

PhEDEx and CMS Data Transfers

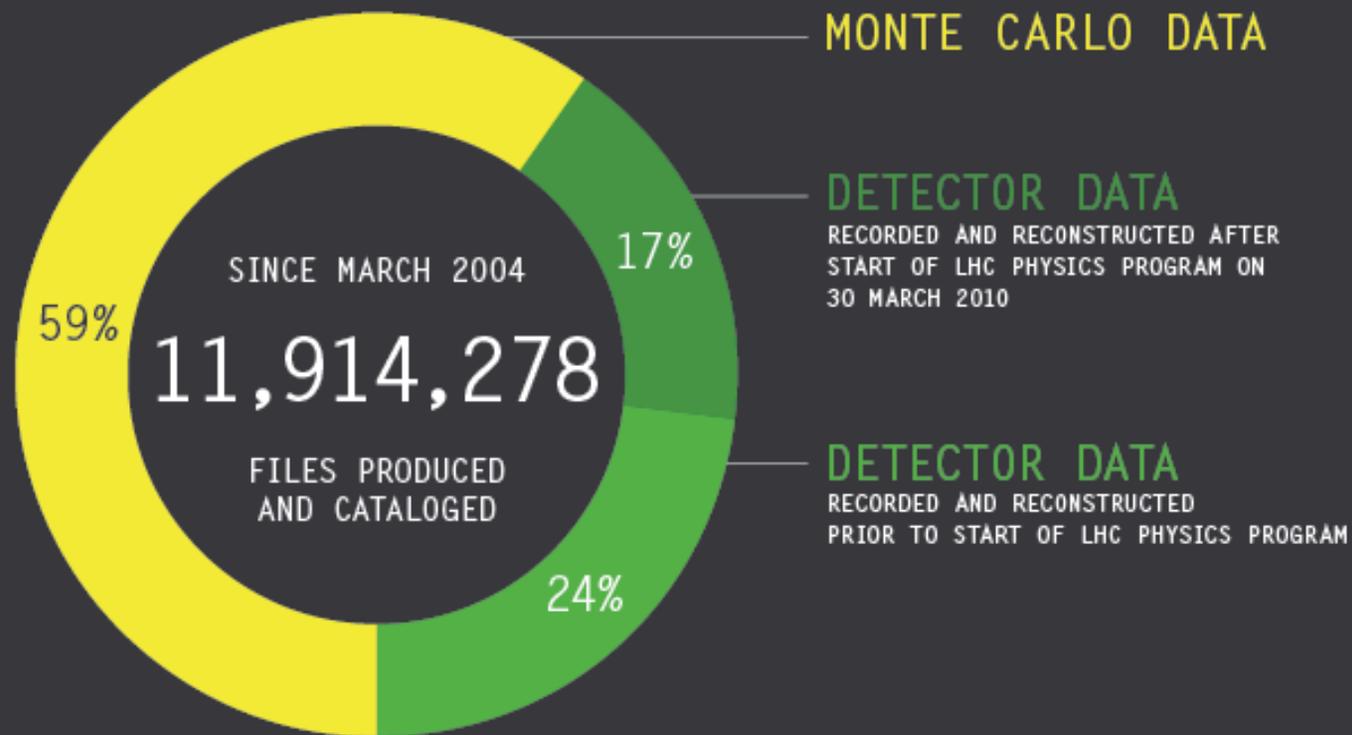
Paul Rossman
Fermilab



AVERAGE DAILY TRANSFER RATE

CUMULATIVE TRANSFER VOLUME





What is PhEDEx?

- ➔ PhEDEx is short for **Physics Experiment Data Export**
- ➔ PhEDEx was developed to manage the movement of data within CMS
 - Centralized system for making global data movement decisions
 - Provides site and data managers and users a realtime view of the global CMS data transfer state
- ➔ PhEDEx automates for CMS many of low level tasks typically found in HEP experiments such as
 - large-scale data replication
 - tape migration
 - consistency
- ➔ In production since mid-2004

What is a PhEDEx agent?

- ➔ PhEDEx is composed of a series of autonomous, robust, persistent, stateless processes or in PhEDEx terms agents
- ➔ These agents share information about replica and transfer state through a database and other agents at CERN
- ➔ There are several agents, for example
 - FileDownload
 - FileExport
 - FileRemove
 - BlockDownloadVerify
- ➔ Not all sites require all agents
 - For instance, sites without a tape system do not require the FileStager agent

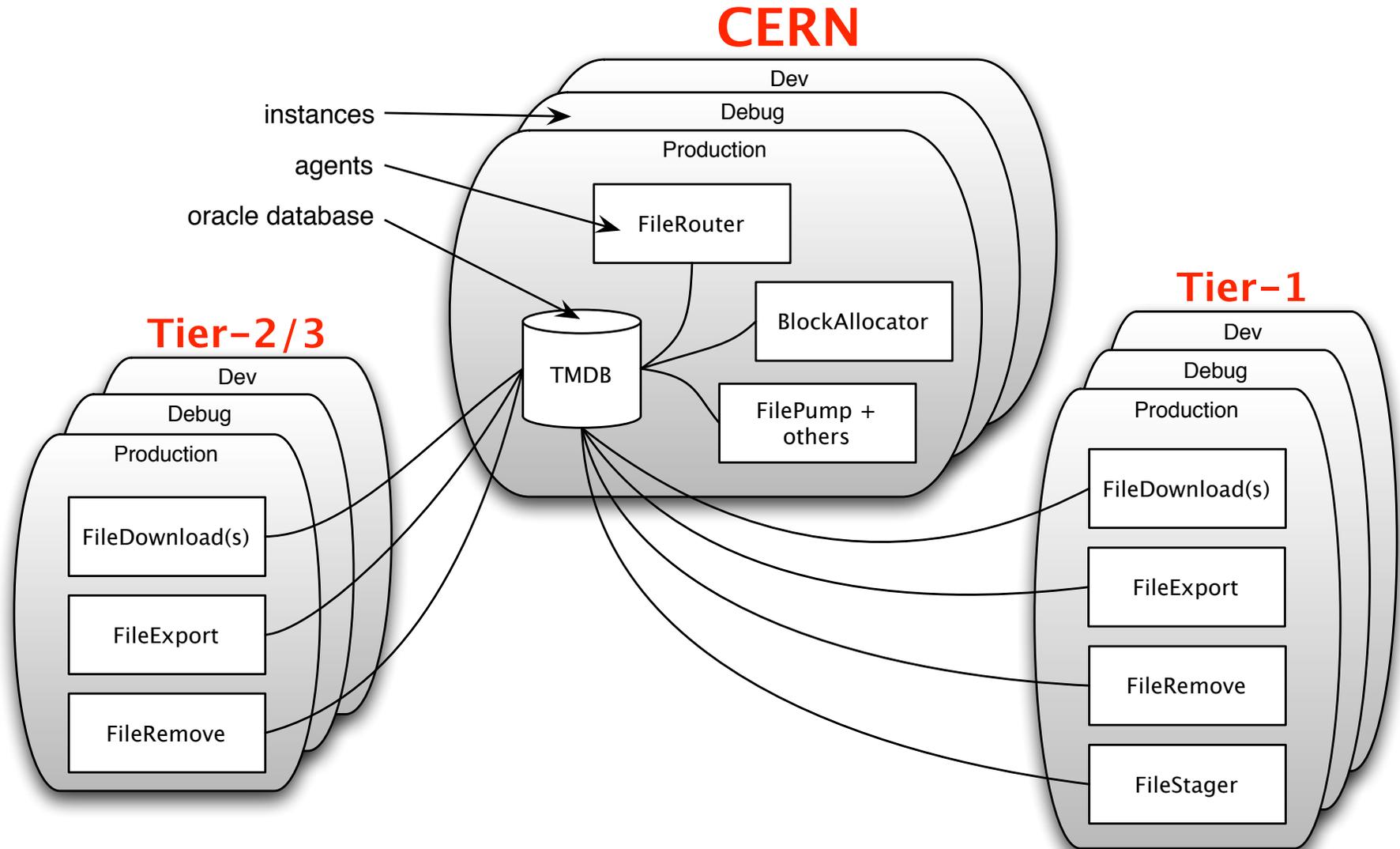
What is a PhEDEx instance?

