

Between

You and your Data



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Data Movement & Storage

... are the networks

LHCOPN

USLHCNET

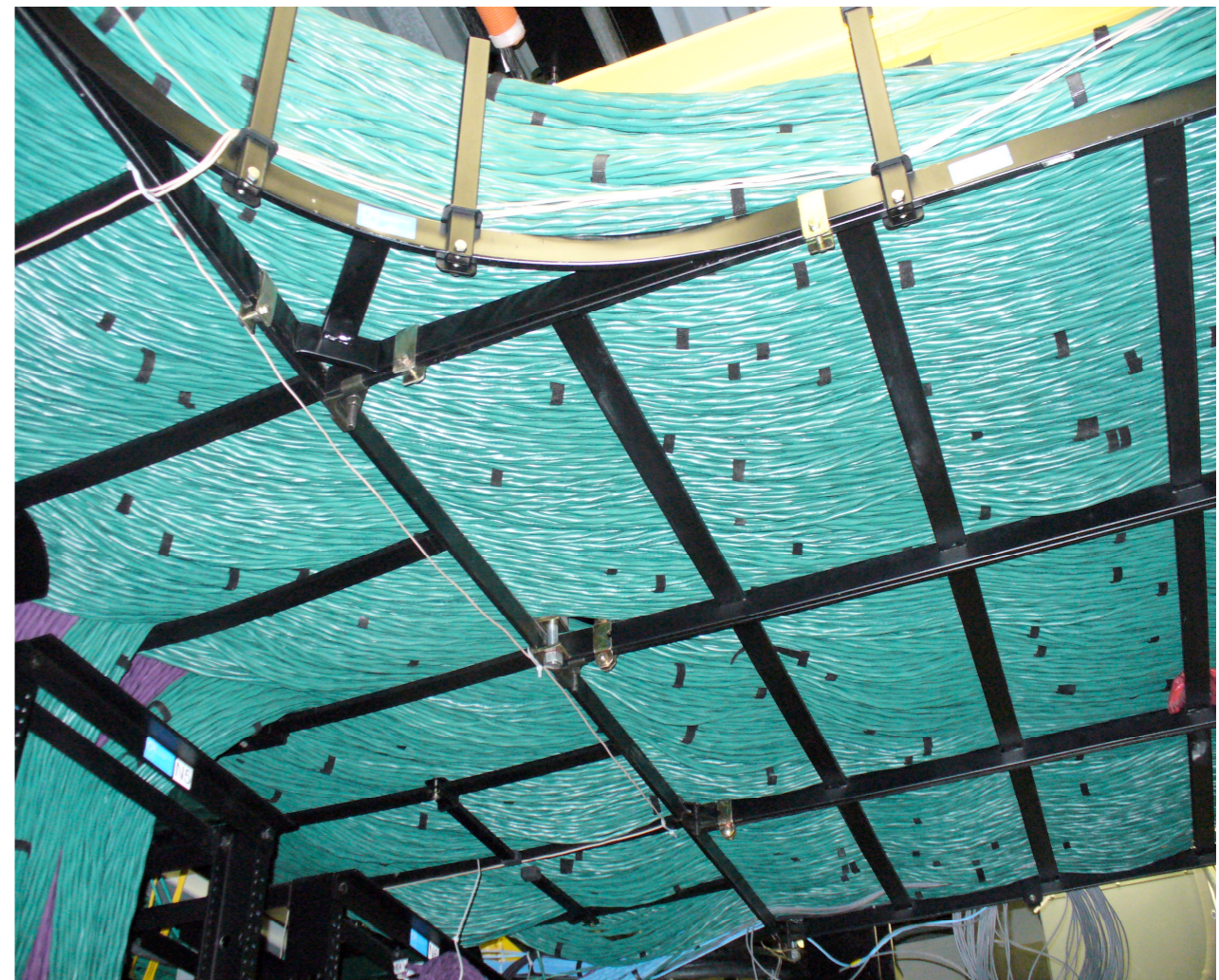
Regional Networks

Internet2

