



CHEP2015
OKINAWA, japan



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21st International Conference on Computing in High Energy and Nuclear Physics **CHEP2015** Okinawa Japan: April 13 - 17, 2015

How the Monte Carlo production of a wide variety of different samples is centrally handled in the LHCb experiment

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et al.:

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D. O'Hanlon (University of Warwick), P. Robbe (LAL Orsay),
V. Romanovsky (IHEP Protvino), F. Stagni (CERN),
A. Zhelezov (Universität Heidelberg)



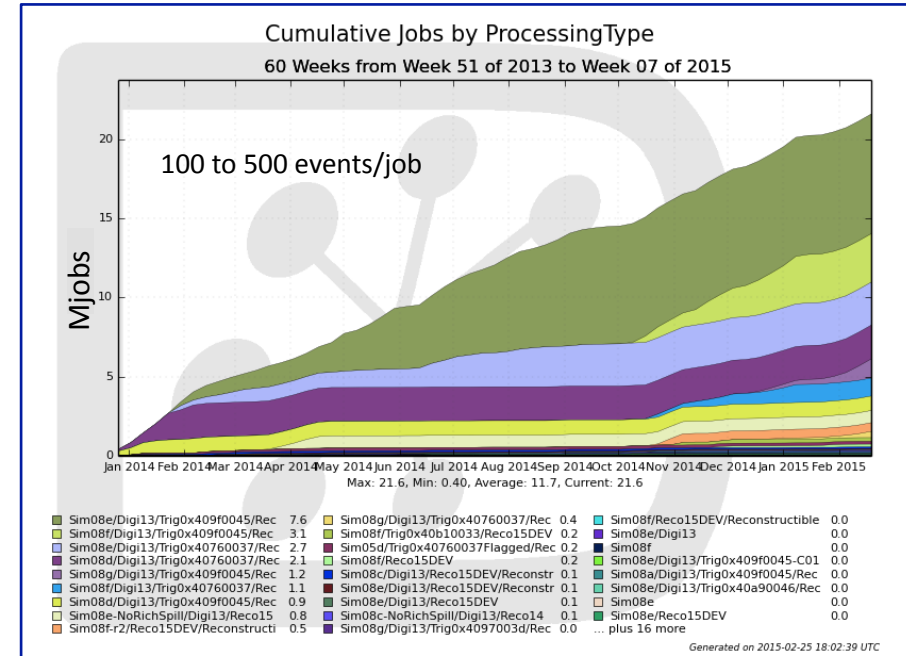
Introduction

- In LHCb a wide variety of Monte Carlo samples need to be produced for the experiment's physics program
- Procedures based on common infrastructures have been setup to handle Monte Carlo productions centrally
 - A numerical **Event Type ID** has been devised to facilitate the configuration of the simulation application
 - Monte Carlo productions are **customized types of productions** centrally handled by the Production Team
 - Deployment of new event types are managed through **standard LHCb distribution software tools**
 - The numerical Event Type ID is also used to transparently **customize Production Requests** and to identify the samples produced
- Conventions allows transparent interplay of different elements

Size of Monte Carlo productions

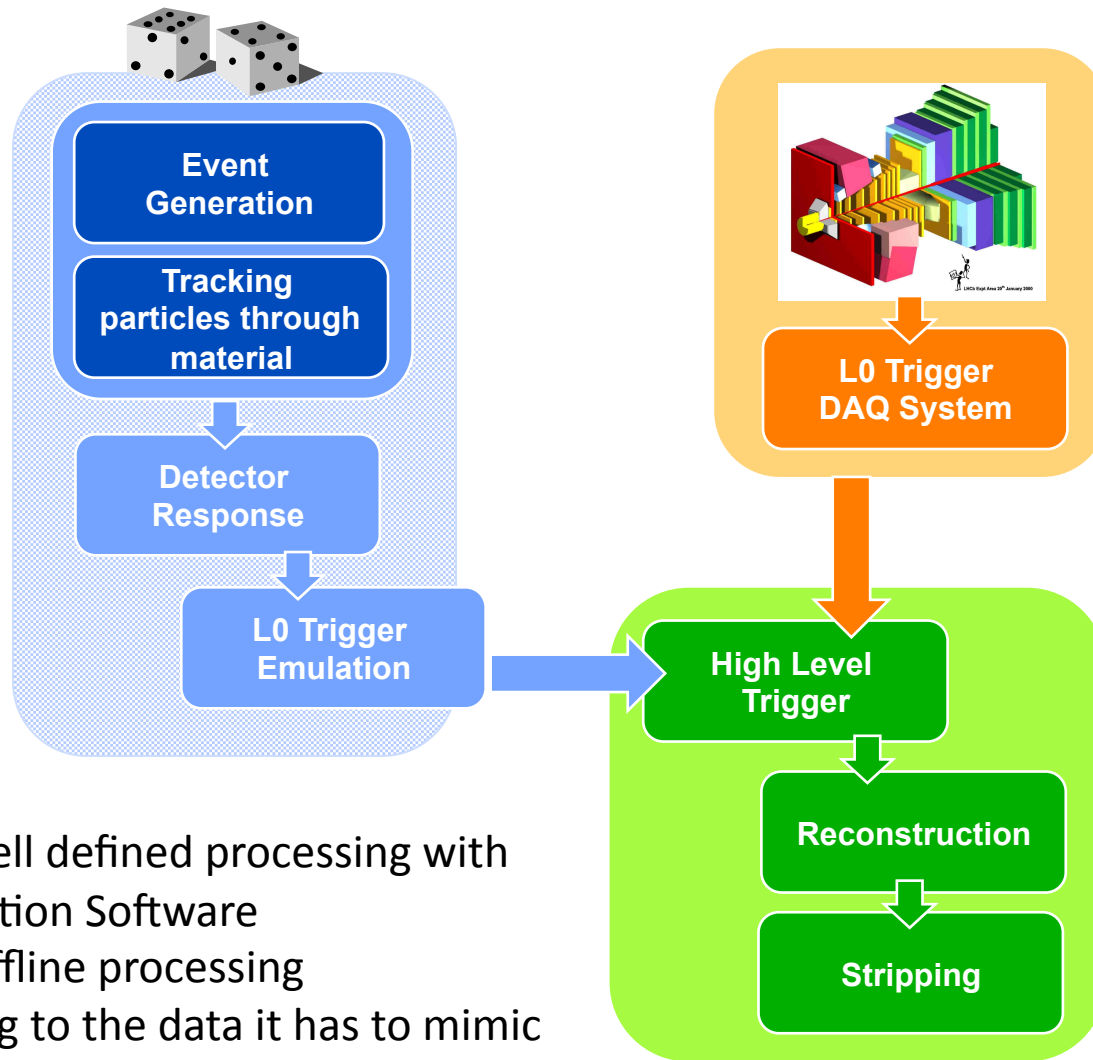
- Production for analysis of Run 1 data samples ongoing since December 2011

