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## **New grid production system**

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**Jan Engels**

LCWS 2010  
Beijing, 27th March 2010

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## Mass production for the ILD LOI (2009)

- ~50 million events simulated and reconstructed

- More than 1/2 million grid jobs recorded in central database

- Production system initially designed for small scale productions

  - Patched and extended by several authors

- Shortcomings revealed during the last mass production

## Develop a new system:

- improve performance

- better checking constraints

- easier to use (non-expert)

- more flexible

## Required features:

- job submission

- job monitoring

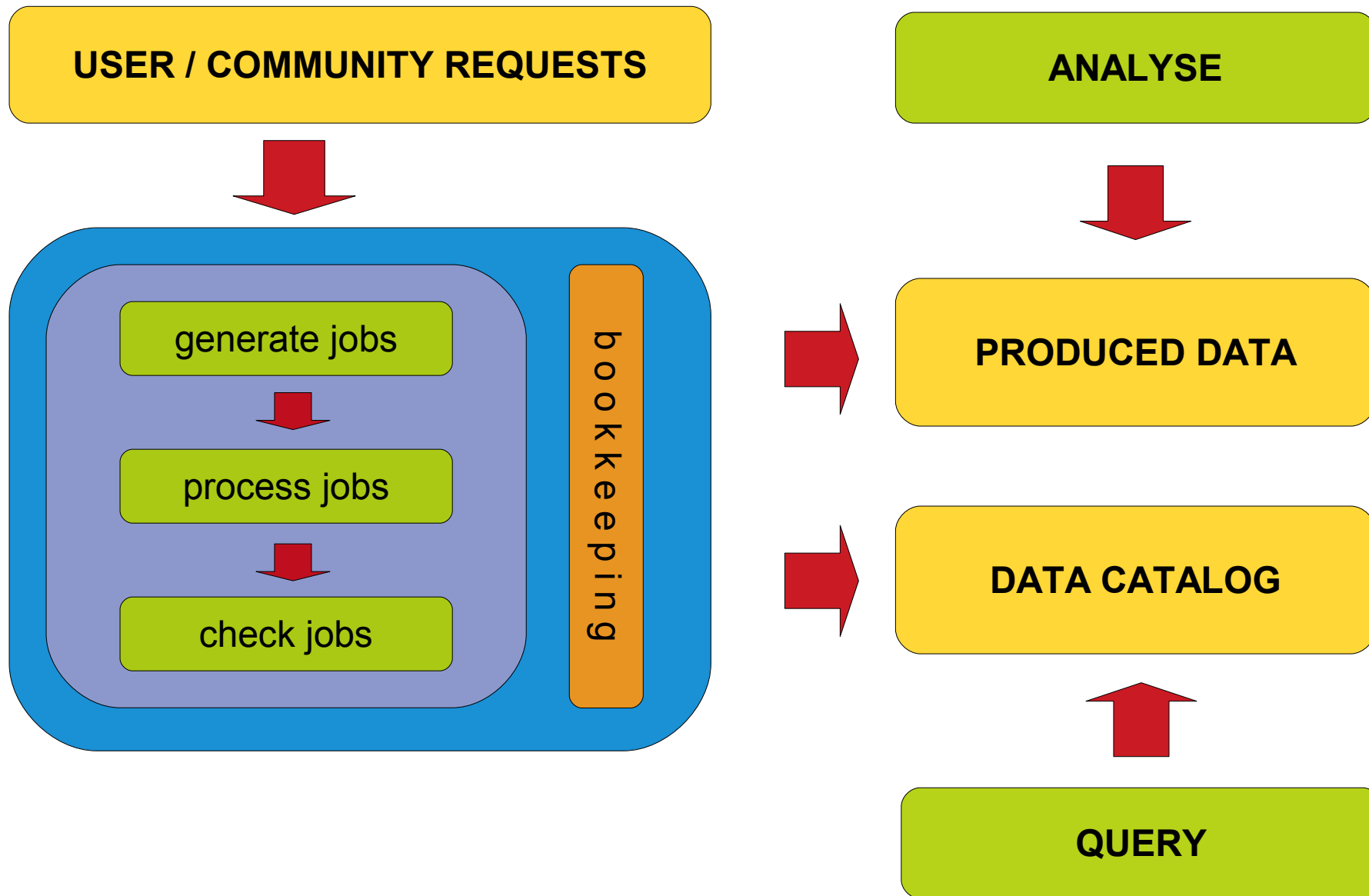
- fault tolerant

- DB used also for data catalogue

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# System overview





## DATA

- Data catalog
- Careful design of the data model
- Data integrity
- Performance

## JOBS

- Run 24h/day – 7days/week
- Minimum interruptions
- Data integrity
- Performance



## Reliability

Errors are sadly inevitable

Error detection

Error handling

## Effective logging

Choosing what and how to log is not trivial

Too noisy vs. too silent

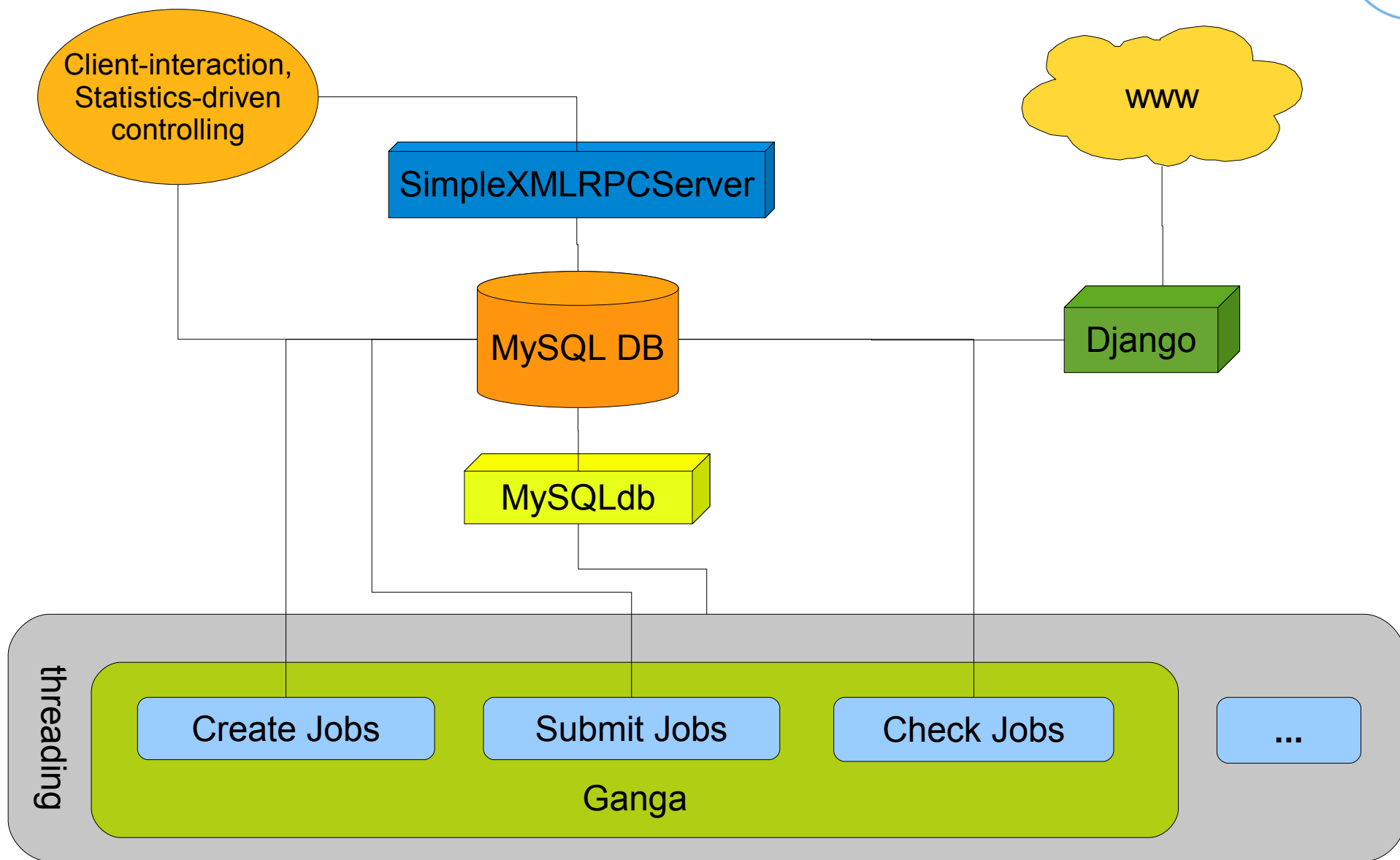
Logging libraries available for most programming languages