- ➔ Agents when combined form an instance
- ➔ There are currently 3 instances in use today
 - Production
 - Debug
 - Development
- ➔ Instances are independent and do not share information between each other

Instances in-depth

- ➔ Production instance (Prod)
 - All CMS experiment data is transferred using this instance
- ➔ Debug instance (Debug)
 - Critical instance used for site commissioning and readiness
 - Tier-1 and Tier-2 sites transfer links can be decommissioned if transfer problems in this instance are not resolved
 - The primary focus of this instance was until recently to *debug* transfer agents and links
- ➔ Development instance (Dev)
 - Was historically used during testing and validation of PhEDEx software releases
 - Plans are being developed to re-task this instance to debugging

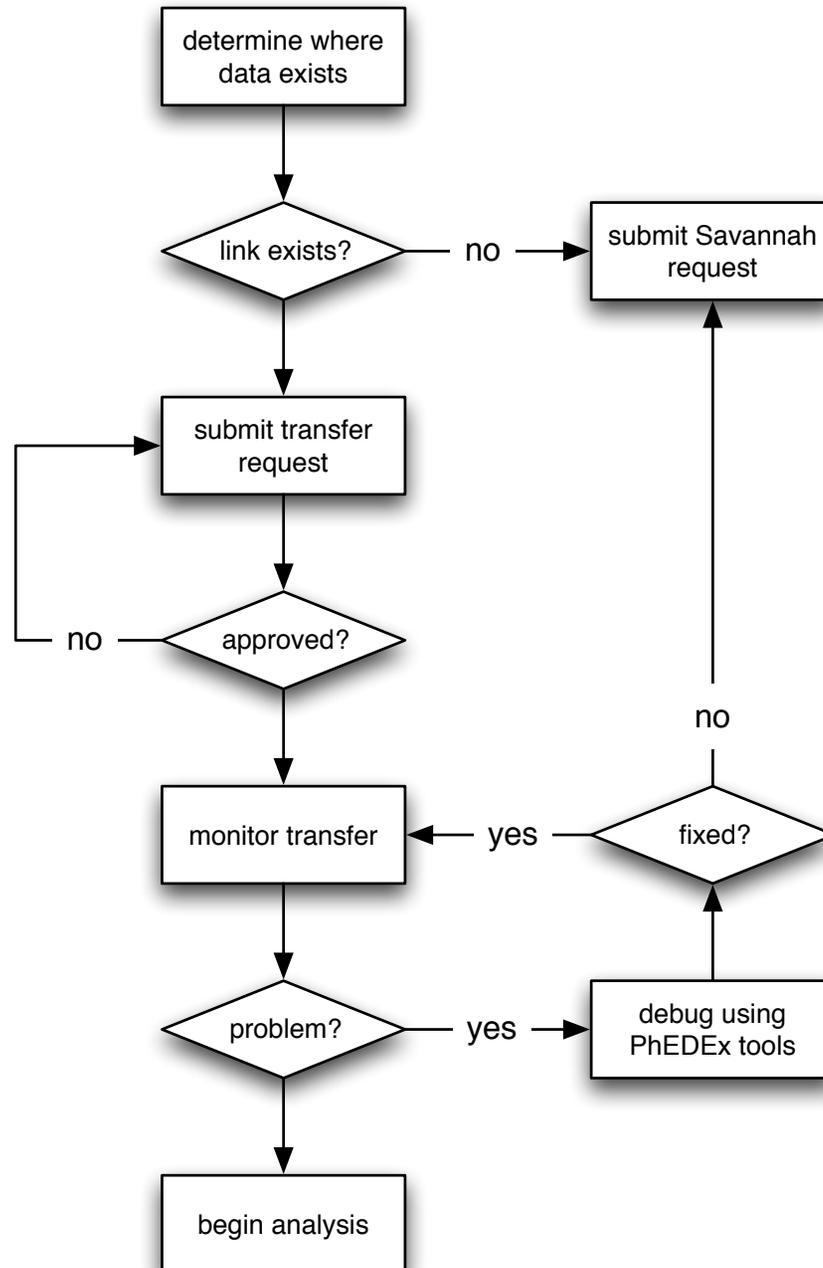
Putting it all together



So you're probably wondering...