- Over **9 billions events produced**
- Two major simulation versions
- Different running conditions (beam & trigger)
- Different reconstruction processing to match the data



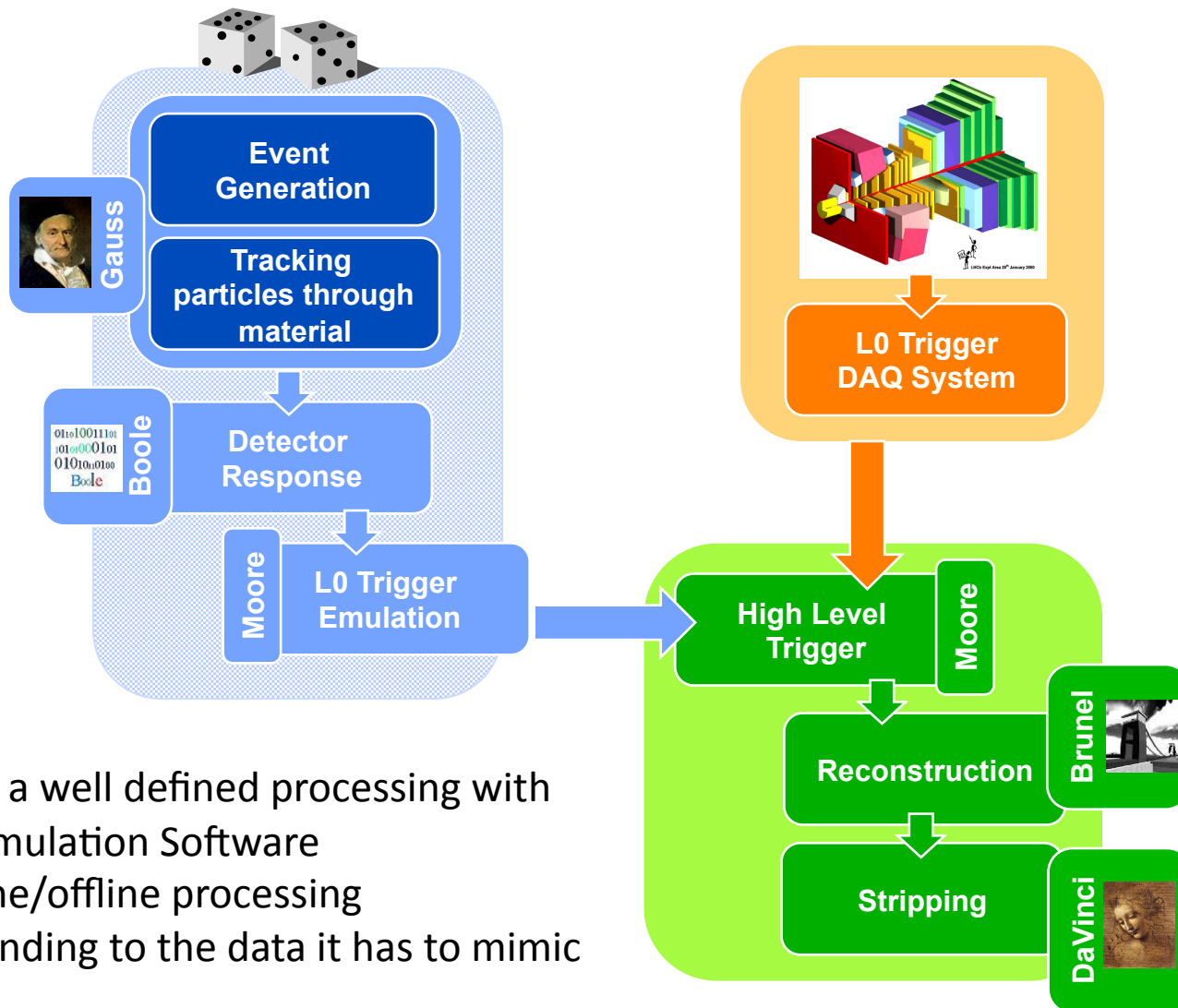
- Wide variety of signal and background samples for different analysis
 - **2260 different event types** up to last week
 - Samples from 50k to 10M events on tape (up to 100M simulated)
- Some samples are shared between physics analysis
 - Essential to keep samples consistent for a given configuration
 - Ensure samples are available to the whole LHCb collaboration

