# Update re: FTS Throughput

Saul Youssef, Boston University, July 7, 2015

- We now have about 2 month of data from the dashboard
- BNL started reporting to the dashboard on May 29
- Global/Experiment/Site/Channel reports are accumulating
- Observations from the reports so far:
    1. Peak transfer rates between Europe and North America are less asymmetric than they were last month
    2. Almost all incoming to BNL still uses TCP=1
    3. The CMS T1s have better transfer rates compared to ATLAS and LHCb
    4. CMS uses TCP=1 more often than ATLAS and LHCb for large files
- Throughput dependence on TCP streams possibly understood (see other talk)
- TCP stream=1 transfers do timeout about 2-3% of the time, however the timeouts are concentrated at a few sites.

Marian Babik, Shawn Mckee, Tomas Javurek, Hassen Riahi and S.Y. have been working on this.

The BNL FTS started reporting to the dashboard on May 29

FTS Domain History: 2015-07-06 02:58:45 UTC

1. "Maximum bunch"

file 2

file 3

file 1

start   end
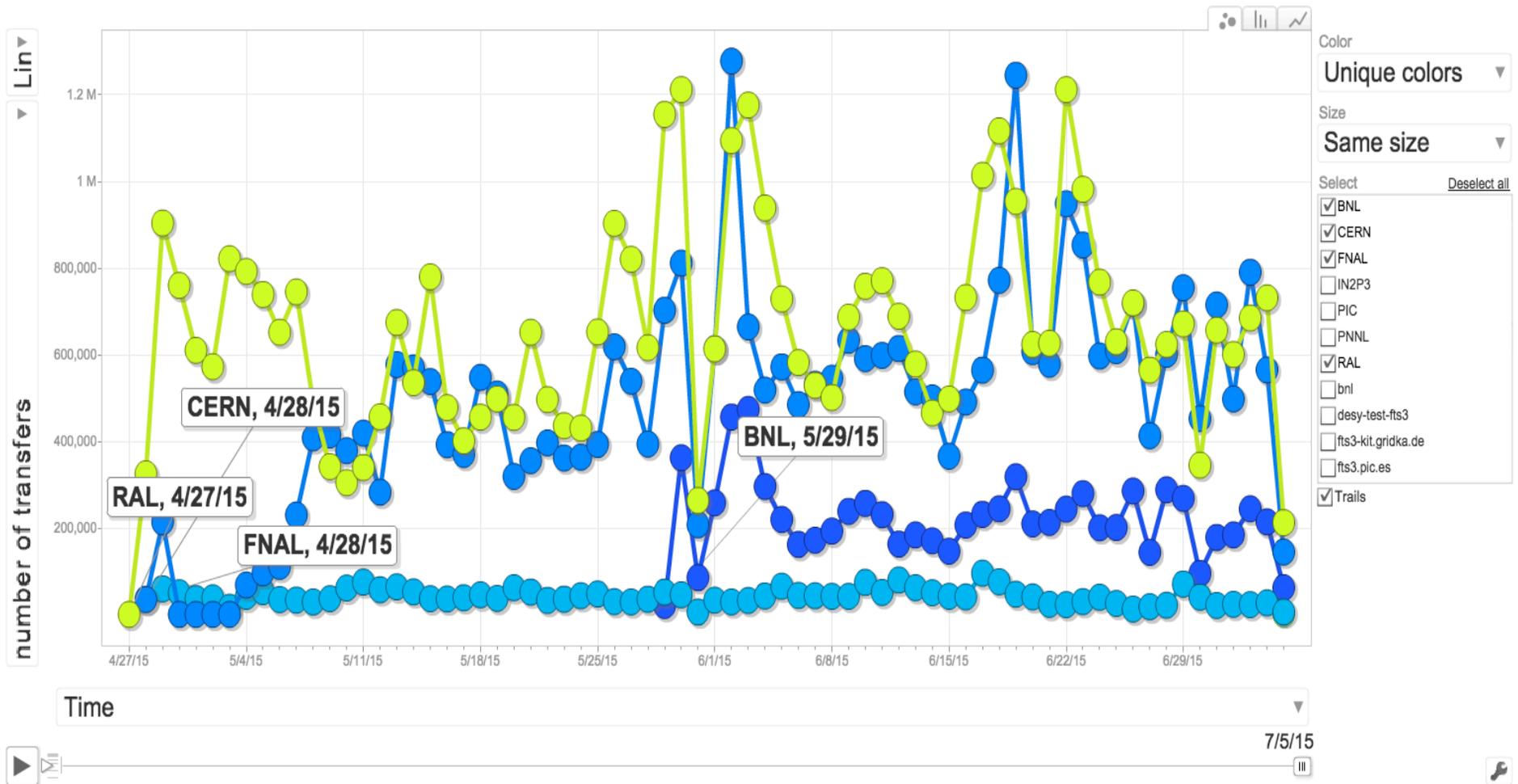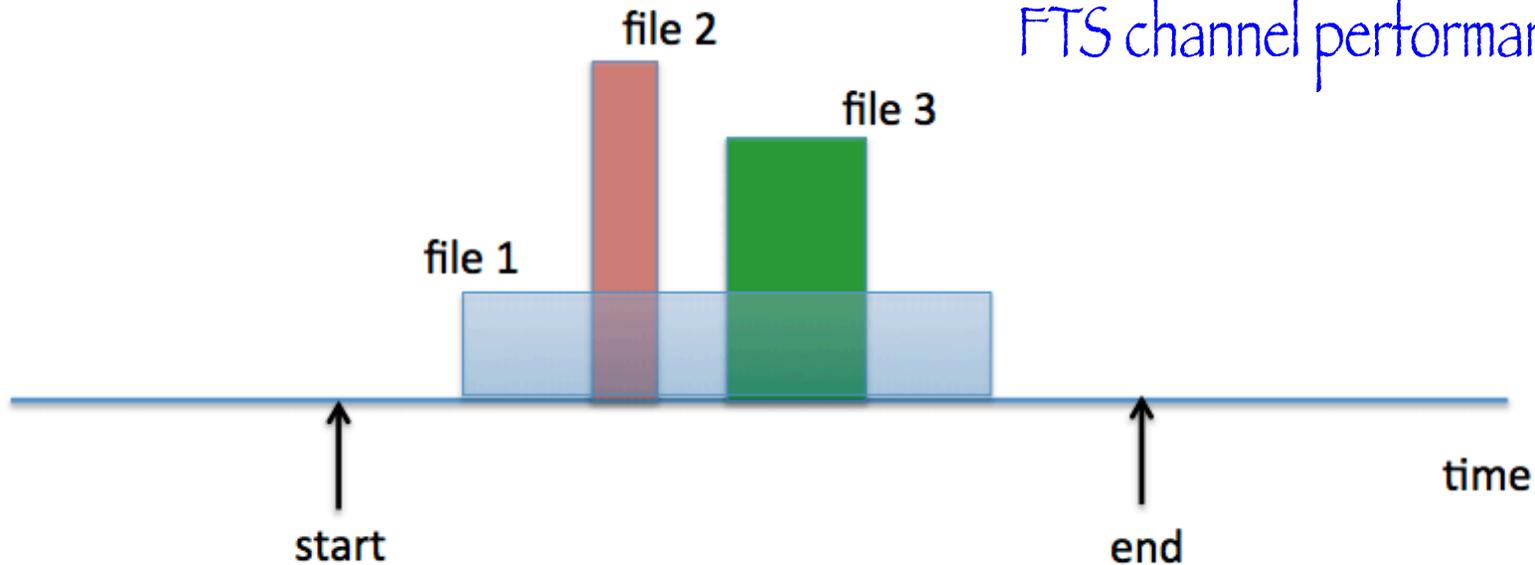
time

