

ZEUS Grid Development



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GridPP Collaboration
Meeting

14/09/2004

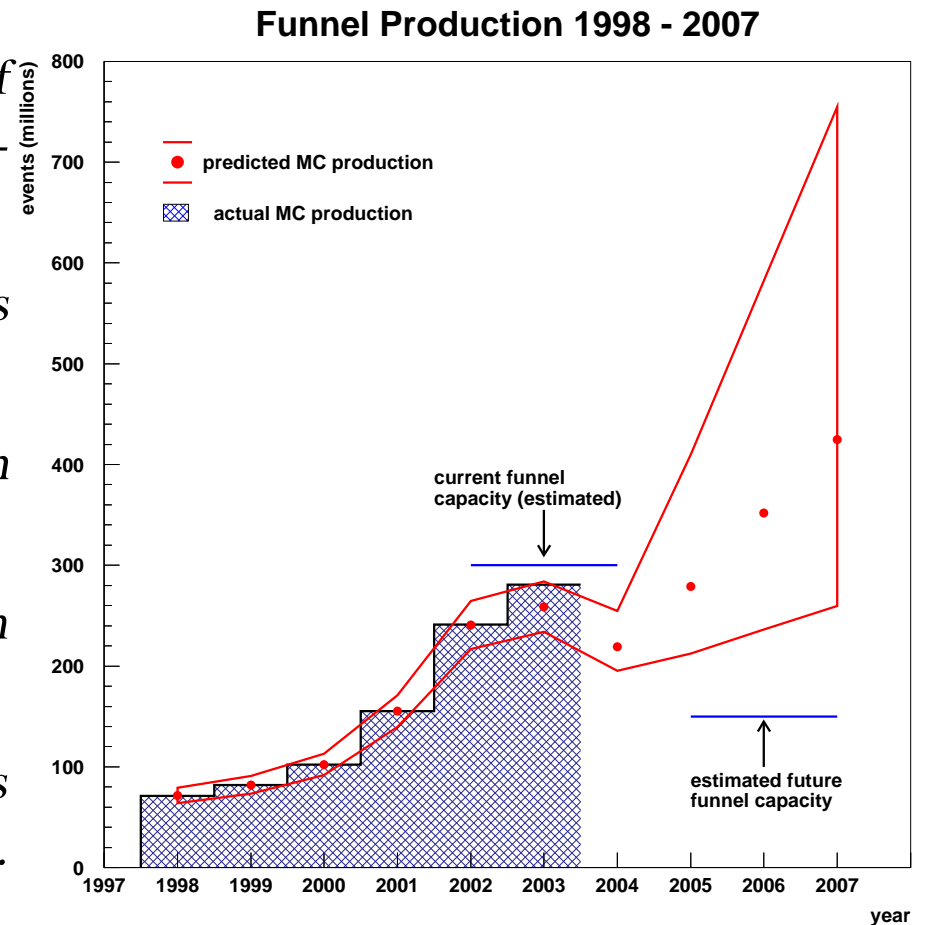


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why does ZEUS need the Grid?

- A major requirement for physics analysis is Monte Carlo statistics.
- ZEUS presently has a maximum capacity of around 350 Million MC events per year (pre-upgrade MC).
- In previous HERA I running full capacity was sufficient to deal with demand.
- Post HERA Luminosity upgrade conditions mean that a far greater rate of production is needed.
- In 2003 For the first time, the production system began to become saturated.
- 4-9/04 there were always more than 2 weeks worth of events to process waiting in the queues.
- Grid resources could be used to augment the existing production system.



People + Facilities available within ZEUS

Involved: F.Brasolin, M.Ernst (DESY-IT) J.Ferrando, R.Mankel, H.Stadie, K.Wrona.

Formerly Involved: L. Cinti , S.Padhi.

- *Grid facilities being used by ZEUS:*
 - *DESY-run Core Grid Facilities:*
DCache enabled SE, 60 cpus.
 - *RAL LCG-2 cluster.*
- *Institutions involved in ZEUS which have Grid facilities:*
 - *GridPP members: Bristol, Glasgow, IC, Oxford, UCL.*
 - *Others including: INFN (Bologna, Padua), Bonn, Hamburg ,Krakow, Moscow, Tel-Aviv.*



The ZEUS Monte Carlo Production System

ZEUS has been using its own distributed computing system since 1996.