Monte Carlo Productions



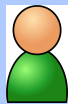
Establish a well defined processing with stable Simulation Software and online/offline processing corresponding to the data it has to mimic

Monte Carlo Productions



Establish a well defined processing with stable Simulation Software and online/offline processing corresponding to the data it has to mimic

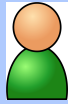
Steps and Players



Physics WG & Simulation
software manager

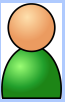
Step 1: Preparation of decay description
and configuration for new decay
channel(s)

Steps and Players



Physics WG & Simulation
software manager

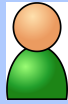
Step 1: Preparation of decay description
and configuration for new decay
channel(s)



Release
manager

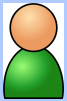
Step 2: Release of new
configurations and
deployment on the Grid

Steps and Players



Physics WG & Simulation
software manager

Step 1: Preparation of decay description
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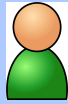
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Simulation
software manager

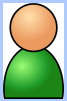
Step 3: Make the production
system aware of the
new event type(s)

Steps and Players



Physics WG & Simulation
software manager

Step 1: Preparation of decay description
and configuration for new decay
channel(s)



Release
manager

Step 2: Release of new
configurations and
deployment on the Grid



Simulation
software manager

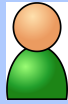
Step 3: Make the production
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MC Physics WG liaison

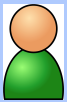
Step 4: Submission of MC request(s)

Steps and Players



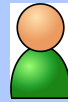
Physics WG & Simulation
software manager

Step 1: Preparation of decay description
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channel(s)



Release
manager

Step 2: Release of new
configurations and
deployment on the Grid



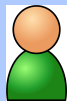
Simulation
software manager

Step 3: Make the production
system aware of the
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MC Physics WG liaison

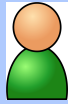
Step 4: Submission of MC request(s)



(MC) Production
manager

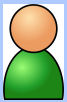
Step 5: Production submission and
follow up

Steps and Players



Physics WG & Simulation
software manager

Step 1: Preparation of decay description
and configuration for new decay
channel(s)



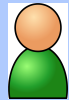
Release
manager

Step 2: Release of new
configurations and
deployment on the Grid



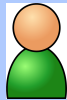
Simulation
software manager

Step 3: Make the production
system aware of the
new event type(s)



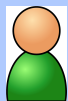
MC Physics WG liaison

Step 4: Submission of MC request(s)



(MC) Production
manager

Step 5: Production submission and
follow up



Physicists

Step 6: Retrieval of data samples produced
for analysis

Event types and configuration

- In LHCb the majority of MC samples are proton-proton collisions with specific decay of b or c hadrons, ...but not only.
- Pythia8 and other generators are used for the p-p collisions while EvtGen, an HEP-wide generator^(*) is used to model the decay of all particles
 - Default behavior is governed by a general DECAY.DEC table with all known decay modes for all particles
 - User decay files are used to force a specific decay for a signal particle via specific models
- LHCb has an extended version of the user decay files with a steering section to generate the specific configuration of the generators to be used at run time to produce a given sample
- The decays files and their automatically generated options reside in a dedicated data package, DecFiles, linked in at run time by the Gauss simulation application

(*) <http://evtgen.warwick.ac.uk>

Event types and automatic generation of options

EventType: 8 digits number “GSDCTNUX” to uniquely identify each decay file, associated options and samples produced

Based on the nature and topology of the decay

Convention established and documented

Extending to 10 digits: migration to new schema for old samples

Descriptor: Details the decays in the file

Cuts: Generator level cuts. Each is implemented in a C++ class residing in a dedicated package

NickName: Short mnemonic: unique and matching the file name

Documentation: Documentation about the decay file. It will appear with the provenance information on a webdocumentation automatically made at release time

```
# EventType: 11114005
#
# Descriptor: {[[B0]nos -> mu+ mu- (K*(892)0
-> K+ pi-)]cc, [[B0]os -> mu- mu+ (K*(892)~0
-> K- pi+)]cc}
#
# NickName: Bd_Kstmumu,phsp=DecProdCut,MomCut
#
# Cuts: DaughtersInLHCbAndWithMinP
#
# Documentation: Decay products in acceptance
and minimum momentum cut
# EndDocumentation
#
# PhysicsWG: RD
# Tested: Yes
# Responsible: John Doe
# Email: John.Doe@mail.address
# Date: 20110928
```