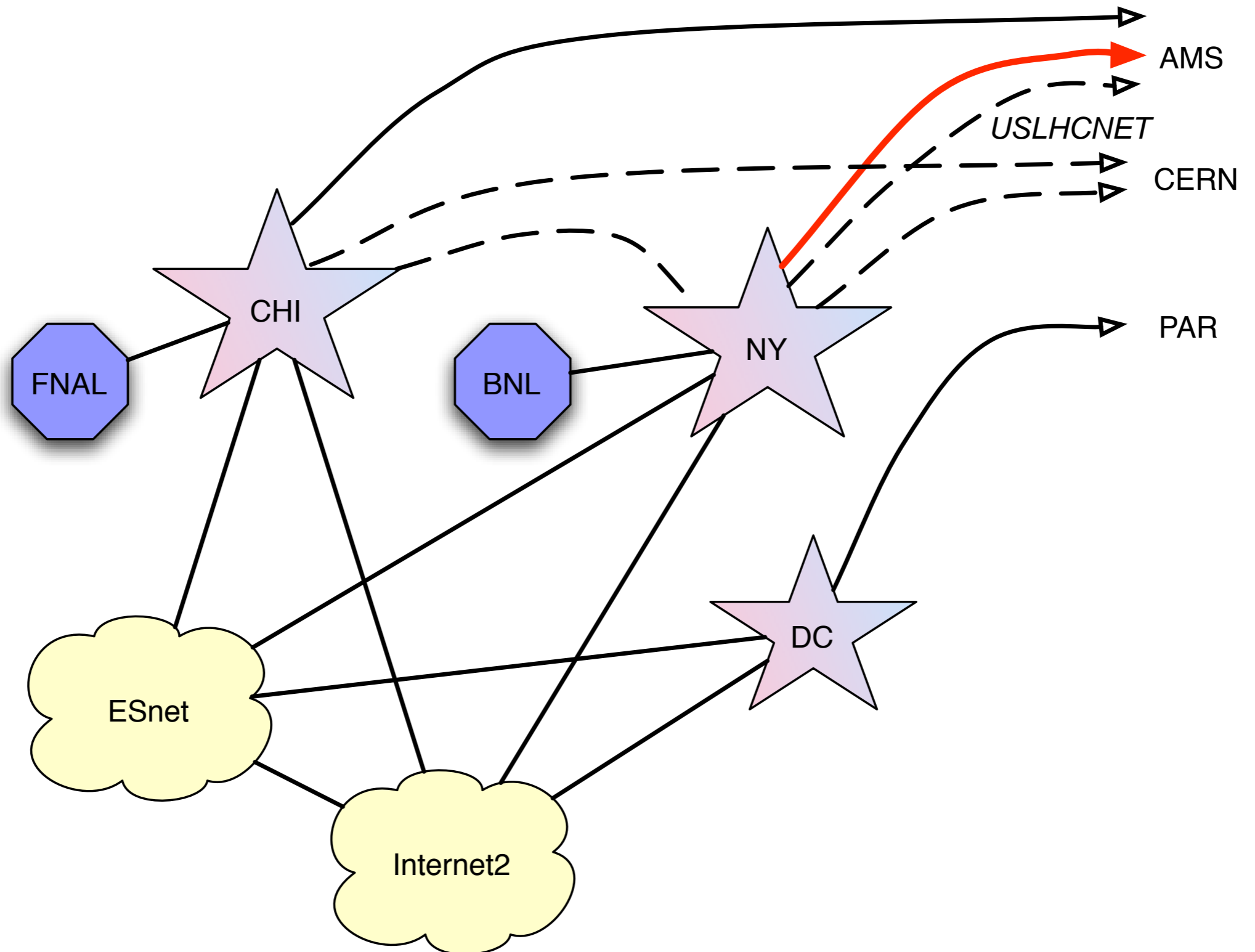
ESnet

GEANT2

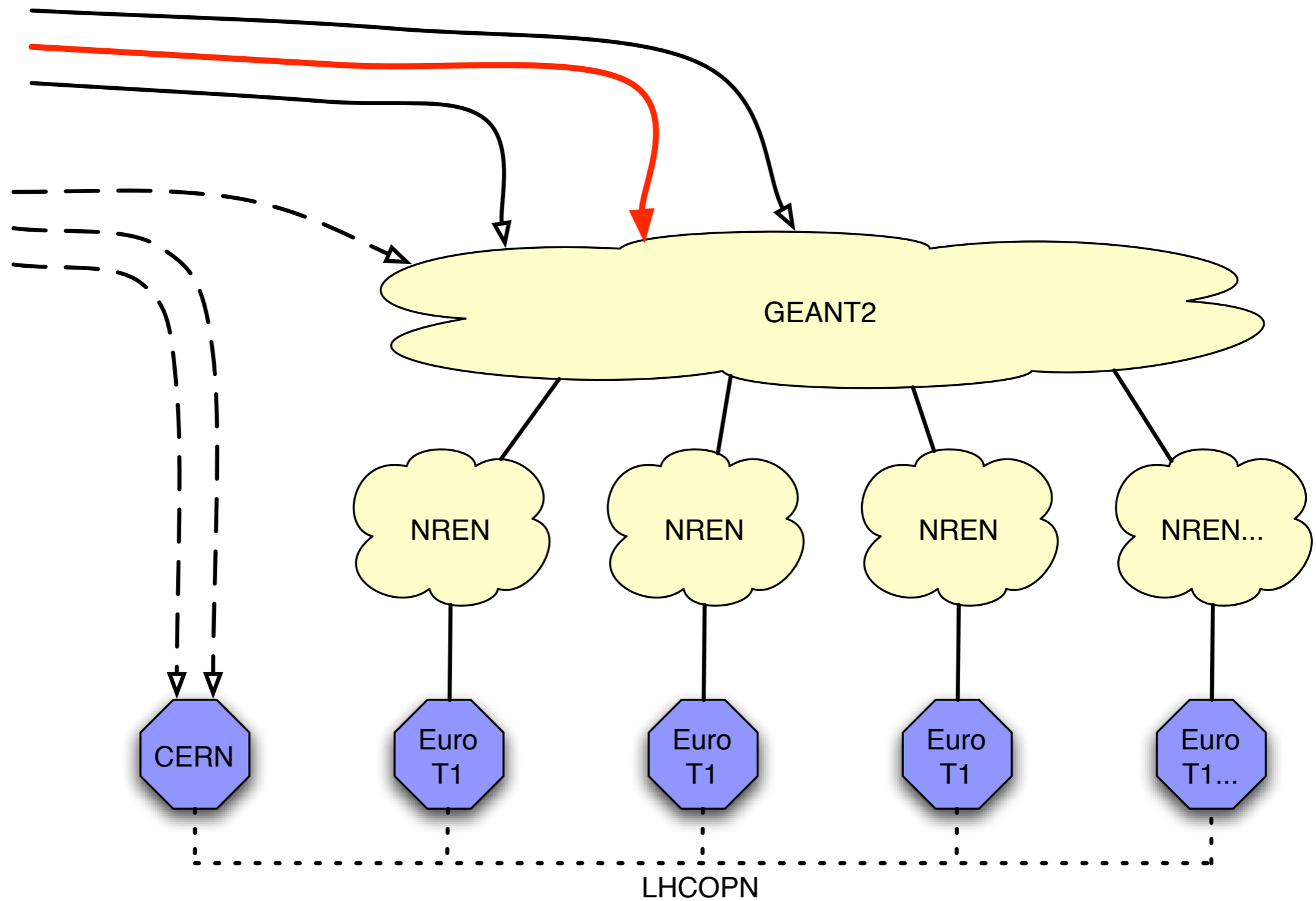
Site networks