Transfer Request Process

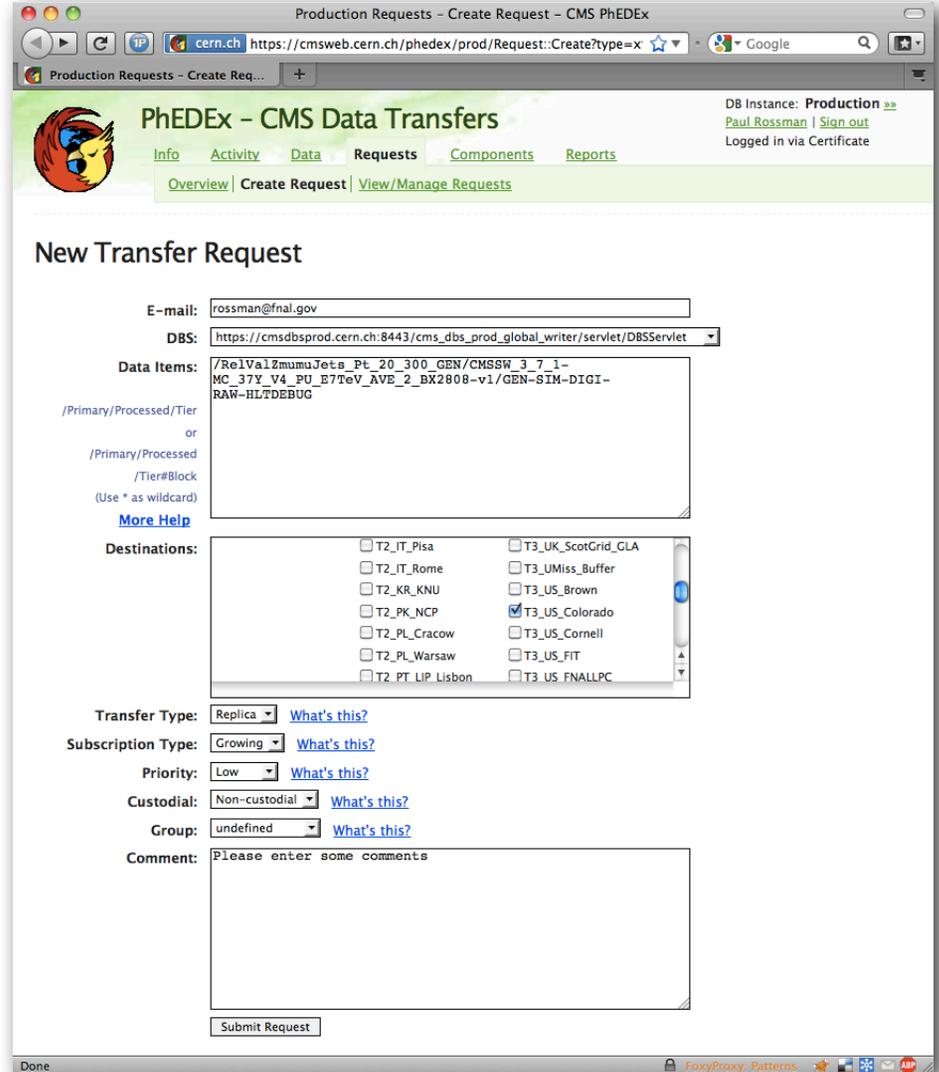
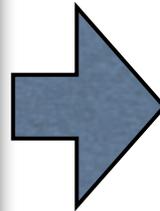
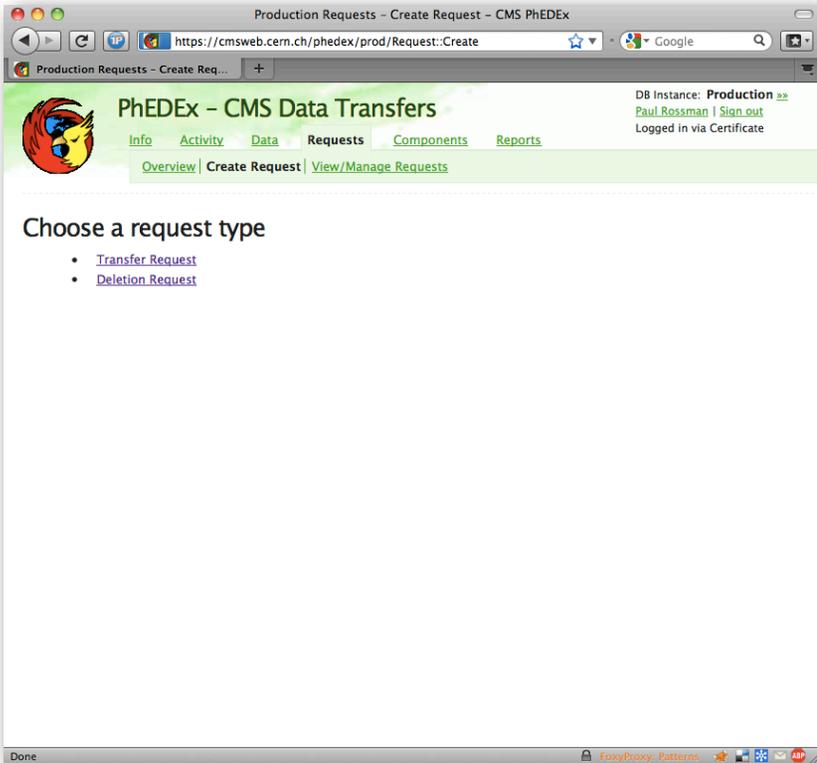


Submit a transfer request



- ➔ <https://cmsweb.cern.ch/phedex/prod/Request::Create>
- ➔ Transfer and delete requests follow similar procedures

submit transfer
request



submit transfer
request

Production Requests - Submit Request - CMS PhEDEx

cern.ch https://cmsweb.cern.ch/phedex/prod/Request::Confirm

Production Requests - Submit Req...

PhEDEx - CMS Data Transfers

DB Instance: **Production** >>
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[Info](#) [Activity](#) [Data](#) [Requests](#) [Components](#) [Reports](#)

[Overview](#) | [Create Request](#) | [View/Manage Requests](#)

Please review these request details and confirm below. If you would like to change your request, use the back button in your browser.

Request Information

Requestor: Paul Rossman
E-mail: rossman@fnal.gov
DBS: https://cmsdbsprod.cern.ch:8443/cms_dbs_prod_global_writer/servlet/DBSServlet
Data: /RelValZmumuJets_Pt_20_300_GEN/CMSSW_3_7_1-MC_37Y_V4_PU_E7TeV_AVE_2_BX2808-v1/GEN-SIM-DIGI-RAW-HLTDEBUG
Destinations: T3_US_Colorado
Is Move?: No
Is Static?: No
Priority: Low
Custodial: No
Group: undefined

Data Item Lookup

The following table summarizes an attempt to look for your requested data items in PhEDEx.