## Modular → Extendable

## Flexible

## Multi-threading/processing

# ILD MC Production system



# ILD MC Grid Production System

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Implemented in python (2.4)



MySQL (5.1) for the Data Catalog



Ganga used for (Grid) job submission



Platform independent interface (XMLRPC)

Designed from scratch for multi-core environments

Reliability (DB transactions: rollback in case of error)

Use of the standard python logging library

# Data Catalog – Generated Events



File Edit View History Bookmarks Tools Help

http://127.0.0.1:8000/admin/public/generatedevent/?ot=asc&o=0

Most Visited M OE X PT CS M W ilcsoft grid programming linux util R T os ganga

Select generated event to c...

**ILD Monte-Carlo Database** Welcome, engels. Documentation / Change password / Log out

Home > Generated events

Select generated event to change

Go

Gen id	Process	Generator	Energy	Luminosity	Cross section	Pol ep	Pol em	Producer	Cut	Root name	Total events
1	n1n1a	Whizard	500.000	255.7	34381.7000000	1.0	-1.0	Slac_SM		w11739	8790678
2	n1n1a	Whizard	500.000	1000.0	632.1560000	-1.0	1.0	Slac_SM		w11740	632157
3	n2n2a	Whizard	500.000	1000.0	989.4840000	1.0	-1.0	Slac_SM		w11743	989485
4	n2n2a	Whizard	500.000	1000.0	630.1760000	-1.0	1.0	Slac_SM		w11744	630177
5	n3n3a	Whizard	500.000	1000.0	987.5470000	1.0	-1.0	Slac_SM		w11747	987548
6	n3n3a	Whizard	500.000	1000.0	631.5610000	-1.0	1.0	Slac_SM		w11748	631562
7	n1n1aa	Whizard	500.000	1000.0	3010.3300000	1.0	-1.0	Slac_SM		w11751	3010334
8	n1n1aa	Whizard	500.000	1000.0	98.2396000	-1.0	1.0	Slac_SM		w11752	98241
9	n2n2aa	Whizard	500.000	1000.0	153.1940000	1.0	-1.0	Slac_SM		w11755	153195
10	n2n2aa	Whizard	500.000	1000.0	97.9220000	-1.0	1.0	Slac_SM		w11756	97923
11	n3n3aa	Whizard	500.000	1000.0	152.7940000	1.0	-1.0	Slac_SM		w11759	152795
12	n3n3aa	Whizard	500.000	1000.0	97.8742000	-1.0	1.0	Slac_SM		w11760	97875
13	n1n1aaa	Whizard	500.000	1000.0	170.7480000	1.0	-1.0	Slac_SM		w11763	170750
14	n1n1aaa	Whizard	500.000	1164.2	8.5905600	-1.0	1.0	Slac_SM		w11764	10001
15	n2n2aaa	Whizard	500.000	1000.0	13.4083000	1.0	-1.0	Slac_SM		w11767	13409
16	n2n2aaa	Whizard	500.000	1160.0	8.6212400	-1.0	1.0	Slac_SM		w11768	10001
17	n3n3aaa	Whizard	500.000	1000.1	13.4676000	1.0	-1.0	Slac_SM		w11771	13469
18	n3n3aaa	Whizard	500.000	1164.5	8.5878800	-1.0	1.0	Slac_SM		w11772	10001
19	uu	Whizard	500.000	245.6	3832.4600000	-1.0	1.0	Slac_SM		w11776	941159
20	uu	Whizard	500.000	135.1	6519.7900000	1.0	-1.0	Slac_SM		w11775	880720
21	cc	Whizard	500.000	231.0	3815.6000000	-1.0	1.0	Slac_SM		w11780	881471
22	cc	Whizard	500.000	127.1	6522.5200000	1.0	-1.0	Slac_SM		w11779	829150
23	e1e1	Whizard	500.000	1.0	17275000.0000000	1.0	1.0	Slac_SM		w11785	17385272
24	e1e1	Whizard	500.000	1.1	17469600.0000000	-1.0	1.0	Slac_SM		w11784	19217585
25	e1e1	Whizard	500.000	1.1	17525700.0000000	1.0	-1.0	Slac_SM		w11783	19217585
26	e1e1	Whizard	500.000	1.0	17265000.0000000	-1.0	-1.0	Slac_SM		w11782	17469564
27	e2e2	Whizard	500.000	1000.0	2041.7200000	-1.0	1.0	Slac_SM		w11788	2041718
28	e2e2	Whizard	500.000	1000.0	2645.3700000	1.0	-1.0	Slac_SM		w11787	2645372

