad pop, node was less frequently used. In case of NUST, its more frequently accessed and hence more information can be drawn from this switch. There must be other nodes in the path there were switched to secondary provider network (for example PERN POP). If someone is interested, I can help through it but given other commitments I might not be able to contribute too much. It can for sure be a masters thesis.

Should we report it to HEC? That is a decision I will leave to Dr. Arshad. Generally, informing them does not make a difference. They sometimes take it positive, at other times, they take it negatively and fire back