Given exact start and end times, the true peak channel transfer rate is bounded by

$$\frac{size(file\ 2) + size(file\ 2) + size(file\ 3)}{end - start}$$

This is referred to the "maximum bunch rate" in the plots. The maximum of this is the best measure of a channel capacity.

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3

The peak rate from Europe to North America is 3.75 GB/s

The peak rate from North America to Europe is 3.06 GB/s

Other continents are more symmetric.   This might be an artifact, but we should follow up and at least continue to watch. (this got more symmetric since last time)

**Maximum Daily Intercontinental Bunch Transfer Rates: 2015-07-06 06:32:36 UTC**
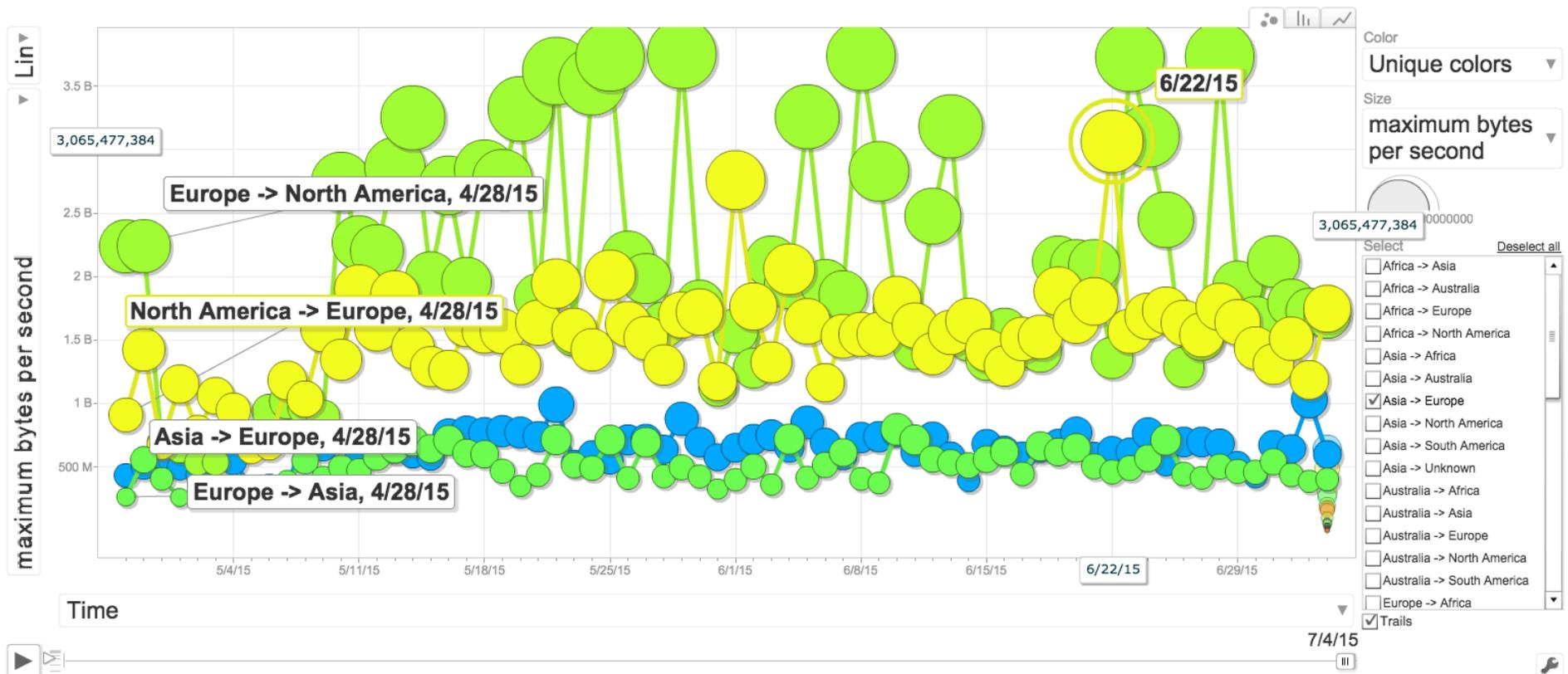
There was a big jump in transfers using TCP streams=1 when BNL started to report