Done

Add generated event +

Filter

**By generator**

- All
- Whizard
- whizard+tauola
- whizard-1.51
- whizard-1.51+tauola

**By pol ep**

- All
- 1.0
- 0.0
- 0.6
- 1.0

**By pol em**

- All
- 1.0
- 0.8
- 0.0
- 1.0

**By producer**

- All
- Desy\_point5
- Desy\_point5\_v2
- Desy\_SM
- Desy\_sps1ap
- Desy\_Xsps1ap\_X
- Slac\_SM
- Slac\_SM\_250\_fore
- Slac\_SM\_250\_ptsu
- Slac\_SM\_cosTheta
- Slac\_SM\_Egamma8G
- Slac\_SM\_forTaika

**By energy**

- All
- 250.0
- 500.0



# Data Catalog – Generated Events (Selection)



File Edit View History Bookmarks Tools Help

http://127.0.0.1:8000/admin/public/generatedevent/?producer=Slac\_SM&generator=Whizard&pol\_em=1.0&ene

Most Visited Gmail Firefox LibreOffice X PT CS M W ilcsoft grid programming linux util R T os ganga

Select generated event to c...

**ILD Monte-Carlo Database** Welcome, engels. Documentation / Change password / Log out

Home > Generated events

### Select generated event to change

Go 186 results (3980 total)