Event types and automatic generation of options

EventType: 8 digits number “GSDCTNUX” to uniquely identify each decay file, associated options and samples produced
Based on the nature and topology of the decay

Convention established and documented

Extending to 10 digits: migration to new schema for old samples

Descriptor: Details the decays in the file. Example: `[[B0]nos -> K+ pi-)]cc, [[B0]os -> K- pi+)]cc}` acceptance

Cuts: Generator level cuts. Each is implemented in a C++ class residing in a dedicated package

NickName: Short mnemonic: unique and matching the file name

Documentation: Documentation about the decay file. It will appear with the provenance information on a webdocumentation automatically made at release time

```
# EventType: 11114005
#
# Descriptor: {[[B0]nos ->
-> K+ pi-)]cc, [[B0]os
-> K- pi+)]cc}
#
# NickName
#
#
```

All used by a script run on demand or at release time to produce the options to be used by the simulation

Guidelines for all of them!

```
Yes
# NickName: John Doe
# Mail: John.Doe@mail.address
# Date: 20110928
```

Release of new Event Types

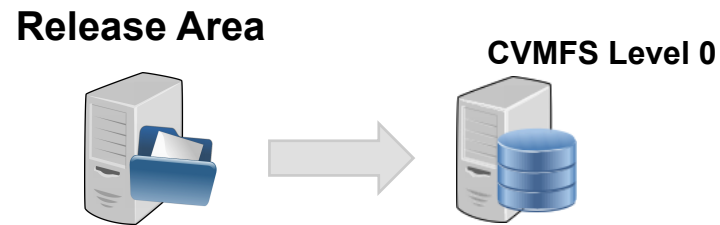
- Decay files for new event types are made continuously by physicists and added to the svn repository of a dedicated package. A notification is also entered in a tag collector.
- DecFiles managers check that rules are respected. Automatic test in nightly builds to verify new event types can be processed.
- Release of DecFiles package asynchronous from that of the Gauss simulation application
 - Major released version number used to ensure compatibility
 - Version to be used is specified in the production system

CMT **lhcb-decfilestests:**

Project	Version	x86_64-slc5-gcc46-opt completed at 0:22:35	
Gauss	v45r9		
DecFilesTests	HEAD	build	tests

World Wide Deployment

- Release and deployment of DecFiles packages by deployment shifters via common LHCb distribution tools



World Wide Deployment

- Release and deployment of DecFiles packages by deployment shifters via common LHCb distribution tools