Incoming to BNL:

Incoming TCP Stream History: 2015-07-06 14:25:07 UTC
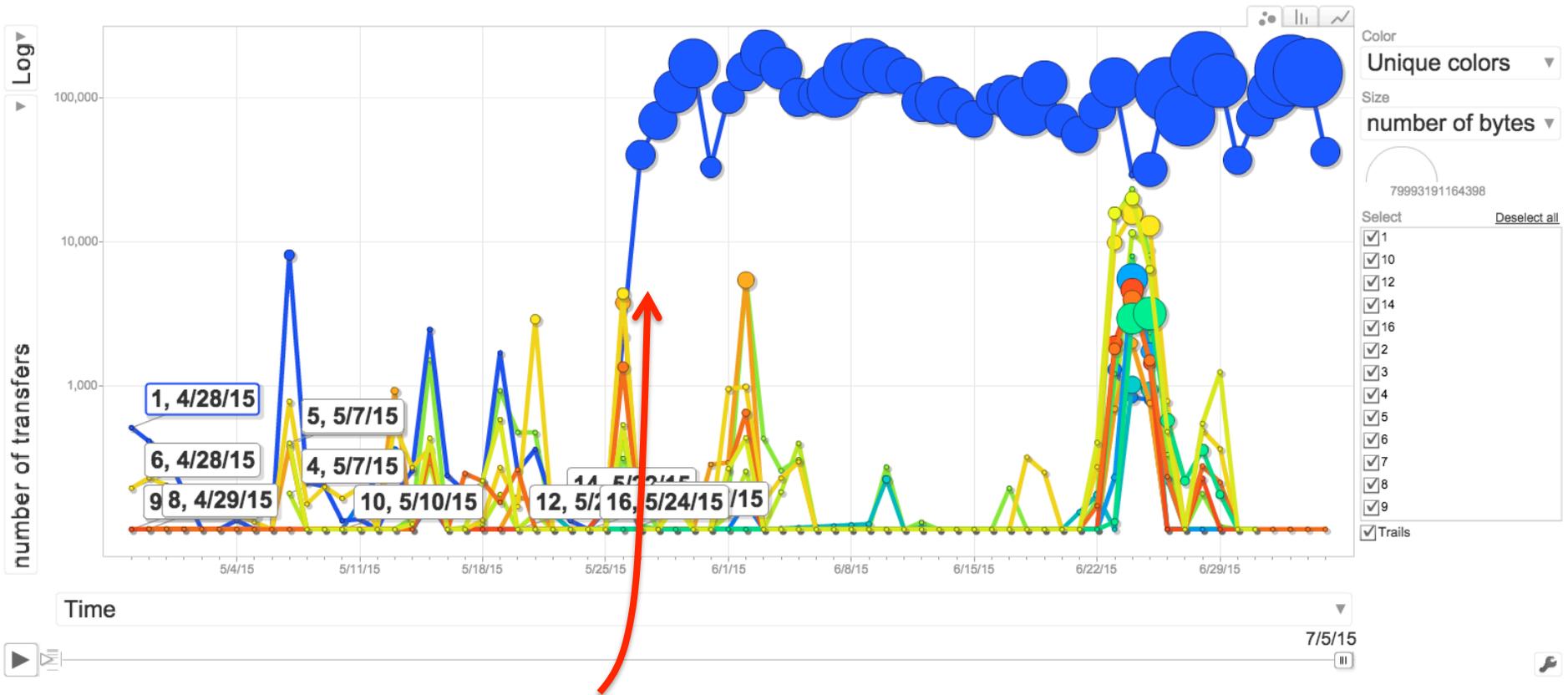
BNL starts reporting,
new FTS3 version