Data Level	Data Item	Files	Size	Known to PhEDEx	Known to DBS	Sources (current)	Comment
Dataset	/RelValZmumuJets_Pt_20_300_GEN/CMSSW_3_7_1-MC_37Y_V4_PU_E7TeV_AVE_2_BX2808-v1/GEN-SIM-DIGI-RAW-HLTDEBUG	64	65.40 GB	Yes	Yes	T1_CH_CERN_Buffer : 63 files, not subscribed T1_CH_CERN_MSS : 63 files, subscribed T1_US_FNAL_Buffer : 64 files, not subscribed T1_US_FNAL_MSS : 64 files, subscribed	None
		64	65.40 GB				

Done

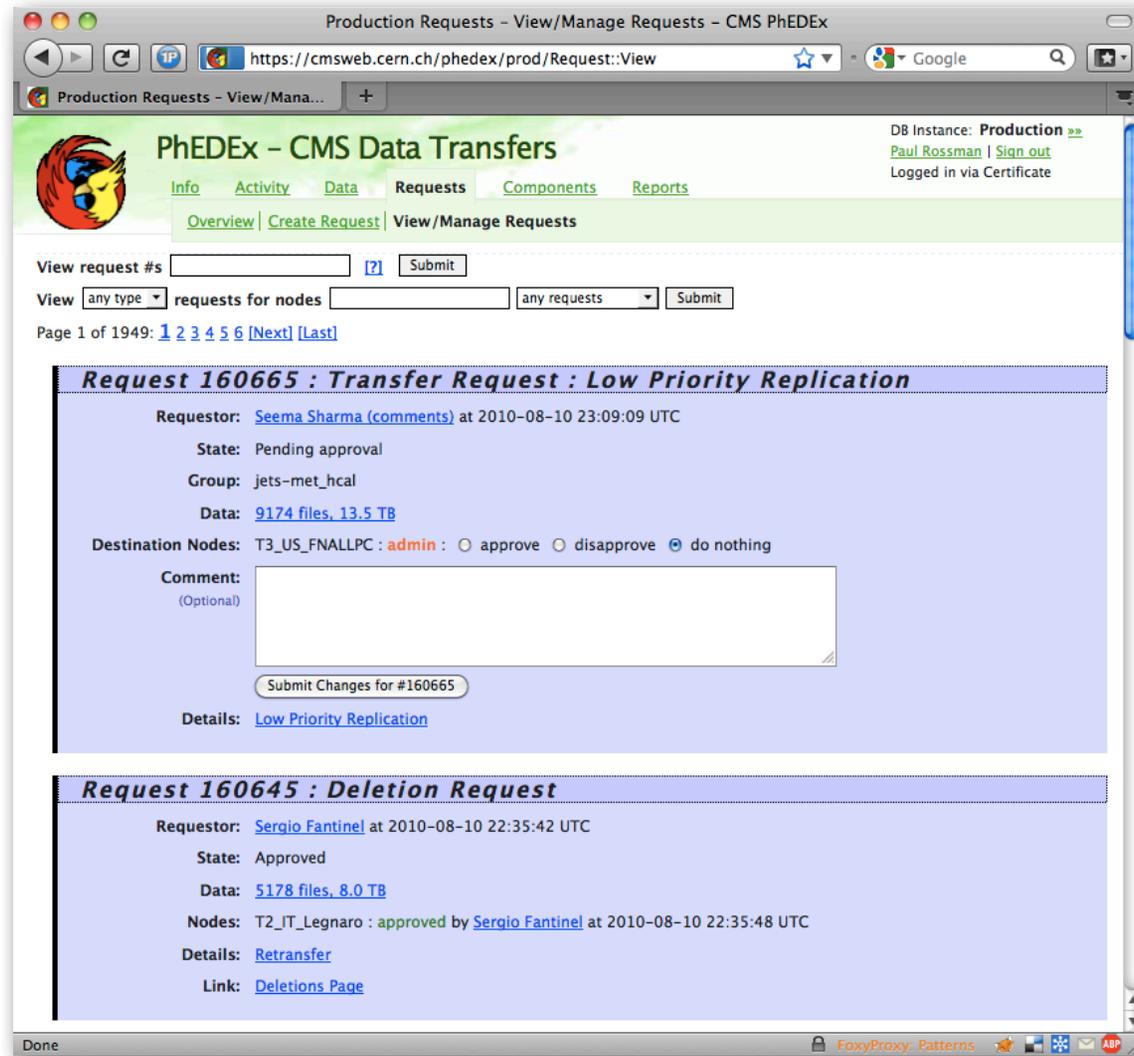
FoxyProxy, Patterns

Find your request



- ➔ <https://cmsweb.cern.ch/phedex/prod/Request::View>
- ➔ You'll find additional notes from approvers here

monitor transfer



The screenshot shows the PhEDEx - CMS Data Transfers web interface. The browser address bar displays <https://cmsweb.cern.ch/phedex/prod/Request::View>. The page title is "PhEDEx - CMS Data Transfers". The user is logged in via Certificate. The interface includes navigation tabs for Info, Activity, Data, Requests, Components, and Reports. The "Requests" tab is active, showing a list of requests. The first request is "Request 160665 : Transfer Request : Low Priority Replication". The details for this request are as follows:

- Requestor:** Seema Sharma (comments) at 2010-08-10 23:09:09 UTC
- State:** Pending approval
- Group:** jets-met_hcal
- Data:** 9174 files, 13.5 TB
- Destination Nodes:** T3_US_FNALLPC : admin : approve disapprove do nothing
- Comment:** (Optional)
- Submit Changes for #160665** (button)
- Details:** [Low Priority Replication](#)

The second request is "Request 160645 : Deletion Request". The details for this request are as follows:

- Requestor:** Sergio Fantinel at 2010-08-10 22:35:42 UTC
- State:** Approved
- Data:** 5178 files, 8.0 TB
- Nodes:** T2_IT_Legnaro : approved by Sergio Fantinel at 2010-08-10 22:35:48 UTC
- Details:** [Retransfer](#)
- Link:** [Deletions Page](#)