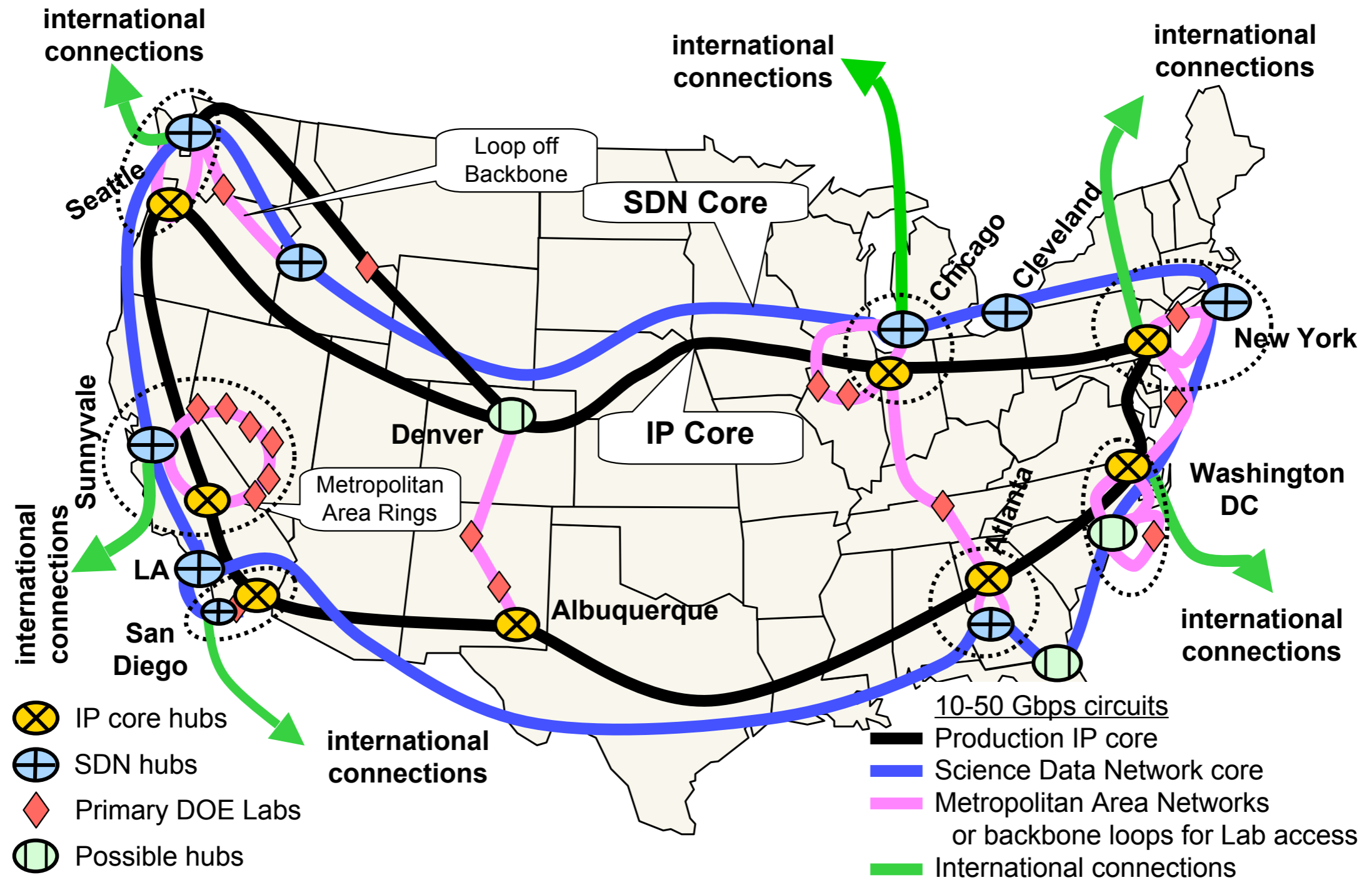
Getting your data



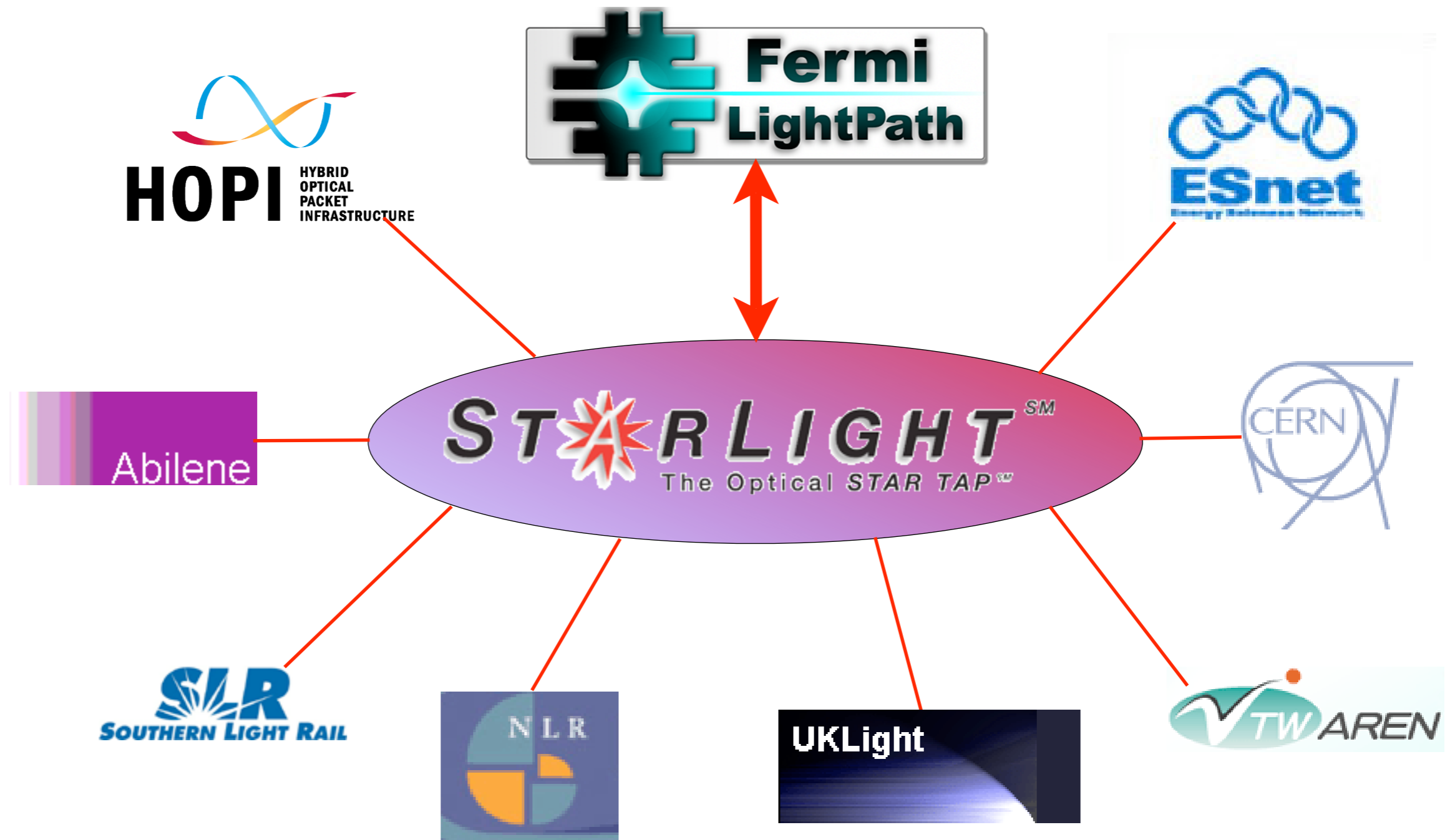