Almost all incoming transfers to BNL are with TCP streams=1

Incoming Flow: 2015-07-06 14:20:44 UTC

rucio -> 1
transfers: 2693257
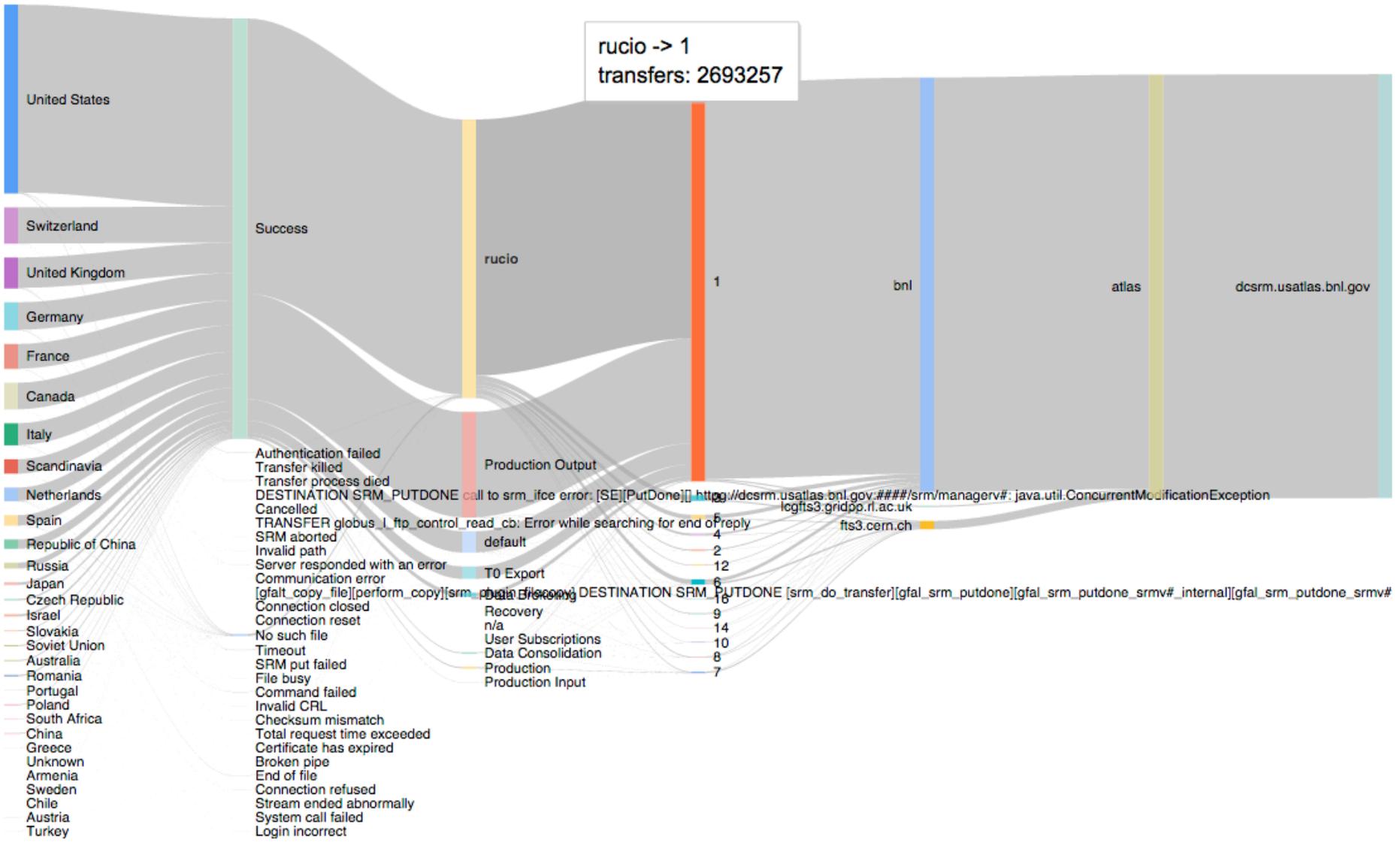
CMS has better incoming transfer rates than ATLAS or LHCb even when compared at the same file size

Maximum Incoming Rates by Site and VO: 2015-07-06 06:39:46 UTC

fts.size: 2684354560
fts.rate: 2415919104
fts.VO: cms
fts.size_avg: 2684354560

atlas
belle
biomed
cms
furano@cern.ch
lhcb
magic
na62.vo.gridpp.ac.uk
nil
snoplus.snolab.ca
t2k.org
vo.paus.pic.es

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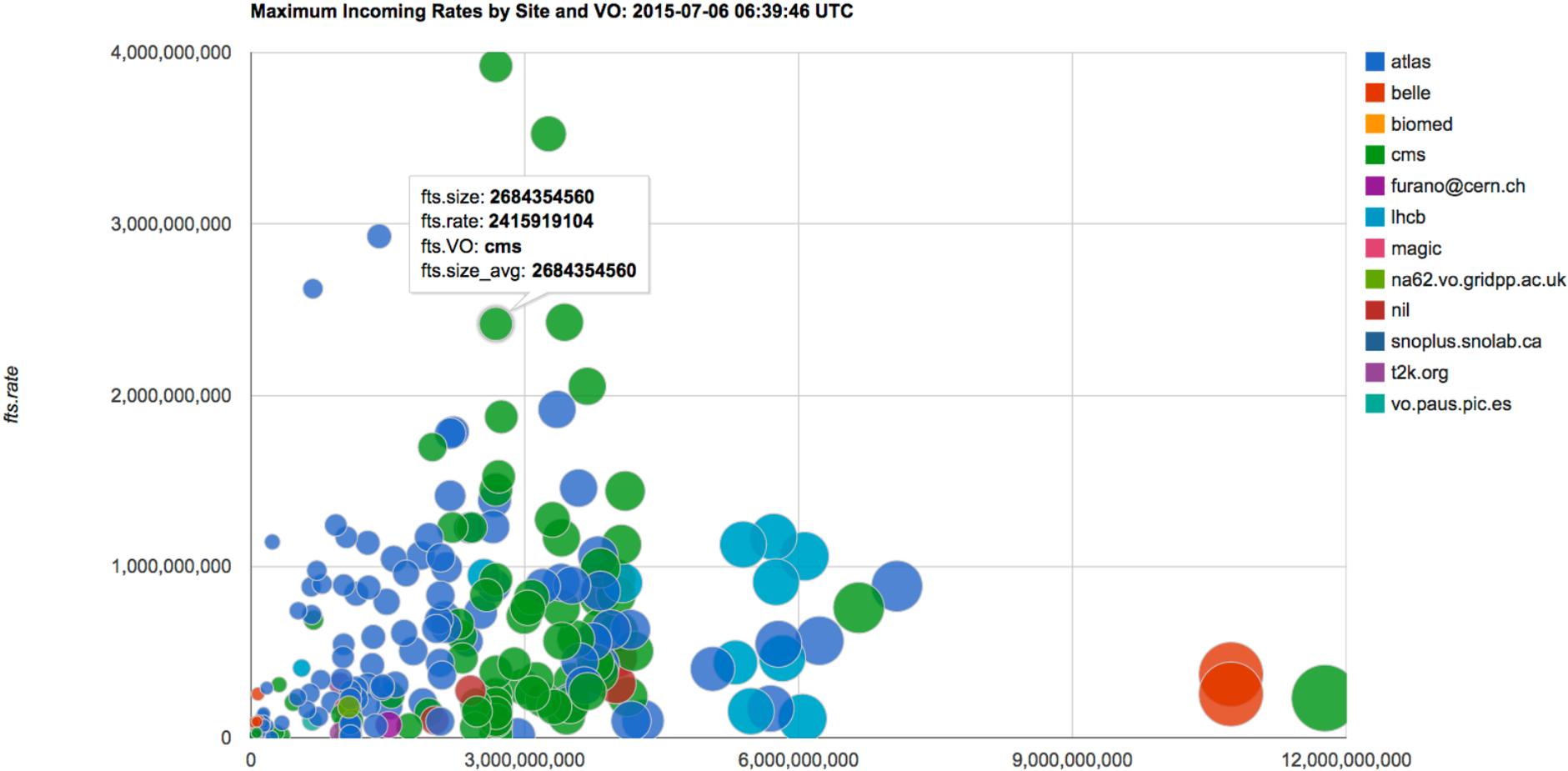
CMS has better maximum incoming rates – compare srm-cms.gridpp with srm-atals.gridpp