Monitoring your transfer



- ➔ Web-based
 - <https://cmsweb.cern.ch/phedex/>

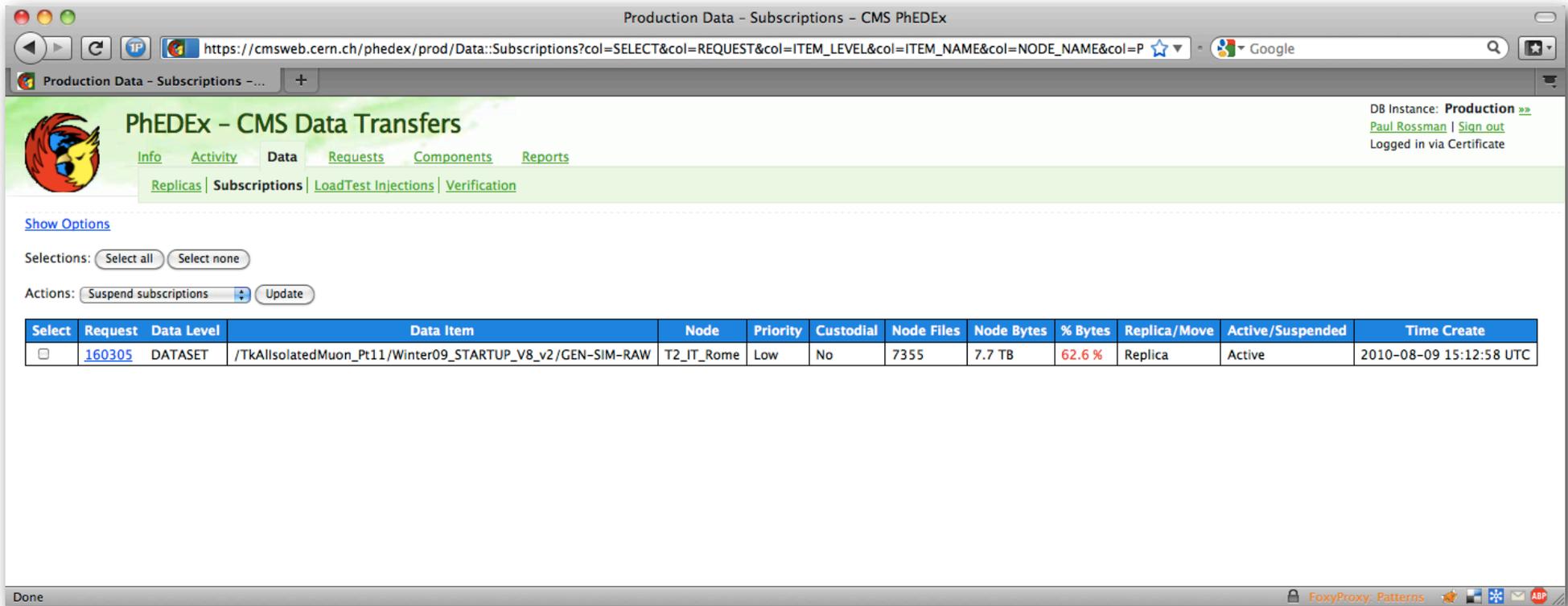
monitor transfer

Monitoring your transfer



➔ <https://cmsweb.cern.ch/phedex/prod/Data::Subscriptions>

monitor transfer



Production Data - Subscriptions - CMS PhEDEx

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PhEDEx - CMS Data Transfers

Info Activity **Data** Requests Components Reports

Replicas | **Subscriptions** | LoadTest Injections | Verification

Show Options

Selections:

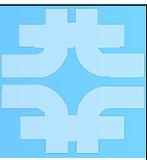
Actions:

Select	Request	Data Level	Data Item	Node	Priority	Custodial	Node Files	Node Bytes	% Bytes	Replica/Move	Active/Suspended	Time Create
<input type="checkbox"/>	160305	DATASET	/TkAllisolatedMuon_Pt11/Winter09_STARTUP_V8_v2/GEN-SIM-RAW	T2_IT_Rome	Low	No	7355	7.7 TB	62.6 %	Replica	Active	2010-08-09 15:12:58 UTC

Done

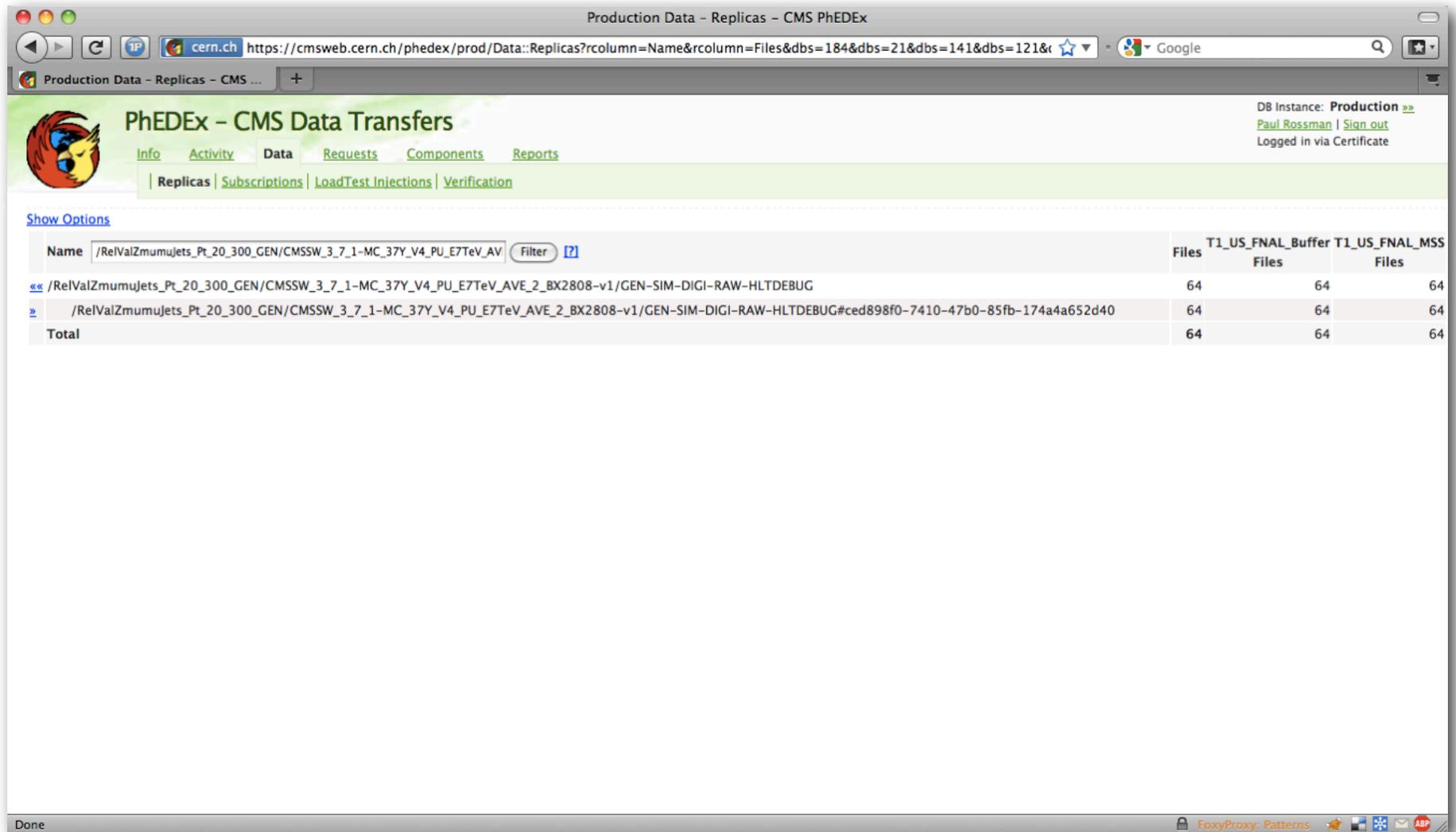
FoxyProxy: Patterns

Monitoring your transfer



- ➔ You can also find info on the replicas page
- ➔ <https://cmsweb.cern.ch/phedex/prod/Data::Replicas>