Release Area



CVMFS Level 0



SINCE 2012

LHCb DIRAC



CVMFS Enabled Site

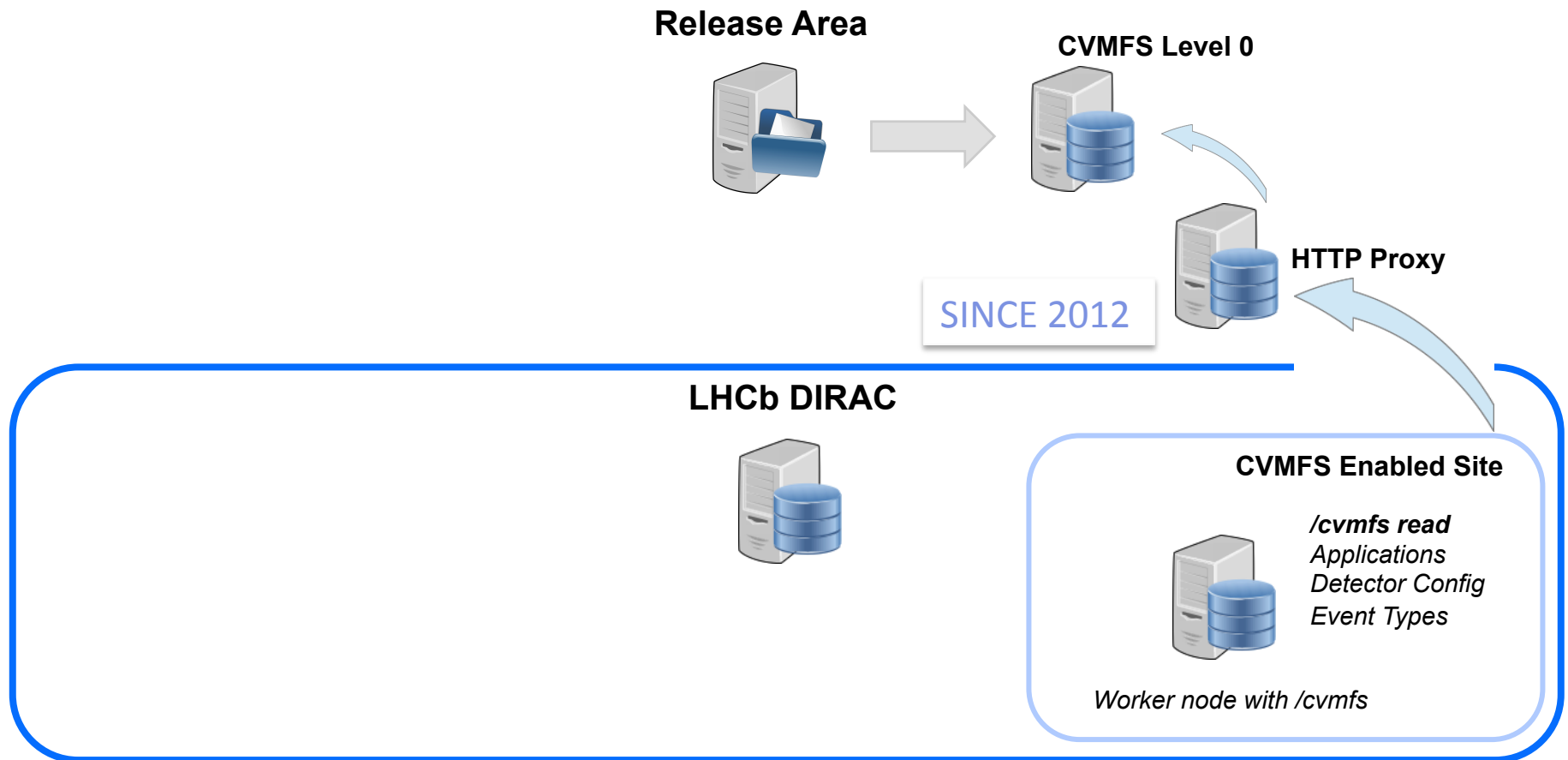


/cvmfs read
Applications
Detector Config
Event Types

Worker node with /cvmfs

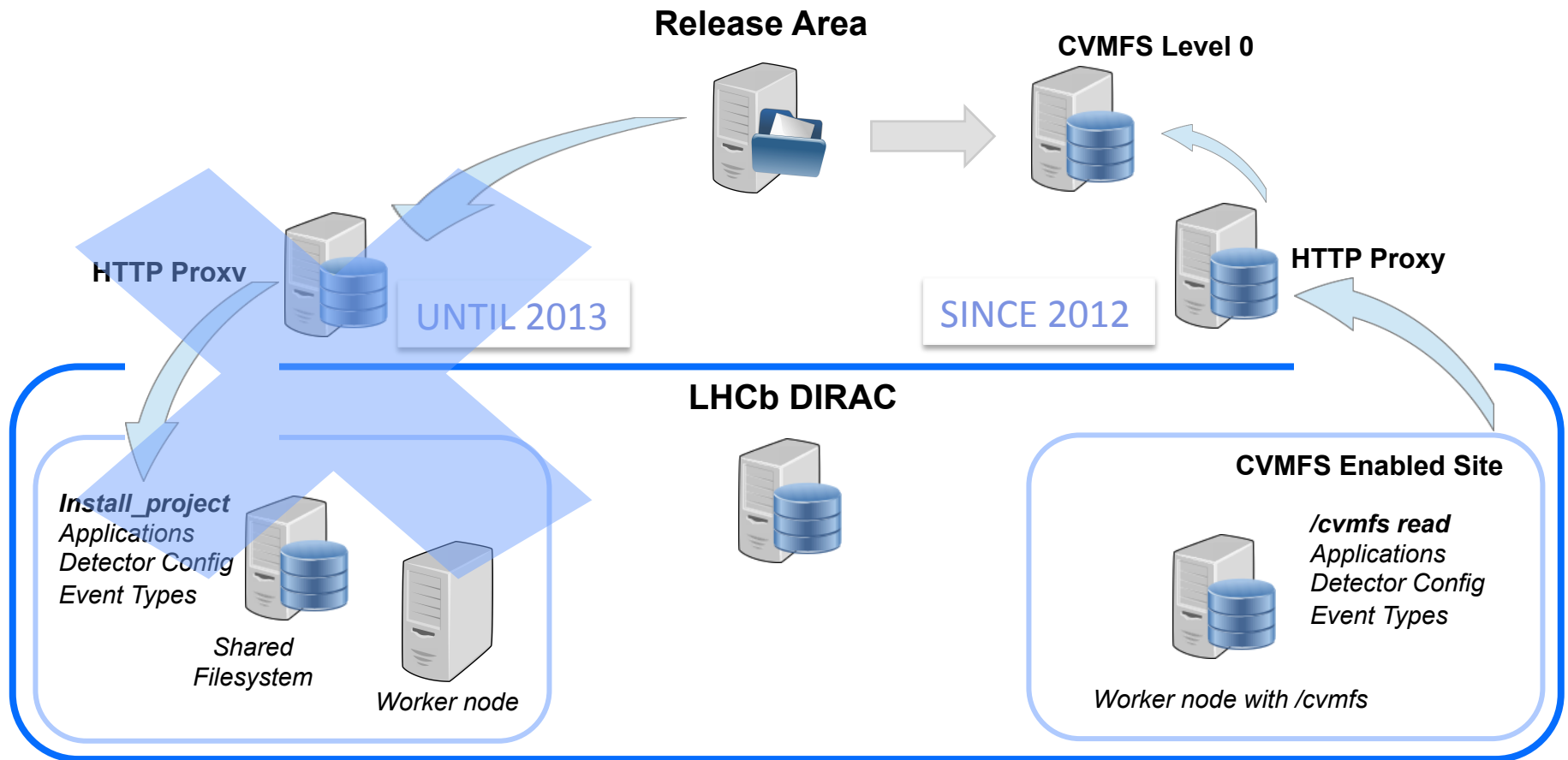
World Wide Deployment

- Release and deployment of DecFiles packages by deployment shifters via common LHCb distribution tools