Jobs are automatically assigned to a remote site when one becomes available

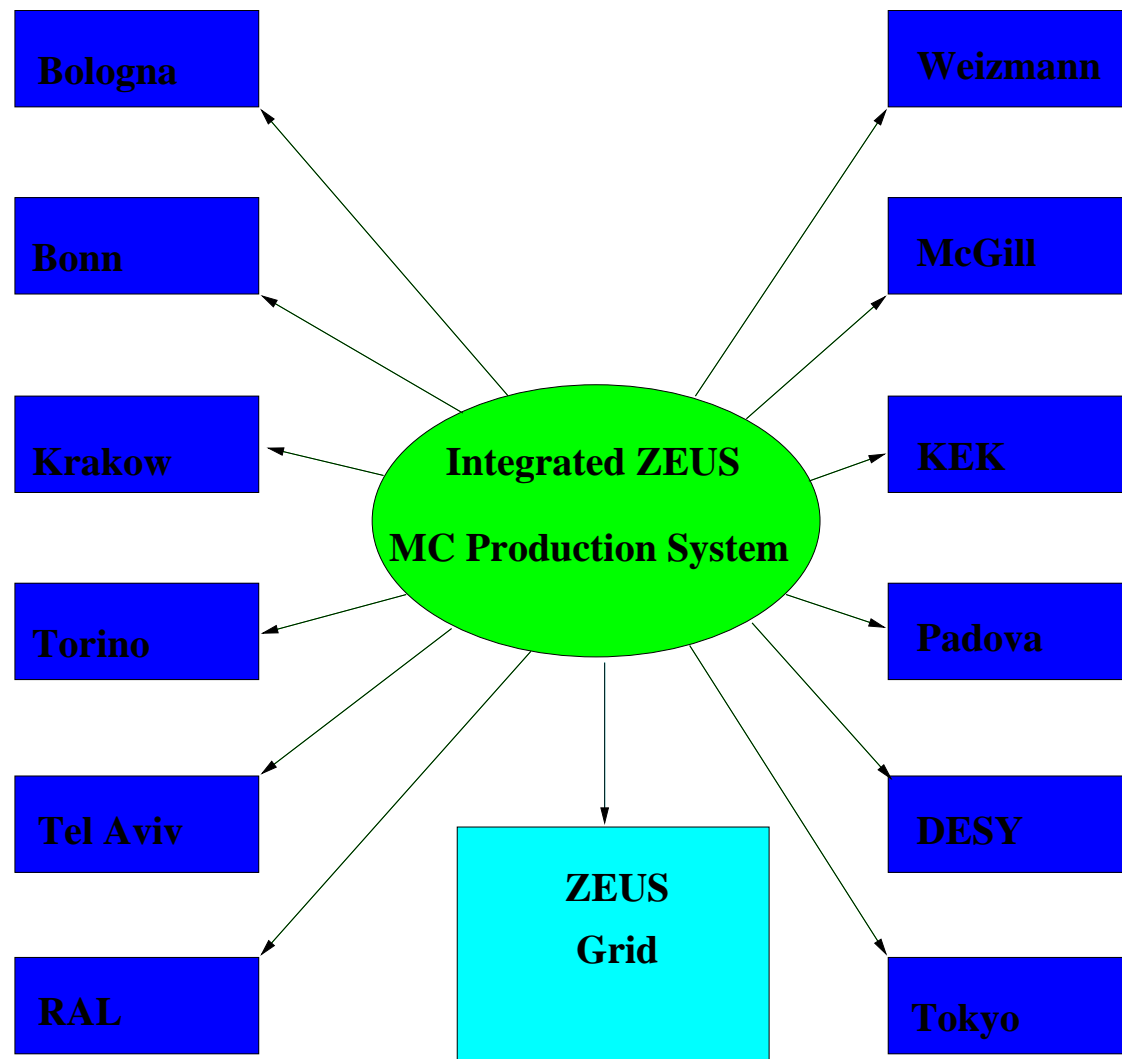
Jobs + infrastructure run at sites using Solaris, Digital Unix, various GNU/Linux distributions (SuSE 6.3-9.0, RedHat 6.2-9, Fedora Core 1-2, Debian Woody-Sarge).