monitor transfer



Production Data - Replicas - CMS PhEDEx

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PhEDEx - CMS Data Transfers

Info Activity Data Requests Components Reports

Replicas | Subscriptions | LoadTest Injections | Verification

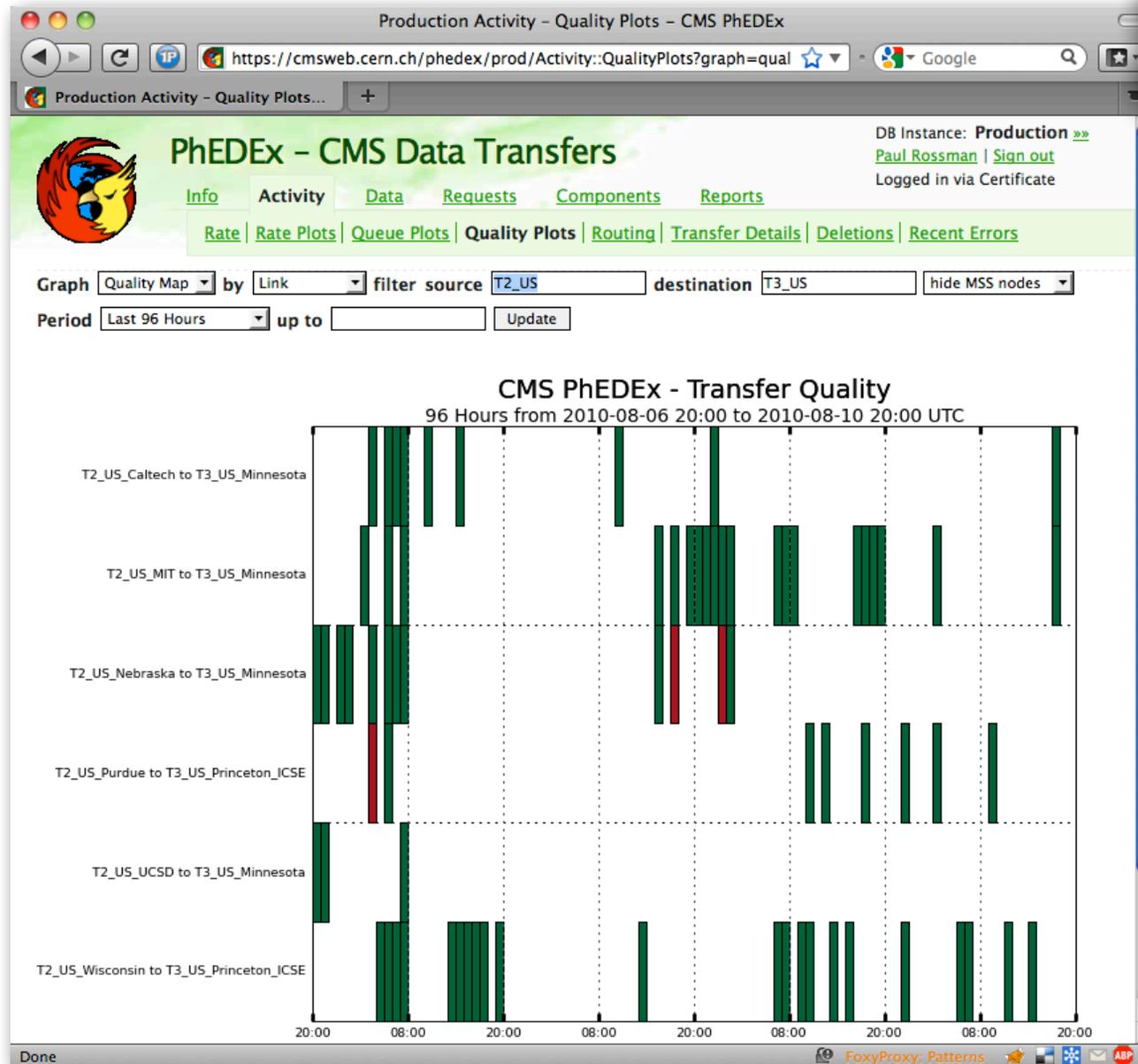
Show Options

Name	Files	T1_US_FNAL_Buffer Files	T1_US_FNAL_MSS Files
/RelValZmumujets_Pt_20_300_GEN/CMSSW_3_7_1-MC_37Y_V4_PU_E7TeV_AV <input type="text" value="Filter"/>			
/RelValZmumujets_Pt_20_300_GEN/CMSSW_3_7_1-MC_37Y_V4_PU_E7TeV_AVE_2_BX2808-v1/GEN-SIM-DIGI-RAW-HLTDEBUG	64	64	64
/RelValZmumujets_Pt_20_300_GEN/CMSSW_3_7_1-MC_37Y_V4_PU_E7TeV_AVE_2_BX2808-v1/GEN-SIM-DIGI-RAW-HLTDEBUG#ced898f0-7410-47b0-85fb-174a4a652d40	64	64	64
Total	64	64	64

Done

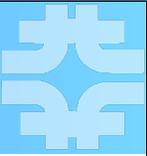
FoxyProxy: Patterns

Overall transfer quality



monitor transfer

Watching your rate



Production Activity - Rate - CMS PhEDEx

https://cmsweb.cern.ch/phedex/prod/Activity::Rate?span=h&errors=

PhEDEx - CMS Data Transfers

DB Instance: **Production** »
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Info Activity **Data** Requests Components Reports

[Rate](#) | [Rate Plots](#) | [Queue Plots](#) | [Quality Plots](#) | [Routing](#) | [Transfer Details](#) | [Deletions](#) | [Recent Errors](#)

Time span: Last hour Include links with nothing but errors

Last hour									
To	From	Files	Total Size	Rate	Errors	Expired	Avg. Est. Rate	Avg. Est. Latency	
T3_US	or								
T3_US_Minnesota	T2_US_MIT	1	7.5 MB	2.1 kB/s	-	-	1.1 MB/s	0h00	
T3_US_OSU	T1_US_FNAL_Buffer	-	-	-/s	27	12	-/s	7d0h00	
Total		1	7.5 MB	2.1 kB/s	27	12	-/s	0h00	