European side



Networks



Exchange Points



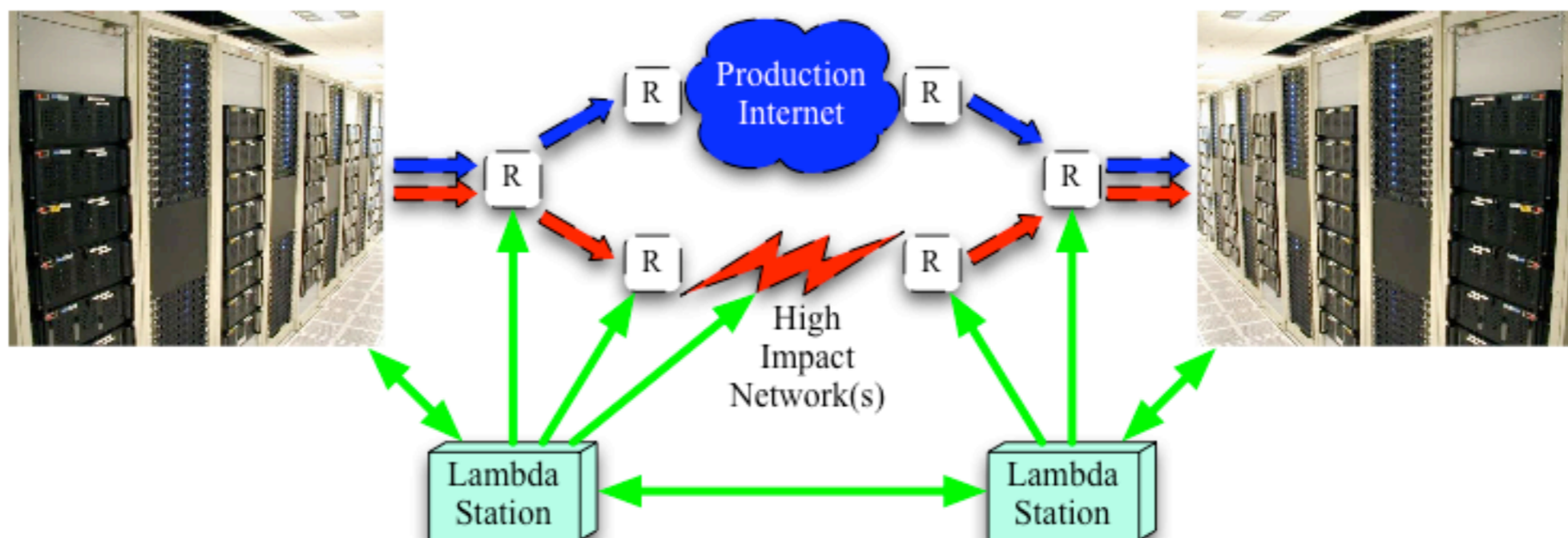
... and many, many others ...