Maximum Incoming Rates by Site for Tier 1s only: 2015-07-06 06:39:46 UTC
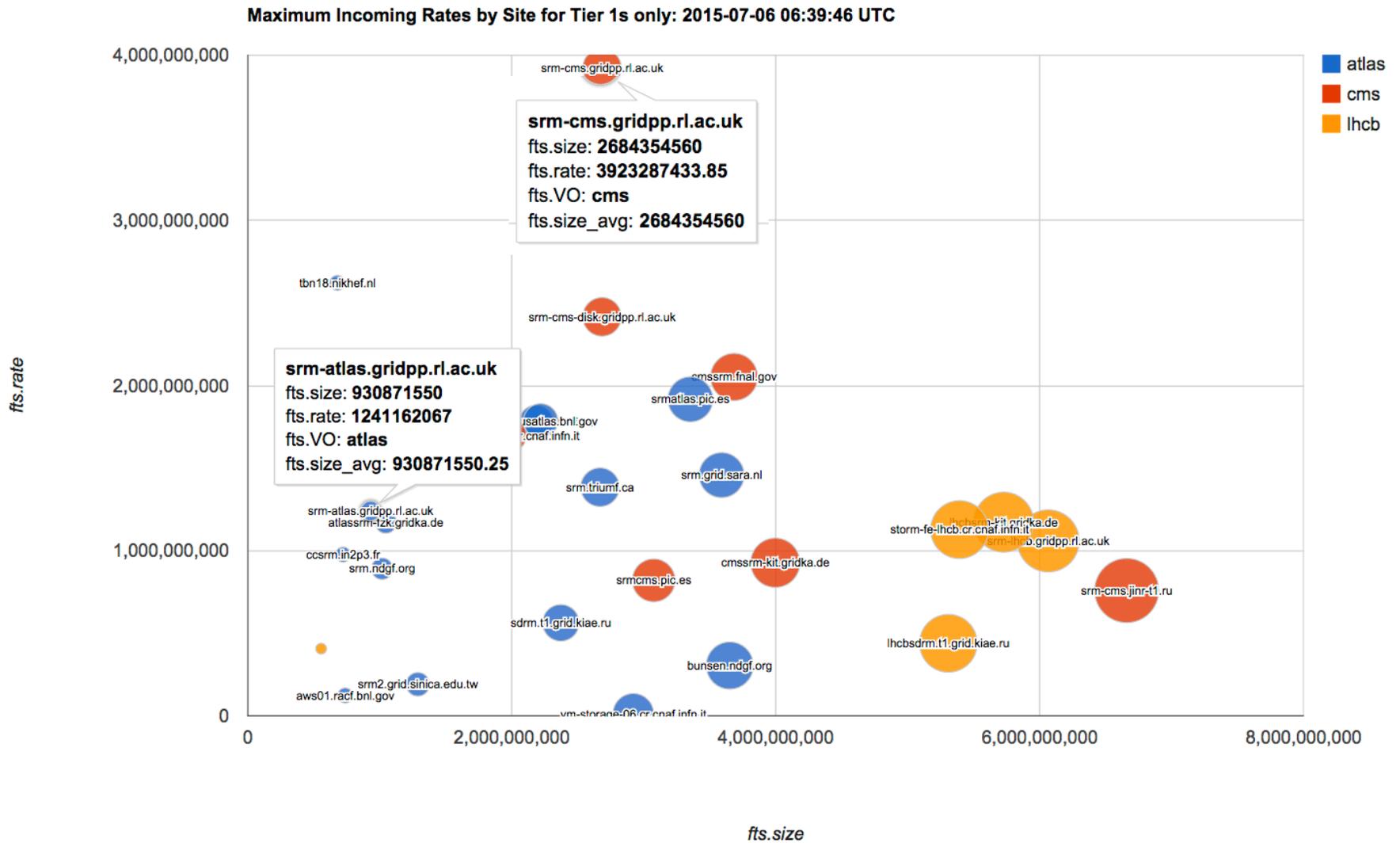
CMS uses TCP streams=1 more often than the other experiments for large file transfers