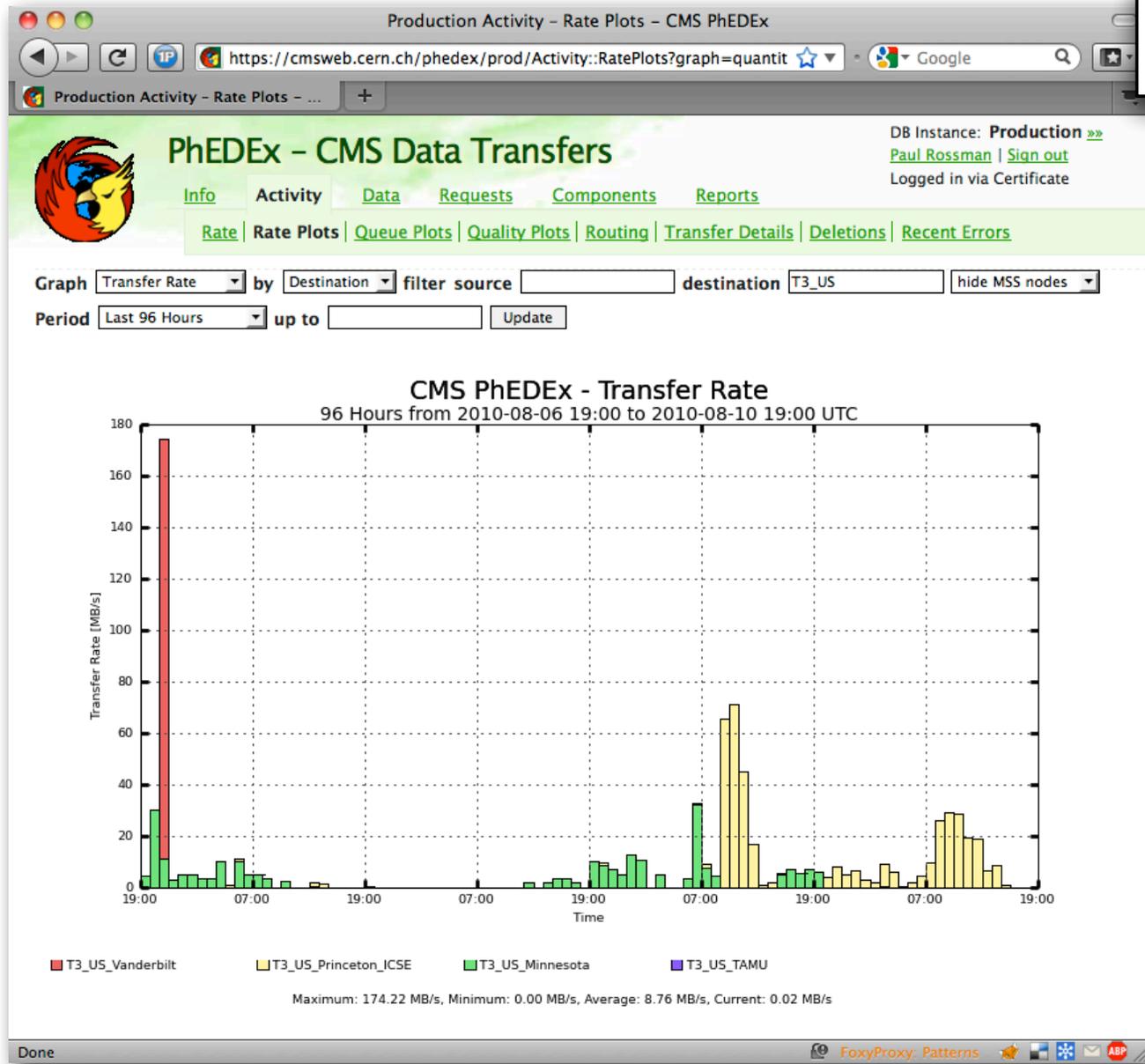
Done FoxyProxy: Patterns

monitor transfer

Watching your rate



monitor transfer

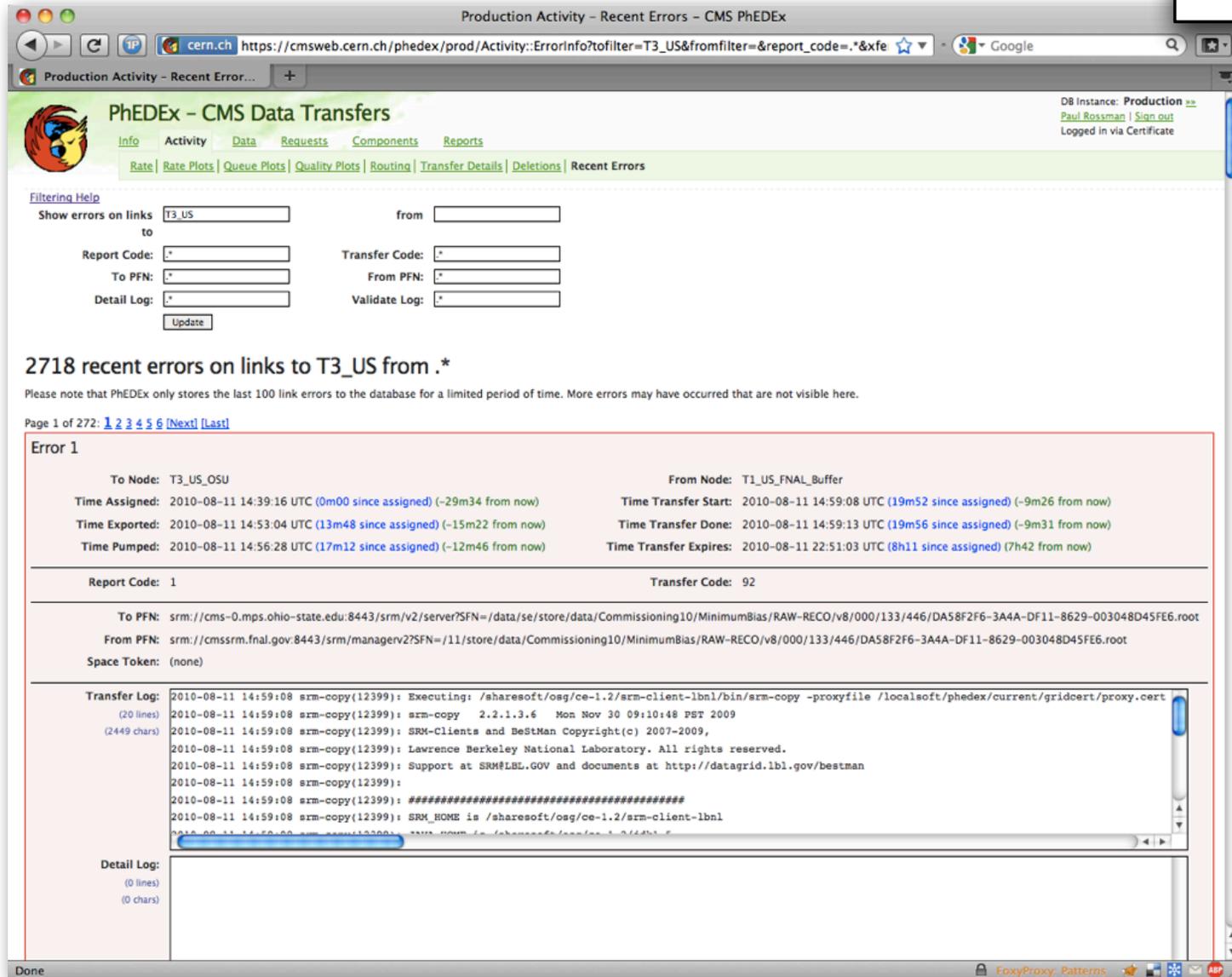


Debugging your transfer



➔ <https://cmsweb.cern.ch/phedex/prod/Activity::ErrorInfo>

debug using
PhEDEx tools



Production Activity - Recent Errors - CMS PhEDEx

PhEDEx - CMS Data Transfers

DB Instance: Production
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Info Activity Data Requests Components Reports

Rate Rate Plots Queue Plots Quality Plots Routing Transfer Details Deletions Recent Errors

Filtering Help

Show errors on links from

to

Report Code: Transfer Code:

To PFN: From PFN:

Detail Log: Validate Log:

2718 recent errors on links to T3_US from .*

Please note that PhEDEx only stores the last 100 link errors to the database for a limited period of time. More errors may have occurred that are not visible here.

Page 1 of 272: [1](#) [2](#) [3](#) [4](#) [5](#) [6](#) [Next](#) [Last](#)

Error 1

To Node: T3_US_OSU	From Node: T1_US_FNAL_Buffer
Time Assigned: 2010-08-11 14:39:16 UTC (0m00 since assigned) (-29m34 from now)	Time Transfer Start: 2010-08-11 14:59:08 UTC (19m52 since assigned) (-9m26 from now)
Time Exported: 2010-08-11 14:53:04 UTC (13m48 since assigned) (-15m22 from now)	Time Transfer Done: 2010-08-11 14:59:13 UTC (19m56 since assigned) (-9m31 from now)
Time Pumped: 2010-08-11 14:56:28 UTC (17m12 since assigned) (-12m46 from now)	Time Transfer Expires: 2010-08-11 22:51:03 UTC (8h11 since assigned) (7h42 from now)

Report Code: 1 **Transfer Code:** 92

To PFN: srm://cms-0.mps.ohio-state.edu:8443/srm/v2/server?SFN=/data/se/store/data/Commissioning10/MinimumBias/RAW-RECO/v8/000/133/446/DA58F2F6-3A4A-DF11-8629-003048D45FE6.root

From PFN: srm://cmssrm.fnal.gov:8443/srm/managerv2?SFN=/11/store/data/Commissioning10/MinimumBias/RAW-RECO/v8/000/133/446/DA58F2F6-3A4A-DF11-8629-003048D45FE6.root

Space Token: (none)

Transfer Log: (20 lines) (2449 chars)

```

2010-08-11 14:59:08 srm-copy(12399): Executing: /sharesoft/osg/ce-1.2/srm-client-lbnl/bin/srm-copy -proxyfile /localsoft/phedex/current/gridoert/proxy.cert
2010-08-11 14:59:08 srm-copy(12399): srm-copy 2.2.1.3.6 Mon Nov 30 09:10:48 PST 2009
2010-08-11 14:59:08 srm-copy(12399): SRM-Clients and BeStMan Copyright(c) 2007-2009,