Gen id	Process	Generator	Energy	Luminosity	Cross section	Pol em	Pol em	Producer	Cut	Root name	Total events
23	e1e1	Whizard	500.000	1.0	17275000.0000000	1.0	1.0	Slac_SM		w11785	17385272
175	n1e1e1n1	Whizard	500.000	1000.0	158.9480000	1.0	1.0	Slac_SM		w11833	158949
188	n2e2e1n1	Whizard	500.000	1000.0	127.5770000	1.0	1.0	Slac_SM		w11853	127578
197	ude1n1	Whizard	500.000	1000.0	379.4840000	1.0	1.0	Slac_SM		w11893	379486
206	cse1n1	Whizard	500.000	1000.0	379.1080000	1.0	1.0	Slac_SM		w11913	379110
251	n2n2e1e1	Whizard	500.000	1000.0	31.9336000	1.0	1.0	Slac_SM		w11989	31935
261	n3n3e1e1	Whizard	500.000	1000.0	31.9917000	1.0	1.0	Slac_SM		w12009	31993
273	uue1e1	Whizard	500.000	1000.0	705.4350000	1.0	1.0	Slac_SM		w12029	705438
283	cce1e1	Whizard	500.000	1000.0	706.7160000	1.0	1.0	Slac_SM		w12049	706719
293	tte1e1	Whizard	500.000	506431.0	0.0197480	1.0	1.0	Slac_SM		w15637	10001
305	e1e1e1e1	Whizard	500.000	1000.0	1434.2800000	1.0	1.0	Slac_SM		w12069	1434285
309	e1e1e2e2	Whizard	500.000	1000.0	1557.9100000	1.0	1.0	Slac_SM		w12073	1557915
313	e1e1dd	Whizard	500.000	1000.0	124.3520000	1.0	1.0	Slac_SM		w12081	124353
317	e1e1ss	Whizard	500.000	1000.0	124.6560000	1.0	1.0	Slac_SM		w12085	124657
321	e1e1bb	Whizard	500.000	1000.0	134.7400000	1.0	1.0	Slac_SM		w17539	134741
1137	e1e1n1e1e1n1	Whizard	500.000	51189.5	0.1953720	1.0	1.0	Slac_SM		w12305	10001
1141	e1e1n1e1e2n2	Whizard	500.000	50587.0	0.1976990	1.0	1.0	Slac_SM		w12309	10001
1145	e1e1n1e1du	Whizard	500.000	17204.1	0.5813150	1.0	1.0	Slac_SM		w12317	10001
1149	e1e1n1e1sc	Whizard	500.000	17307.6	0.5778370	1.0	1.0	Slac_SM		w12321	10001
1153	e1e1n2e2e1n1	Whizard	500.000	48028.6	0.2082300	1.0	1.0	Slac_SM		w12325	10001
1157	e1e1n2e2e2n2	Whizard	500.000	48947.2	0.2043220	1.0	1.0	Slac_SM		w12329	10001
1161	e1e1n2e2du	Whizard	500.000	16821.5	0.5945370	1.0	1.0	Slac_SM		w12337	10001
1165	e1e1n2e2sc	Whizard	500.000	16816.5	0.5947120	1.0	1.0	Slac_SM		w12341	10001
1169	e1e1ude1n1	Whizard	500.000	16134.9	0.6198380	1.0	1.0	Slac_SM		w12365	10001
1173	e1e1ude2n2	Whizard	500.000	16755.7	0.5968700	1.0	1.0	Slac_SM		w12369	10001
1177	e1e1uddu	Whizard	500.000	6018.8	1.6616300	1.0	1.0	Slac_SM		w12377	10001
1181	e1e1udsc	Whizard	500.000	5886.6	1.6989400	1.0	1.0	Slac_SM		w12381	10001
1185	e1e1cse1n1	Whizard	500.000	16209.7	0.6169760	1.0	1.0	Slac_SM		w12385	10001

Done

**Filter**

**By generator**

- All
- Whizard
- whizard+tauola
- whizard-1.51
- whizard-1.51+tauola

**By pol ep**

- All
- 1.0
- 0.0
- 0.6
- 1.0

**By pol em**

- All
- 1.0
- 0.8
- 0.0
- 1.0

**By producer**

- All
- Desy\_point5
- Desy\_point5\_v2
- Desy\_SM
- Desy\_sps1ap
- Desy\_Xsps1ap\_X
- Slac\_SM
- Slac\_SM\_250\_fore
- Slac\_SM\_250\_ptsu
- Slac\_SM\_cosTheta
- Slac\_SM\_Egamma8G
- Slac\_SM\_forTaika

**By energy**

- All
- 250.0
- 500.0

# Data Catalog – Produced Files



File Edit View History Bookmarks Tools Help

http://127.0.0.1:8000/admin/public/file/

Most Visited | Select file to change | ILD M... | ILD Monte-Carlo Database | Welcome, engels. Documentation / Change password / Log out