- *Generator output is processed in three stages:*
 - **MOZART:** *Detector Simulation. (5.3s /event → 19.2s /event - 1GHz pentium III), run in parallel on several nodes.*
 - **ZGANA:** *Trigger simulation. (0.3s /event), runs on a single server using the piped output from the MOZART nodes.*
 - **ZEPHYR:** *Reconstruction. (0.8s /event → 5.3s /event), runs on the same server using the piped output from ZGANA.*
- *Output + logs are retrieved to central machines at DESY and copied via DCache to tape.*
- *Central database is updated with production details.*



Solution - ZEUS Integrated Monte Carlo Production

Funnel as a gateway to grid via a DESY UI:



- *Set up a metadata catalogue with required files, data etc.*
- *Run applications in series.*
- *Copy output from grid back to central DESY funnel servers in the usual way.*
- *Advantages:*
 - *No disturbance to running system.*
 - *Users do not explicitly have to choose to run on Grid.*
 - *Existing middleware for book-keeping etc. easily reused.*
 - *Speed of migration to grid is maximised.*

Requirements for ZEUS MC-grid integration

To set up our ZEUS Monte Carlo Grid , we required:

- *A ZEUS VO definition available to remote sites.*
- *A running standalone version of the MC code suite.*
- *Tuning + alteration of the software to optimise Grid production rate.*

ZEUS and other DESY VO's

- *DESY runs an LDAP service to maintain VOs for DESY experiments.*
- *VO is listed by LCG registrar.*
- *VO is not yet supported in LCG default install:*
 - *Support via script or default installation expected in next LCG release.*
 - *Instructions: <http://grid.desy.de/testbed2/DESY-VO.html>*
- *VO is now recognised at DESY, **RAL**, Dortmund, Krakow, Karlsruhe, **Scotgrid (Glasgow)** many INFN sites (including Ferrara,Bari,Catania, Bologna, Padua)*
- *Oxford are preparing to enable the VO.*

MC Package for Grid - basics.

- *Normally funnel software is pre-installed at a site exported to all nodes via NFS.*
- *Division of software (Linux):*
 - *400 MB : calibration constants, geometries etc. ,updated every few months*
 - *700 MB : binaries. New binaries are added from time to time.*
 - *100 MB : other tools. rarely changed.*
- *Typical input files (gzipped) are of size 20-40 MB*
- *Output is broken into 200 MB chunks, can total over 1 GB for a typical job.*
- *A tarball of all this was run on Grid succesfully for an input file.*
- *But only 3 binaries (40 MB) are required per job.*
- *Required binaries can be identified before submission.*

MC Package for Grid - Production Version.

- *Size of input sent to grid sites is minimised:*
- *A metadata catalogue of registered files are used:*
- *Registered files:*
 - *All different mozart,zgana,zephyr binaries (up to 20 MB each).*
 - *115MB gaf.tgz (calibration constants etc.)*
 - *14 MB funnel.tgz : other tools.*
- *Registered catalogue is easy to upgrade.*
- *Only input file and script are sent to grid site.*
- *at run time nearest replica of gaf.tgz, funnel.tgz and necessary binaries are copied.*
- *169000 events processed so far of which 14000 at RAL.*
- *Events are being used for physics analysis.*

Current status of FUNNEL - Mozilla Firefox

File Edit View Go Bookmarks Tab Tools Help

http://giroz.desy.de/components/funnel/cgi-bin/current.cgi

MVD and GTT DDL ZEUS MC Prod Using ti HERA ZEUS LogBook ZEUS - DQM JF ZEUS Web Page ziew Hera - Logbuch Aston Villa News

ZEUS FORUMS: Welc... https://ww..._show.php Current status of... Funnel Production we... Current status of FU... Funnel Production Su... file:///hom...period.htm

Owner	Group	Job name	N event	Stat	Site	Comment
chekanov	hphp	8jp020.h7728.rap00neut15a45	20000	wait	gridsite	
chekanov	hphp	8jp020.h7728.rap00neut15a46	20000	wait	gridsite	
chekanov	hphp	8jp020.h7728.rap00neut15a47	20000	wait	gridsite	
chekanov	hphp	8jp020.h7728.rap00neut16a44	20000	wait	gridsite	