2010-08-11 14:59:08 srm-copy(12399): Lawrence Berkeley National Laboratory. All rights reserved.
2010-08-11 14:59:08 srm-copy(12399): Support at SRM@LBL.GOV and documents at http://datagrid.lbl.gov/bestman
2010-08-11 14:59:08 srm-copy(12399):
2010-08-11 14:59:08 srm-copy(12399): #####
2010-08-11 14:59:08 srm-copy(12399): SRM_HOME is /sharesoft/osg/ce-1.2/srm-client-lbnl
2010-08-11 14:59:08 srm-copy(12399): SRM_HOME is /sharesoft/osg/ce-1.2/srm-client-lbnl

```

Detail Log: (0 lines) (0 chars)

➔ Data Service

monitor transfer

- <http://cmsweb.cern.ch/phedex/datasvc/doc>
- Programmatically query PhEDEx and retrieve data in xml, json or perl formats

➔ Shell Example

monitor transfer

```
curl http://cmsweb.cern.ch/phedex/datasvc/xml/prod/transferqueuefiles
    ?from=T1_US_FNAL_Buffer&to=T1_US_FNAL_MSS&priority=high&state=transferring
```

format
instance
api call

↑
options

➔ Perl Example

```
#!/usr/bin/perl -w

use XML::Simple;
use LWP::Simple;
use Data::Dumper;

$xml = new XML::Simple;

$data = $xml->XMLin( get("http://cmsweb.cern.ch/phedex/datasvc/xml/prod/transferqueuefiles
    to=T1_US_FNAL_Buffer&priority=normal&state=transferring"), forcearray => ["block"] );

print Dumper($data);
```

- ➔ PhEDEx documentation and other documents can be found at
 - <https://twiki.cern.ch/twiki/bin/view/CMS/PhEDEx>
- ➔ Questions regarding PhEDEx can be posted to one of these HyperNews forums
 - hn-cms-phedex@cern.ch
 - hn-cms-osg-tier3@cern.ch
- ➔ Other transfer or site related questions can be posted to these
 - hn-cms-dataops@cern.ch
 - hn-cms-facilitiesOps@cern.ch
- ➔ Transfer problems should be posted to Savannah
 - <https://savannah.cern.ch/projects/cmscompinfrasup/>
- ➔ Bug reports and feature requests should be posted to Savannah
 - <https://savannah.cern.ch/projects/phedex/>
- ➔ Please make sure you have both a HyperNews and Savannah account before posting (please don't post anonymously to Savannah)

➔ Very good how-to links

- <http://hep-t3.physics.umd.edu/HowToForAdmins.html>
- http://hep.phys.utk.edu/wiki/PhEDEx_Installation

➔ Example configurations

- http://cmssw.cvs.cern.ch/cgi-bin/cmssw.cgi/COMP/SITECONF/T3_US_UMD/PhEDEx/

➔ <https://cmsweb.cern.ch/phedex/datasvc/doc>

➔ <https://cmsweb.cern.ch/overview/session>

➔ There are many others, apologies for the omission!

Questions?