Circuits

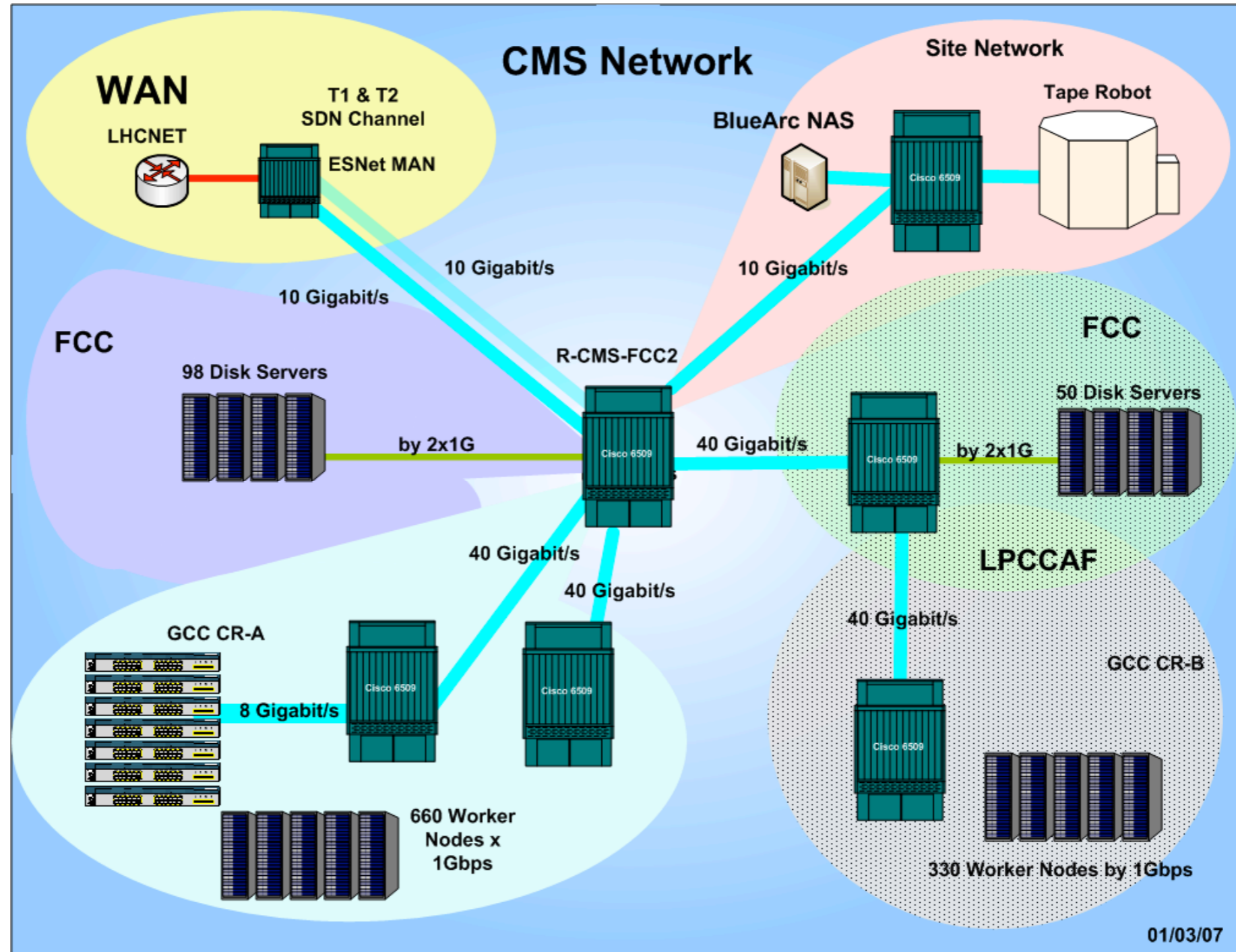
<u>Remote Site</u>	<u>Experiment</u>	<u>Transit Provider(s)</u>	<u>Max B.W.</u>	<u>Status</u>
UCL. UK	CDF	UKLight	1 Gb/s	Moderate use
CERN (LHC)	CMS	US-LHCnet	10 Gb/s	LHCOPN
Caltech	R & D	UltraScience Network	1 & 10 Gb/s	Intermittent use
Simon Fraser	D0	CAnet4; WestGrid (BC)	1 Gb/s	decommissioned
Caltech	CMS	UltraLight	10 Gb/s	T1/T2 data
Apache Pt (NM)	SDSS	ESnet (MPLS)	<< 1Gb/s	decommissioned
Sinica, Taiwan	CDF	ASnet	2.5 Gb/s	Intermittent use
Florida	CMS	UltraLight; FLR	10 Gb/s	T1/T2 data
McGill	CDF / D0	CAnet4	1 Gb/s	Intermittent use
NCHC, Taiwan	SDSS	Twaren	1 Gb/s	Intermittent use
IoP; Prague, Cz	D0	Surfnet; CESnet	1 Gb/s	Intermittent use
UCSD	CMS	ESnet (MPLS & SDN)	< 10Gb/s	T1/T2 data
Wisconsin	CMS	WISnet	10 Gb/s	T1/T2 data
Purdue	CMS	Purdue	10 Gb/s	T1/T2 data
IN2P3 , France	D0 (CMS?)	ESnet,HOPI,GEANT	Two x 1Gb/s	#1 – Intermittent use #2 – Moderate use

Exploiting Circuits

- Dynamic path-selection services now being deployed
 - LambdaStation, Terapaths are site interfaces to:
 - BRUW, DRAGON, OSCARS, UCLP, ... in the WAN.
- LambdaStation client will be activated on FNAL TI dCache Thursday morning.