Select file to change

Search:  Go

Id	Path	Filename	Filesize	Guid	Created
6023	generated/ilc-tests/rec/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-rsw-v01-07-0003-DST.slcio	None	None	March 22, 2010, 4:36 p.m.
6022	generated/ilc-tests/rec/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-rsw-v01-07-0003-REC.000.slcio	None	None	March 22, 2010, 4:36 p.m.
6021	generated/ilc-tests/logs/rec/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-rsw-v01-07-0003-REC.tar.gz	None	None	March 22, 2010, 4:36 p.m.
6020	generated/ilc-tests/rec/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-rsw-v01-07-0002-DST.slcio	None	None	March 22, 2010, 4:36 p.m.
6019	generated/ilc-tests/rec/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-rsw-v01-07-0002-REC.000.slcio	None	None	March 22, 2010, 4:36 p.m.
6018	generated/ilc-tests/logs/rec/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-rsw-v01-07-0002-REC.tar.gz	None	None	March 22, 2010, 4:36 p.m.
6017	generated/ilc-tests/rec/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-rsw-v01-07-0001-DST.slcio	None	None	March 22, 2010, 4:36 p.m.
6016	generated/ilc-tests/rec/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-rsw-v01-07-0001-REC.000.slcio	None	None	March 22, 2010, 4:36 p.m.
6015	generated/ilc-tests/logs/rec/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-rsw-v01-07-0001-REC.tar.gz	None	None	March 22, 2010, 4:36 p.m.
6014	generated/ilc-tests/sim/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-0007.slcio	None	None	March 22, 2010, 4:36 p.m.
6013	generated/ilc-tests/logs/sim/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-0007.tar.gz	None	None	March 22, 2010, 4:36 p.m.
6012	generated/ilc-tests/sim/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-0006.slcio	None	None	March 22, 2010, 4:36 p.m.
6011	generated/ilc-tests/logs/sim/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-0006.tar.gz	None	None	March 22, 2010, 4:36 p.m.
6010	generated/ilc-tests/sim/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-0005.slcio	None	None	March 22, 2010, 4:36 p.m.
6009	generated/ilc-tests/logs/sim/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-0005.tar.gz	None	None	March 22, 2010, 4:36 p.m.
6008	generated/ilc-tests/sim/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-0004.slcio	None	None	March 22, 2010, 4:36 p.m.
6007	generated/ilc-tests/logs/sim/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-0004.tar.gz	None	None	March 22, 2010, 4:36 p.m.
6006	generated/ilc-tests/sim/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-0003.slcio	None	None	March 22, 2010, 4:36 p.m.
6005	generated/ilc-tests/logs/sim/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-0003.tar.gz	None	None	March 22, 2010, 4:36 p.m.
6004	generated/ilc-tests/sim/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-0002.slcio	None	None	March 22, 2010, 4:36 p.m.
6003	generated/ilc-tests/logs/sim/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-0002.tar.gz	None	None	March 22, 2010, 4:36 p.m.
6002	generated/ilc-tests/sim/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-0001.slcio	None	None	March 22, 2010, 4:36 p.m.
6001	generated/ilc-tests/logs/sim/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-0001.tar.gz	None	None	March 22, 2010, 4:36 p.m.
6000	mc-2008_2/generated/Slac_SM_500_Presel_IDAG/	w11785_cs096acol15_05.stdhep	None	None	March 22, 2010, 4:36 p.m.
5999	mc-2008_2/generated/Slac_SM_500_Presel_IDAG/	w11785_cs096acol15_04.stdhep	None	None	March 22, 2010, 4:36 p.m.

Done

Filter

- By usr
  - All
  - jan
  - steve
  - jenny
  - nils\_ilc
  - nils\_cal
- By se
  - All
  - desy
  - lyon
  - lal
- By created
  - Any date
  - Today
  - Past 7 days
  - This month
  - This year
- By path
  - All
  - generated/ilc-tests/logs/rec/
  - generated/ilc-tests/logs/sim/
  - generated/ilc-tests/rec/
  - generated/ilc-tests/sim/
  - mc-2008/generated/CMS\_500/
  - mc-2008/generated/Desy\_point5/
  - mc-2008/generated/DESY\_SM\_500/
  - mc-2008/generated/Desy\_sps1ap/
  - mc-2008\_2/generated/Desy\_point5\_v2/
  - mc-2008\_2/generated/Desy\_sps1ap/
  - mc-2008\_2/generated/Slac\_SM\_250/
  - mc-2008\_2/generated/Slac\_SM\_500/
  - mc-2008\_2/generated