World Wide Deployment

- Release and deployment of DecFiles packages by deployment shifters via common LHCb distribution tools



Registration to the Bookkeeping System

A dedicated step in the release procedure is to register the new Event Type into the LHCb Bookkeeping system



LHCb Bookkeeping browser [Untitled 1]

Bookkeeping tree

- /
 - HCAL
 - IT
 - LHCb
 - MC
 - 2009
 - 2010
 - 2011
 - 2012
 - 2010
 - 2011
 - 2012
 - Beam4000GeV-2012-MagDown-Nu2.5-BcVegPy
 - Beam4000GeV-2012-MagDown-Nu2.5-Powheg
 - Beam4000GeV-2012-MagDown-Nu2.5-Pythia6
 - Beam4000GeV-2012-MagDown-Nu2.5-Pythia8
 - Gen08a
 - Sim08a
 - Digi13
 - Trig0x409f0045
 - Reco14
 - Stripping20NoPrescalingFlagged
 - 11104143 (Bd_KSKS=DecProc)
 - ALLSTREAMS.DST

Simulation Condition: Advanced Refresh

Data quality

Bookmarks

Default

| # | File Name | Event Stat | File Size | Run number | Creation Date | Job Start |
|----|----------------------|------------|------------|------------|---------------|-----------|
| 1 | /lhcb/MC/2012/ALL... | 17750 | 3792470394 | - | 2013-06-22 | |
| 2 | /lhcb/MC/2012/ALL... | 17750 | 3774194318 | - | 2013-06-22 | |
| 3 | /lhcb/MC/2012/ALL... | 17500 | 3751281276 | - | 2013-06-22 | |
| 4 | /lhcb/MC/2012/ALL... | 17750 | 3763510201 | - | 2013-06-22 | |
| 5 | /lhcb/MC/2012/ALL... | 17750 | 3777166993 | - | 2013-06-22 | |
| 6 | /lhcb/MC/2012/ALL... | 17750 | 3763012566 | - | 2013-06-22 | |
| 7 | /lhcb/MC/2012/ALL... | 17500 | 3742635125 | - | 2013-06-22 | |
| 8 | /lhcb/MC/2012/ALL... | 17500 | 3790204010 | - | 2013-06-22 | |
| 9 | /lhcb/MC/2012/ALL... | 17750 | 3766383570 | - | 2013-06-22 | |
| 10 | /lhcb/MC/2012/ALL... | 17750 | 3744144203 | - | 2013-06-22 | |
| 11 | /lhcb/MC/2012/ALL... | 17500 | 3763367147 | - | 2013-06-22 | |
| 12 | /lhcb/MC/2012/ALL... | 17750 | 3758931134 | - | 2013-06-22 | |
| 13 | /lhcb/MC/2012/ALL... | 17750 | 3756132221 | - | 2013-06-22 | |
| 14 | /lhcb/MC/2012/ALL... | 17250 | 3760894029 | - | 2013-06-22 | |
| 15 | /lhcb/MC/2012/ALL... | 17750 | 3755364524 | - | 2013-06-22 | |
| 16 | /lhcb/MC/2012/ALL... | 17500 | 3760856010 | - | 2013-06-22 | |
| 17 | /lhcb/MC/2012/ALL... | 17750 | 3748599416 | - | 2013-06-22 | |
| 18 | /lhcb/MC/2012/ALL... | 17500 | 3776351713 | - | 2013-06-22 | |
| 19 | /lhcb/MC/2012/ALL... | 17500 | 3752053173 | - | 2013-06-22 | |
| 20 | /lhcb/MC/2012/ALL... | 17750 | 3744085782 | - | 2013-06-22 | |
| 21 | /lhcb/MC/2012/ALL... | 17750 | 3777782747 | - | 2013-06-22 | |
| 22 | /lhcb/MC/2012/ALL... | 18000 | 3791025829 | - | 2013-06-22 | |
| 23 | /lhcb/MC/2012/ALL... | 17750 | 3759538531 | - | 2013-06-22 | |
| 24 | /lhcb/MC/2012/ALL... | 18000 | 3791462666 | - | 2013-06-22 | |
| 25 | /lhcb/MC/2012/ALL... | 9250 | 1970757898 | - | 2013-06-22 | |

Items per page: 25 Page 1 of 2 Updated: 2015-03-29 21:03 [UTC] 0 0:4

Statistics:

Configuration Name: MC

Configuration Version: 2012

Simulation/DataTaking Conditions: Beam4000GeV-2012-MagD

Processing pass: /Sim08a/Digi13/Trig0x409f

Event Type: 11104143

FileType: ALLSTREAMS.DST

Number Of Files: 31

Number Of Events: 514750

Luminosity: 0

File(s) Size: 102.2 GB

sim+std://MC/2012/Beam4000GeV-2012-MagDown-Nu2.5-Pythia8/Sim08a/Digi13/Trig0x409f0045/ Go Save

Registration to the Bookkeeping System

A dedicated step in the release procedure is to register the new Event Type into the LHCb Bookkeeping system