TCP streams for >700MB files: 2015-07-06 06:32:36 UTC
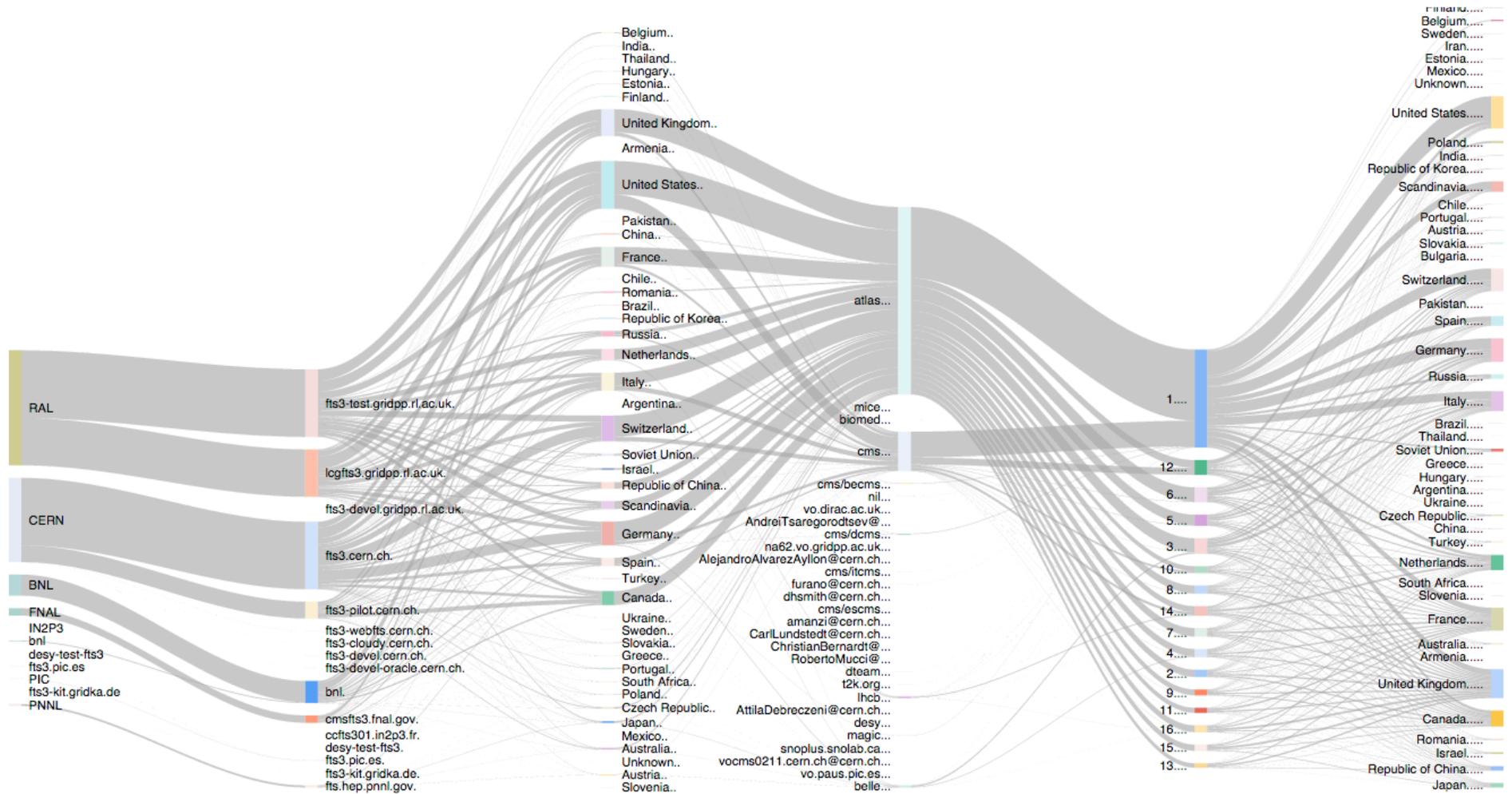
Maximum Tier 0 Rates

Incoming

	VO	Tier ▲	country	destination	maximum bunch rate	avg file size in bunch	files in bunch	size_avg
1	atlas	T0	Switzerland	srm-eosatlas.cern.ch	1051.41 MB/s	2.08 GB	51	2079569059.69
121	cms	Tier-0	Switzerland	srm-cms.cern.ch	2425.71 MB/s	3.44 GB	12	3436422993.67
113	lhcb	Tier 0	Switzerland	srm-lhcb.cern.ch	904.64 MB/s	4.07 GB	2	4070863383.0

Outgoing

	VO	Tier ▲	country	source	maximum bunch rate	avg file size in bunch	files in bunch	size_avg
1	atlas	T0	Switzerland	srm-eosatlas.cern.ch	16.78 MB/s	1.05 MB	16	1048576.0
120	cms	Tier-0	Switzerland	srm-cms.cern.ch	3400.56 MB/s	3.04 GB	153	3044949760.66
112	lhcb	Tier 0	Switzerland	srm-lhcb.cern.ch	947.70 MB/s	2.55 GB	23	2554657915.13

Note that CMS has higher incoming and outgoing peak rates to the T0s.

Presumably the ATLAS outgoing peak rate is low because there has been very little outgoing traffic.