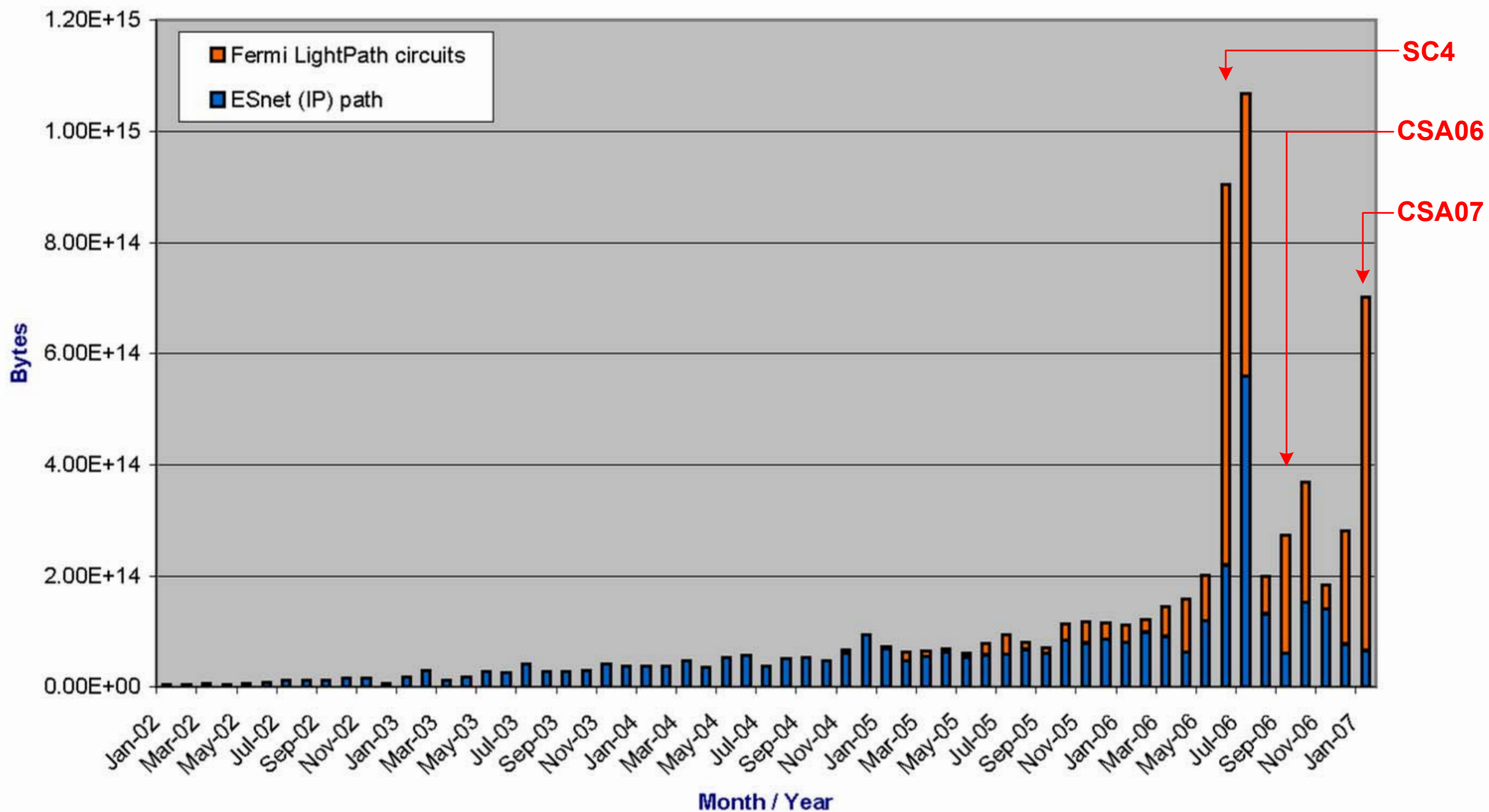


Site network – CMS TI





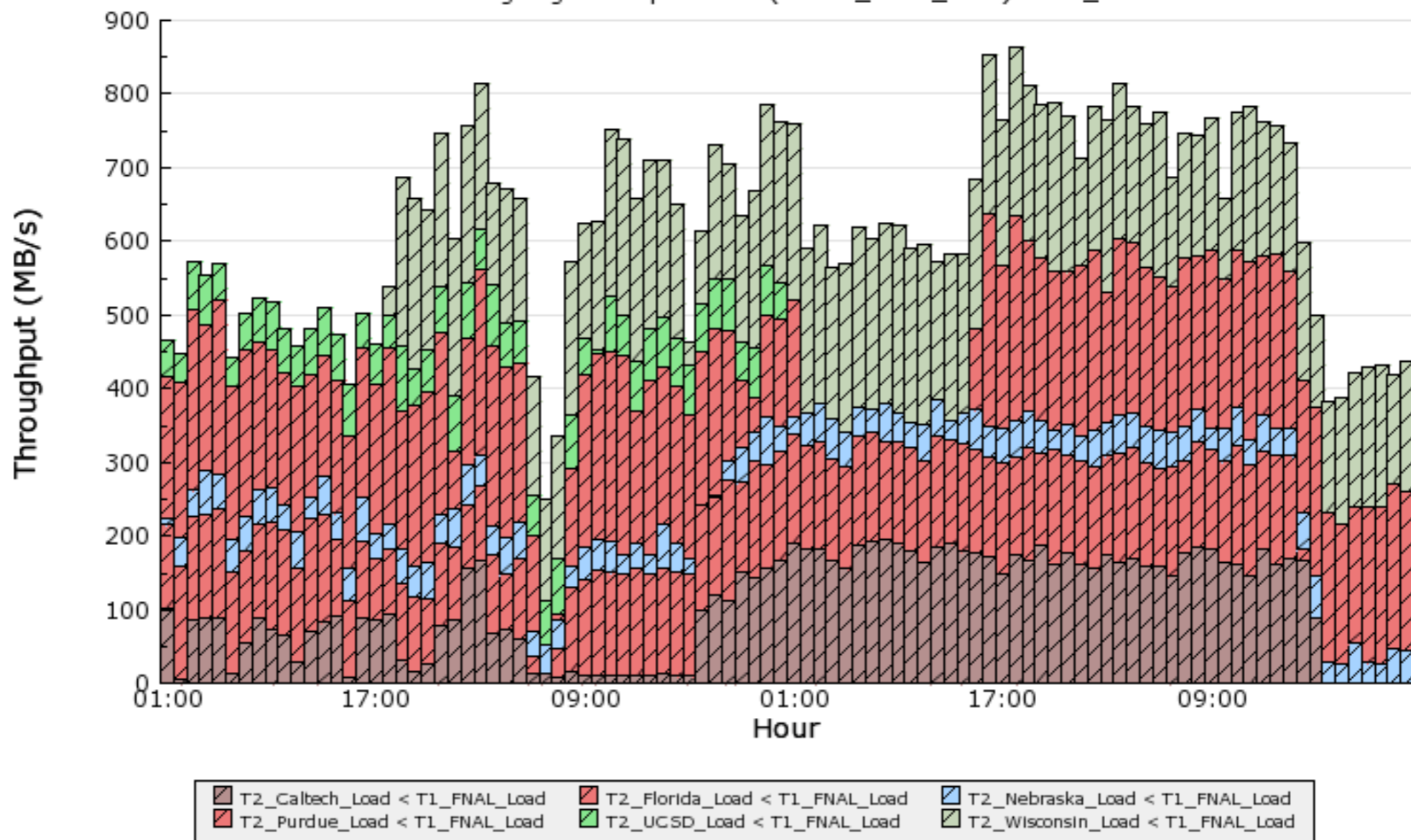
FNAL Outbound Traffic



Time to Upgrade!

PhEDx SC4 Data Transfers By Link

96 Hours from 2007-02-05 01:00 to 2007-02-09 00:00 GMT
 Nodes matching regular expression '(?!T1_FNAL_MSS) < T1_FNAL'



Making it work

The CMS computing model makes no concession to geography – all T2/T3 centers take data from any T1 centers, at widely varying distances.

Round-trip time is the enemy of throughput!

Fermilab is committed to making the model work. We view giving good service to Euro-T2s as a precondition of you requiring good service from Euro-T1s.

Excellent service to US sites is a given.

System factors

Linux presents ~~problems~~ challenges.

We are researching, testing, and contributing kernel fixes.

Network research feeds into dCache/SRM (and now, gridFTP) development.

Call us

US-CMS center

Tier-I center managers (CMS)

Storage developers

Network engineers

OS performance research



You can use
traceroute to
check your paths
to other sites.

(Please send me
additions to this table!)

*	T0	CERN	128.142.128.0/17
ATLAS	T1	BNL	dcdoor0{1,2,3,4,5}.usatlas.bnl.gov