LHCb Bookkeeping System

| # | File Name | Event Stat | File Size | Run number | Creation Date | Job Start |
|----|---------------------|------------|------------|------------|---------------|------------|
| 1 | /hcb/MC/2012/ALL... | 17750 | 3792470394 | - | 2013-06-22 | 2013-06-22 |
| 2 | /hcb/MC/2012/ALL... | 17750 | 3774194318 | - | 2013-06-22 | 2013-06-22 |
| 3 | /hcb/MC/2012/ALL... | 17500 | 3751281276 | - | 2013-06-22 | 2013-06-22 |
| 4 | /hcb/MC/2012/ALL... | 17750 | 3763510201 | - | 2013-06-22 | 2013-06-22 |
| 5 | /hcb/MC/2012/ALL... | 17750 | 3777166993 | - | 2013-06-22 | 2013-06-22 |
| 6 | /hcb/MC/2012/ALL... | 17750 | 3763012566 | - | 2013-06-22 | 2013-06-22 |
| 7 | /hcb/MC/2012/ALL... | 17500 | 3742635125 | - | 2013-06-22 | 2013-06-22 |
| 8 | /hcb/MC/2012/ALL... | 17500 | 3790204010 | - | 2013-06-22 | 2013-06-22 |
| 9 | /hcb/MC/2012/ALL... | 17750 | 3766383570 | - | 2013-06-22 | 2013-06-22 |
| 10 | /hcb/MC/2012/ALL... | 17750 | 3744144203 | - | 2013-06-22 | 2013-06-22 |
| 11 | /hcb/MC/2012/ALL... | 17500 | 3763367147 | - | 2013-06-22 | 2013-06-22 |
| 12 | /hcb/MC/2012/ALL... | 17750 | 3758931134 | - | 2013-06-22 | 2013-06-22 |
| 13 | /hcb/MC/2012/ALL... | 17750 | 3756132221 | - | 2013-06-22 | 2013-06-22 |
| 14 | /hcb/MC/2012/ALL... | 17250 | 3760894029 | - | 2013-06-22 | 2013-06-22 |
| 15 | /hcb/MC/2012/ALL... | 17750 | 3755364524 | - | 2013-06-22 | 2013-06-22 |
| 16 | /hcb/MC/2012/ALL... | 17500 | 3760856010 | - | 2013-06-22 | 2013-06-22 |
| 17 | /hcb/MC/2012/ALL... | 17750 | 3748599416 | - | 2013-06-22 | 2013-06-22 |
| 18 | /hcb/MC/2012/ALL... | 17500 | 3776351713 | - | 2013-06-22 | 2013-06-22 |
| 19 | /hcb/MC/2012/ALL... | 17500 | 3752053173 | - | 2013-06-22 | 2013-06-22 |
| 20 | /hcb/MC/2012/ALL... | 17750 | 3744085782 | - | 2013-06-22 | 2013-06-22 |
| 21 | /hcb/MC/2012/ALL... | 17750 | 3777782747 | - | 2013-06-22 | 2013-06-22 |
| 22 | /hcb/MC/2012/ALL... | 18000 | 3791025829 | - | 2013-06-22 | 2013-06-22 |
| 23 | /hcb/MC/2012/ALL... | 17750 | 3759538531 | - | 2013-06-22 | 2013-06-22 |
| 24 | /hcb/MC/2012/ALL... | 18000 | 3791462666 | - | 2013-06-22 | 2013-06-22 |
| 25 | /hcb/MC/2012/ALL... | 9250 | 1970757898 | - | 2013-06-22 | 2013-06-22 |

- The LHCb Bookkeeping system is a metadata management system which stores the conditions relative to jobs, files and their metadata, as well as their provenance information in an organized way
 - Data stored in relational model and presented as a hierarchical structure (tree-like format) to the users.
- It has a Web User Interface (WUI), a Graphical User Interface (GUI) and a Command Line Interface (CLI).
- It is based on Oracle RDBMS which has to fulfill the following requirements: rapid response, high throughput, availability and scalability.

Using the new DecFiles version in production

Event
Types



Bookkeeping Metadata
Catalog Browser

System Jobs Production Data View Grid Web Tools

New web portal is available!!!!

Registered Steps Step 127264

| Id | Name | Processing pass | Application | Version | Visible | Usable |
|--------|------------------------------|-----------------|-------------|---------|---------|--------|
| 127391 | Sim08g - 2011 - N | | | | | |
| 127390 | Sim08g - 2011 - N | | | | | |
| 127389 | Sim08g - 2012 - N | | | | | |
| 127388 | Sim08g - 2012 - N | | | | | |
| 127387 | Sim08g - 2011 - N | | | | | |
| 127386 | Sim08g - 2011 - N | | | | | |
| 127385 | Sim08g - 2012 - N | | | | | |
| 127384 | Sim08g - 2012 - N | | | | | |
| 127383 | Sim08g - 2011 - N | | | | | |
| 127382 | Sim08g - 2011 - N | | | | | |
| 127381 | Sim08g - 2012 - N | | | | | |
| 127380 | Sim08g - 2012 - N | | | | | |
| 127265 | Early 2015 - MU - | | | | | |
| 127264 | Early 2015 - MD - | | | | | |
| 127263 | Early 2015 - MU - | | | | | |
| 127262 | Early 2015 - MD - | | | | | |
| 127261 | Nominal 2015 - M | | | | | |
| 127260 | Nominal 2015 - M | | | | | |
| 127240 | Sim08g - 2012 - N | | | | | |
| 127231 | Sim08g - 2011 - N | | | | | |
| 127230 | Sim08g - 2011 - MD - BcVegPy | | | | | |