Maximum Tier 1 Incoming Rates

	VO	Tier ▲	country	destination	maximum bunch rate	avg file size in bunch	files in bunch	size_avg
2	atlas	T1	United Kingdom	srm-atlas.gridpp.rl.ac.uk	1241.16 MB/s	0.93 GB	8	930871550.25
3	atlas	T1	Scandinavia	bunsen.ndgf.org	304.38 MB/s	3.65 GB	2	3652506471.5
4	atlas	T1	Canada	srm.triumf.ca	1384.10 MB/s	2.67 GB	42	2669344285.62
5	atlas	T1	Canada	ppshead.lcg.triumf.ca	74.33 MB/s	4.16 GB	1	4162281079.0
6	atlas	T1	Spain	srmatlas.pic.es	1916.63 MB/s	3.35 GB	12	3354096246.58
7	atlas	T1	Russia	sdrm.t1.grid.kiae.ru	562.96 MB/s	2.37 GB	14	2372463840.86
8	atlas	T1	United States	aws01.racf.bnl.gov	123.11 MB/s	0.74 GB	7	738686123.857
9	atlas	T1	Italy	storm-fe.cr.cnaf.infn.it	1776.81 MB/s	2.18 GB	74	2184990923.8
10	atlas	T1	Netherlands	tbn18.nikhef.nl	2621.55 MB/s	0.68 GB	27	679660739.259
11	atlas	T1	Italy	vm-storage-06.cr.cnaf.infn.it	11.66 MB/s	2.92 GB	2	2921540829.0
12	atlas	T1 Tier 1	Netherlands	srm.grid.sara.nl	1457.61 MB/s	3.59 GB	41	3590698117.88
13	atlas	T1, T2	Republic of China	srm2.grid.sinica.edu.tw	190.96 MB/s	1.29 GB	8	1289001840.25
14	atlas	T1, T2, T2D, T3, T3D	Scandinavia	srm.ndgf.org	890.77 MB/s	1.02 GB	14	1018021710.07
15	atlas	T1, T2, T3 Tier-1 Tier 1	France	ccsrm.in2p3.fr	976.44 MB/s	0.72 GB	56	722525648.714
16	atlas	T1, T3	United States	dcsrm.usatlas.bnl.gov	1786.08 MB/s	2.22 GB	103	2219596820.82
17	atlas	T1, T3	Germany	atlassrm-fzk.gridka.de	1170.66 MB/s	1.05 GB	47	1046119569.64
122	cms	Tier-1	United Kingdom	srm-cms-disk.gridpp.rl.ac.uk	2415.92 MB/s	2.68 GB	9	2684354560.0
123	cms	Tier-1	United States	cmssrmdisk.fnal.gov	3526.01 MB/s	3.26 GB	146	3260347561.05
124	cms	Tier-1	Spain	srmcms.pic.es	820.31 MB/s	3.08 GB	12	3076145471.5
125	cms	Tier-1	Germany	cmssrm-kit.gridka.de	926.95 MB/s	4.00 GB	16	3997472146.75
126	cms	Tier-1	Italy	storm-fe-cms.cr.cnaf.infn.it	1696.76 MB/s	1.99 GB	29	1989308305.86
127	cms	Tier-1	United States	cmssrm.fnal.gov	2051.75 MB/s	3.68 GB	291	3684896879.79
128	cms	Tier-1	United Kingdom	srm-cms.gridpp.rl.ac.uk	3923.29 MB/s	2.68 GB	19	2684354560.0
129	cms	Tier-1	Russia	srm-cms.jinr-t1.ru	758.70 MB/s	6.66 GB	9	6659690546.56
114	lhcb	Tier 1	Spain	srmlhcb.pic.es	406.42 MB/s	0.56 GB	19	556147452.632
115	lhcb	Tier 1	Russia	lhcbsdrm.t1.grid.kiae.ru	439.06 MB/s	5.31 GB	11	5308659999.18
116	lhcb	Tier 1	United Kingdom	srm-lhcb.gridpp.rl.ac.uk	1059.02 MB/s	6.07 GB	11	6065319197.82
117	lhcb	Tier 1	Italy	storm-fe-lhcb.cr.cnaf.infn.it	1127.57 MB/s	5.39 GB	23	5392707096.39
118	lhcb	Tier 1	Germany	lhcbsrm-kit.gridka.de	1172.58 MB/s	5.73 GB	26	5727610525.92

Compare srm-atlas.gridpp.rl.ac.uk and srm-cms-gridpp.rl.ac.uk.

Maximum Tier 1 Outgoing Rates

	VO	Tier ▲	country	destination	maximum bunch rate	avg file size in bunch	files in bunch	size_avg
2	atlas	T1	Italy	vm-storage-06.cr.cnaf.infn.it	2.10 MB/s	1.05 MB	2	1048576.0
3	atlas	T1	Russia	sdrm.t1.grid.kiae.ru	542.72 MB/s	0.24 GB	16	237439228.75
4	atlas	T1	Canada	srm.triumf.ca	1225.19 MB/s	2.39 GB	21	2392047291.48
5	atlas	T1	United Kingdom	srm-atlas.gridpp.rl.ac.uk	987.64 MB/s	2.15 GB	52	2146227048.23
6	atlas	T1	Canada	ppshead.lcg.triumf.ca	282.16 MB/s	2.73 GB	3	2727556412.33
7	atlas	T1	Italy	storm-fe.cr.cnaf.infn.it	1160.17 MB/s	1.82 GB	7	1823121821.71
8	atlas	T1	Netherlands	tbn18.nikhef.nl	1457.61 MB/s	3.59 GB	41	3590698117.88
9	atlas	T1	Scandinavia	bunsen.ndgf.org	311.58 MB/s	1.09 GB	2	1090519040.0
10	atlas	T1	United States	aws01.racf.bnl.gov	168.21 MB/s	0.71 GB	4	714910156.5
11	atlas	T1	Spain	srmatlas.pic.es	2927.93 MB/s	1.41 GB	25	1405406729.84
12	atlas	T1 Tier 1	Netherlands	srm.grid.sara.nl	2621.55 MB/s	0.68 GB	27	679660739.259
13	atlas	T1, T2	Republic of China	srm2.grid.sinica.edu.tw	705.46 MB/s	2.94 GB	66	2939431277.52
14	atlas	T1, T2, T2D, T3, T3D	Scandinavia	srm.ndgf.org	1252.07 MB/s	0.82 GB	26	818663951.577
15	atlas	T1, T2, T3 Tier-1 Tier 1	France	ccsrm.in2p3.fr	896.95 MB/s	0.11 GB	8	112119117.75
16	atlas	T1, T3	Germany	atlassrm-fzk.gridka.de	1231.33 MB/s	2.65 GB	13	2652101477.15
17	atlas	T1, T3	United States	dcsrm.usatlas.bnl.gov	1384.10 MB/s	2.67 GB	42	2669344285.62
121	cms	Tier-1	Germany	cmssrm-kit.gridka.de	1352.82 MB/s	1.35 GB	18	1352821594.06
122	cms	Tier-1	United Kingdom	srm-cms.gridpp.rl.ac.uk	2415.92 MB/s	2.68 GB	9	2684354560.0
123	cms	Tier-1	Spain	srmcms.pic.es	1076.95 MB/s	2.69 GB	4	2692383018.5
124	cms	Tier-1	United States	cmssrm.fnal.gov	3008.74 MB/s	3.30 GB	302	3301742006.87
125	cms	Tier-1	Russia	srm-cms.jinr-t1.ru	876.34 MB/s	3.69 GB	76	3689855724.2
126	cms	Tier-1	Italy	storm-fe-cms.cr.cnaf.infn.it	2425.71 MB/s	3.44 GB	12	3436422993.67
127	cms	Tier-1	United Kingdom	srm-cms-disk.gridpp.rl.ac.uk	3923.29 MB/s	2.68 GB	19	2684354560.0
128	cms	Tier-1	United States	cmssrmdisk.fnal.gov	2051.75 MB/s	3.68 GB	291	3684896879.79
113	lhcb	Tier 1	United Kingdom	srm-lhcb.gridpp.rl.ac.uk	667.73 MB/s	3.92 GB	8	3922897644.0
114	lhcb	Tier 1	Spain	srmlhcb.pic.es	910.16 MB/s	6.07 GB	3	6067739098.0
115	lhcb	Tier 1	Russia	lhcbsdrm.t1.grid.kiae.ru	200.77 MB/s	6.52 GB	2	6524974795.0
116	lhcb	Tier 1	Italy	storm-fe-lhcb.cr.cnaf.infn.it	1172.58 MB/s	5.73 GB	26	5727610525.92
117	lhcb	Tier 1	Germany	lhcbsrm-kit.gridka.de	660.36 MB/s	5.61 GB	10	5613096280.7