# Data Catalog – Produced Files (Selection)



File Edit View History Bookmarks Tools Help

http://127.0.0.1:8000/admin/public/ffile/?q=ilc-tests%2Frec%2F+w14002-aa\_csdu&created\_day=22&usr\_id\_e

Most Visited M DE X PT CS M W ilcsoft grid programming linux util R T os ganga

Select file to change | ILD M... x

**ILD Monte-Carlo Database** Welcome, engels. Documentation / Change password / Log out

Home > Files

### Select file to change

6 results (6023 total)

< March 2010 **March 22**

Id	Path	Filename	Filesize	Guid	Created
6023	generated/ilc-tests/rec/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-rsw-v01-07-0003-DST.slcio	None	None	March 22, 2010, 4:36 p.m.
6022	generated/ilc-tests/rec/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-rsw-v01-07-0003-REC.000.slcio	None	None	March 22, 2010, 4:36 p.m.
6020	generated/ilc-tests/rec/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-rsw-v01-07-0002-DST.slcio	None	None	March 22, 2010, 4:36 p.m.
6019	generated/ilc-tests/rec/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-rsw-v01-07-0002-REC.000.slcio	None	None	March 22, 2010, 4:36 p.m.
6017	generated/ilc-tests/rec/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-rsw-v01-07-0001-DST.slcio	None	None	March 22, 2010, 4:36 p.m.
6016	generated/ilc-tests/rec/	w14002-aa_csdu-ssw-v01-07-LCPhys-ILD_00-rsw-v01-07-0001-REC.000.slcio	None	None	March 22, 2010, 4:36 p.m.

6 files

Done

**Filter**

**By usr**

- All
- jan
- steve
- jenny
- nils\_ilc
- nils\_cal

**By se**

- All
- desy
- lyon
- lal

**By created**

- Any date
- Today
- Past 7 days
- This month
- This year

**By path**

- All
- generated/ilc-tests/logs/rec/
- generated/ilc-tests/logs/sim/
- generated/ilc-tests/rec/
- generated/ilc-tests/sim/
- mc-2008/generated/CMS\_500/
- mc-2008/generated/Desy\_point5/
- mc-2008/generated/DESY\_SM\_500/
- mc-2008/generated/Desy\_sps1ap/
- mc-2008\_2/generated/Desy\_point5\_v2/
- mc-2008\_2/generated/Desy\_sps1ap/
- mc-2008\_2/generated/Slac\_SM\_250/
- mc-2008\_2/generated/Slac\_SM\_500/
- mc-2008\_2/generated

# Adding new requests



- User adds a new data request based on a previous database query

<b>Usr:</b>	<input type="text" value="steve"/>  
<b>Gen:</b>	<input type="text" value="ch1ch1_ude1n1 ep+1.0em-1.0_ch1ch1_ude1n1_v2"/>  
<b>Sim:</b>	<input type="text" value="ilcsoft_v01-06 - ILD_00 - LCPhys"/>  
<b>Rec:</b>	<input type="text" value="ilcsoft_v01-06 - ILD_00 - mc2008 - gear_ILD_00.xml"/>  
<b>Total events:</b>	<input type="text" value="20000"/>
<b>Last update:</b>	<b>Date:</b> <input type="text" value="2010-03-22"/> <a href="#">Today</a>    <b>Time:</b> <input type="text" value="16:36:48"/> <a href="#">Now</a>   



- Summary:
  - New production system still in beta-testing
  - More work than expected!
  - Still work to do (GUI)
  - More Testing needed
  - Currently in contact with CERN LDC Group to evaluate DIRAC and a possible integration with this system
  
- Outlook
  - Testing...
  - GUI
  - DIRAC ?
  - Extend system to bookkeep and manage grid software installations