CMS	T1	FNAL	{cmsrm,cmslscgce,cmsuaf,cmswn051.fnal.gov
*	T1	ASCC	osgc01.grid.sinica.edu.tw
CMS	T2	UNL	{red,thpc-1}.unl.edu
CMS	T2	WISC	{cmsgrid02,cmsrm}.hep.wisc.edu
CMS	T2	CALTECH	{cit-gatekeeper,cithep59}.ultralight.org
CMS	T2	UCSD	{osg-gw-2,t2data2}.t2.ucsd.edu
CMS	T2	Florida	{hg,pg}.ihepa.ufl.edu
CMS	T2	MIT	{ce01,se01}.cmsaf.mit.edu
CMS	T2	Purdue	{osg,dcache}.rcac.purdue.edu
CMS	T2	SPRACE	{sprace,spgrid,spdc00}.if.usp.br
CMS	T2	UERJ	prod-frontend.hepgrid.uerj.br
CMS	T2	ÖAW	bauch.oeaw.ac.at
*	T1	IN2P3	ccsrm.in2p3.fr
*	T1	CNAF	
*	T1	GridKa	gridka-dcache.fzk.de
ATLAS	T1	NIKHEF	
ATLAS	T1	Nordic	
*	T1	PIC	
*	T1	RAL	
ATLAS	T1	TRIUMF	
CMS	T1	Korea	
ATLAS		Japan	
*		China	
ATLAS		AU	
*	T2	SINP	lcg06.sinp.msu.ru
*	T2	ITEP	ceitep.itep.ru
*	T2	JINR	lcgce01.jinr.ru
*	T2	IHEP	ce0001.m45.ihep.su
*	T2	KI	gate.grid.kiae.ru
*	T2	PNPI	cluster.pnpi.nw.ru
*	T2	FIAN	ce1.grid.lebedev.ru
*	T2	INR	grce001.inr.troitsk.ru
ATLAS	T2	BU	atlas.bu.edu
ATLAS	T2	OU	tier2-01.occhep.ou.edu
ATLAS	T2	UTA	atlas.dpcc.uta.edu
ATLAS	T2	UNM	
ATLAS	T2	LU	
ATLAS	T2	CA-E	
ATLAS	T2	CA-W	
ATLAS	T2	Chicago	
ATLAS	T2	IU	
ATLAS	T2	Harvard	
CMS	T3	VU	vampire.accre.vanderbilt.edu