Compare srm-atlas.gridpp.rl.ac.uk and srm-cms-gridpp.rl.ac.uk.

Hiro and Shawn raised the issue of whether TCP stream=1 transfers might have more timeout errors:

Result by TCP Stream: 2015-05-27 19:35:08 UTC
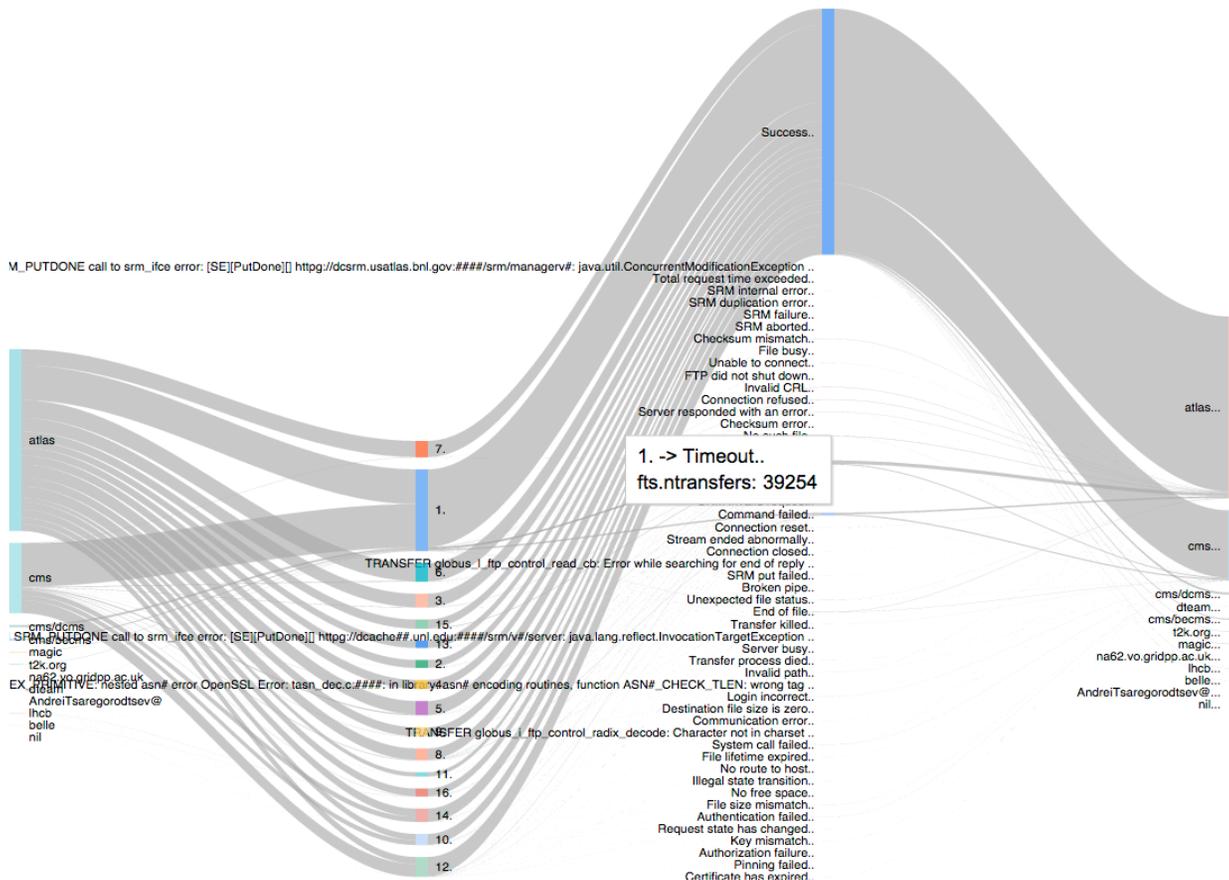
TCP streams

Indeed, about 2-3% of TCP=1 transfers timeout – a higher rate than other TCP stream values.

Most of the errors, however, happen at a handful of sites: srm.triumf.ca, atlassrm-fzk.gridka.de, se.hpc.utfsm.cl, se0002.m45.ihep.su, svr018.gla.scotgrid.ac.uk and cluster.pnpi.nw.ru