Owner	Group	Job name	Nreq	Stat	Site	Stream	Ndone	db-date	time-ok
funnel	det	82p803.t1353.mcm.1.run03.gridtest	1000	ok	gridsite	A	1000	040818	1092824924
funnel	det	82p819.t1353.mcm.1.run02.gridtest	1000	ok	gridsite	A	1000	040818	1092850457
funnel	det	82p819.t1353.mcm.1.run04.gridtest	1000	ok	gridsite	A	1000	040818	1092850446
funnel	det	82p819.t1353.mcm.1.run05.gridtest	1000	ok	gridsite	A	1000	040818	1092850436
funnel	det	82p819.t1353.mcm.1.run06.gridtest	1000	ok	gridsite	A	1000	040818	1092850426
funnel	det	82p819.t1353.mcm.1.run08.gridtest	1000	ok	gridsite	A	1000	040818	1092850416
funnel	det	82p819.t1353.mcm.1.run12.gridtest	1000	ok	gridsite	A	1000	040818	1092850406
funnel	det	82p819.t1353.mcm.1.run13.gridtest	2000	ok	gridsite	A	2000	040818	1092850396
funnel	det	82p819.t1353.mcm.1.run14.gridtest	1000	ok	gridsite	A	1000	040818	1092850386
funnel	det	82p819.t1353.mcm.1.run15.gridtest	772	ok	gridsite	A	772	040818	1092850376
funnel	det	82r819.t1353.mcm.1.run11.gridtest	5000	ok	gridsite	A	5000	040818	1092850477
funnel	det	82r819.t1353.mcm.1.run07.gridtest	1000	ok	gridsite	A	1000	040819	1092850507
funnel	det	82r819.t1353.mcm.1.run09.gridtest	1000	ok	gridsite	A	1000	040819	1092850497
funnel	det	82r819.t1353.mcm.1.run10.gridtest	5000	ok	gridsite	A	5000	040819	1092850486
funnel	det	82r819.t1353.mcm.1.run16.gridtest	10000	ok	gridsite	A	10000	040819	1092850467
ferrando	exo	82p020.e8718.qq100.ari.nc97t2	20000	ok	gridsite	A	20000	040830	1093872754
ferrando	exo	82p020.e8718.qq100.ari.nc99t2	20000	ok	gridsite	A	20000	040830	1093892947
ferrando	exo	82p020.e8718.qq100.ari.nc96t2	20000	ok	gridsite	A	20000	040830	1093893933
ferrando	exo	82p020.e8718.qq100.ari.nc98t2	20000	ok	gridsite	A	20000	040830	1093893943

Search again:

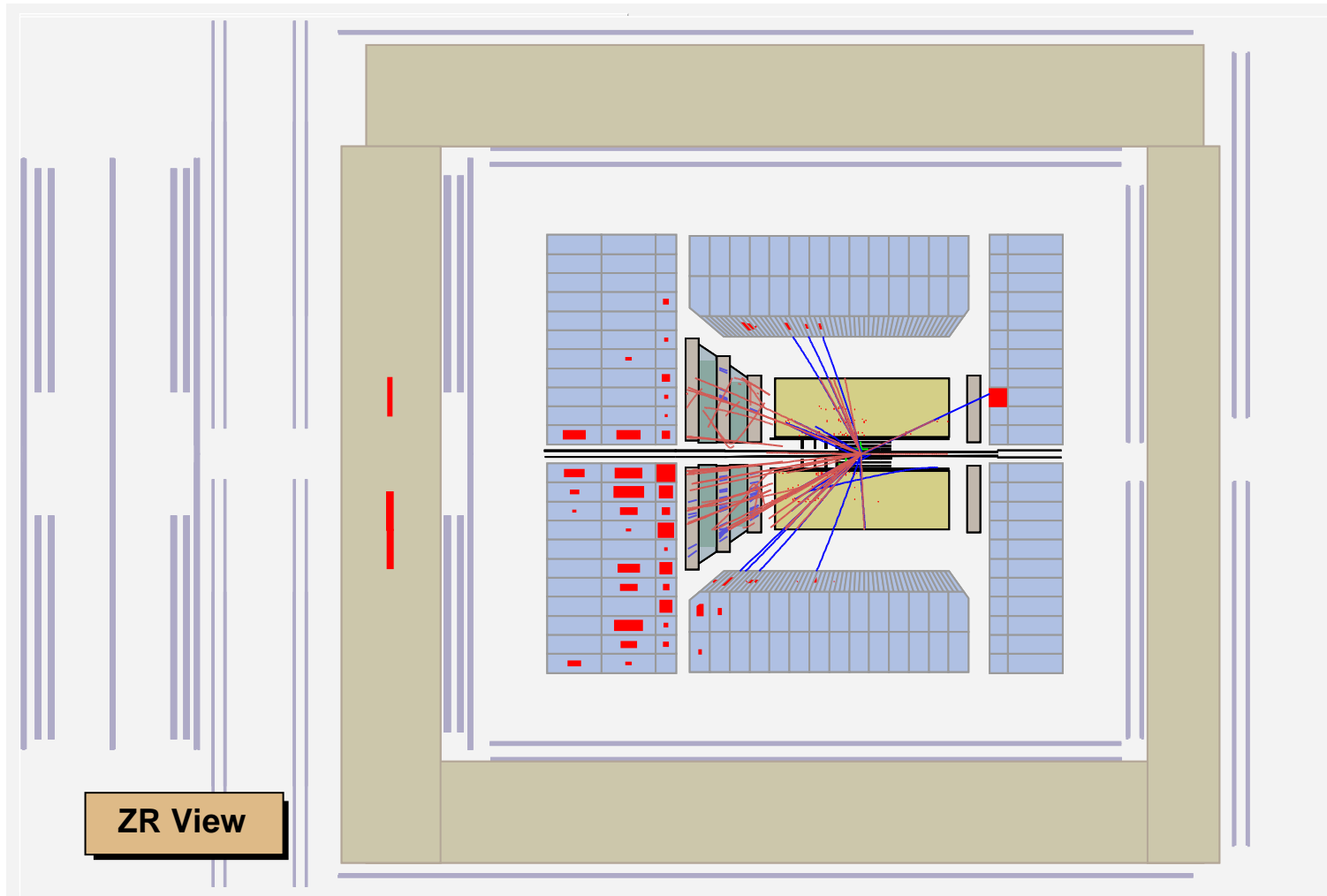
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ZEUS MC Package for Grid: Data Quality

- *A set of 16 funnel jobs (34000 events) is normally used to test data quality.*
- *This set of jobs is tested with each new version of the software / each new architecture.*
- *Job tests various detector components down to the hit level*
- *In addition some important physics distributions are tested.*
- *These jobs were the first ZEUS jobs submitted to the DESY grid.*
- *A version of MC running on Grid was compared to the same version on a normal linux site.*
- *The output from grid processing passed this DQM process.*
- *Quality of processing can be seen in event displays.*

Funnel Package for Grid: Event Picture



How a job is processed via the Grid - Snapshot

- *User submits generator output to funnel in the normal way.*
- *Gridsite is chosen if:*
 - *The Monte Carlo version is able to run on Grid.*
 - *There are less than a certain number of jobs waiting.*
- *A waiting daemon can submit the jobs to grid*
- *Output is received in a specific output directory.*
- *Output + logging are copied to particular places*
- *Automated system takes care of bookkeeping + transfer to tape.*

User accesses Grid resources transparently

Manual intervention is still needed to keep grid-proxy valid + copy output correctly.

It is possible to write output directly to tape via DCache SE.

Summary and Outlook

- **ZEUS needs the Grid to respond to increasing demand for MC production.**
- **The ZEUS MC software has been adapted and shown to work in the grid.**
- **A ZEUS VO has been created and is served from DESY.**
- **The Grid component has been integrated with the existing production system.**
- **A catalogue of registered files has been used to minimise input sandbox size.**
- **169000 events have been funneled on Grid already (0.5%) of funnel production since 16/08/2004.**
- **Quality of grid output has been tested and found to be good.**
- **Key steps to increase production and finalise the system:**
 - **Full automisation of the grid submission/retrieval procedure.**
 - **Increase in number of sites.**