Step Manager

Registered Steps Edit step 127380

Name: Sim08g - 2012 - MD - Pythia8

Processing pass: Sim08g

Application: Gauss v45r9

System config: NULL

MC TCK:

Option files: \$APPCONFIGNOPTS/Sim08-Beam4000GeV-md100-2012-nu2.5.py;\$DECFILESROOT/options/@(eventType).py;\$LBPYTHIA8ROOT/options/Pythia8.py;\$APPCONFIGNOPTS/Ga

Options format:

Multicore: N

Extra packages: AppConfig.v3r205;DecFiles.v27r39

Runtime project: Select Runtime Project if desired

CondDB: sim-20130522-1-vc-md100

DDDB: dddb-20130929-1

DQTag:

Visible: Y

Usable: Yes

Input File Types

File type: select file type Add

Output File Types

File type: select file type Add

| File type | Visible |
|-----------|---------|
| SIM | N |

Bookkeeping Metadata Catalog Browser

| | | | | | | |
|----|------------------|-------|------------|---|------------|---|
| 7 | /hcb/MC/2011/ALL | 17500 | 3742635135 | - | 2013-06-22 | Processing pass: /Sim08/Step 1.1/Trig0409 |
| 8 | /hcb/MC/2012/ALL | 17500 | 3790204010 | - | 2013-06-22 | Event Type: 11104143 |
| 9 | /hcb/MC/2012/ALL | 17500 | 3766383570 | - | 2013-06-22 | FileType: ALLSTREAMS.DST |
| 10 | /hcb/MC/2012/ALL | 17500 | 3744144203 | - | 2013-06-22 | Number Of Files: 31 |
| 11 | /hcb/MC/2012/ALL | 17500 | 3783367147 | - | 2013-06-22 | Number Of Events: 514750 |
| 12 | /hcb/MC/2013/ALL | 17750 | 3759591134 | - | 2013-06-22 | Luminosity: 0 |
| 13 | /hcb/MC/2012/ALL | 17750 | 3756132221 | - | 2013-06-22 | File(s) Size: 102.2 GB |
| 14 | /hcb/MC/2012/ALL | 17250 | 3760894029 | - | 2013-06-22 | |
| 15 | /hcb/MC/2012/ALL | 17750 | 3755364524 | - | 2013-06-22 | |
| | | | 3760896010 | - | 2013-06-22 | |
| | | | 3746599416 | - | 2013-06-22 | |
| | | | 3776251713 | - | 2013-06-22 | |
| | | | 3752053173 | - | 2013-06-22 | |
| | | | 3744885782 | - | 2013-06-22 | |
| | | | 3777782747 | - | 2013-06-22 | |
| | | | 3791625029 | - | 2013-06-22 | |
| | | | 3795036311 | - | 2013-06-22 | |
| | | | 3791462666 | - | 2013-06-22 | |
| | | | 1970797898 | - | 2013-06-22 | |

Application
Manager

After the DecFiles is released and deployed to the Grid a Step is created and registered in the LHCb Bookkeeping System. This Step is an abstraction of an application and its configurations (such as different option files, database tags, etc.) which can be executed during data processing.

Using the new DecFiles version in production

Event Types

Bookkeeping Metadata

Step Manager

Application Manager

Registered Steps

| Id | Name |
|--------|---|
| 127391 | Sim08g - 2011 - MU - BcVegPy |
| 127390 | Sim08g - 2011 - MD - BcVegPy |
| 127389 | Sim08g - 2012 - MU - BcVegPy |
| 127388 | Sim08g - 2012 - MD - BcVegPy |
| 127387 | Sim08g - 2011 - MU - Pythia6 |
| 127386 | Sim08g - 2011 - MD - Pythia6 |
| 127385 | Sim08g - 2012 - MU - Pythia6 |
| 127384 | Sim08g - 2012 - MD - Pythia6 |
| 127383 | Sim08g - 2011 - MU - Pythia8 |
| 127382 | Sim08g - 2011 - MD - Pythia8 |
| 127381 | Sim08g - 2012 - MU - Pythia8 |
| 127380 | Sim08g - 2012 - MD - Pythia8 |
| 127265 | Early 2015 - MU - Nu1.6 (Lumi 2.2 at 5) |
| 127264 | Early 2015 - MD - Nu1.6 (Lumi 2.2 at 5) |
| 127263 | Early 2015 - MU - Nu1.6 (Lumi 2.2 at 5) |
| 127262 | Early 2015 - MD - Nu1.6 (Lumi 2.2 at 5) |
| 127261 | Nominal 2015 - MU - Nu1.6 (Lumi 4 at :) |
| 127260 | Nominal 2015 - MD - Nu1.6 (Lumi 4 at :) |
| 127240 | Sim08g - 2012 - MD - Signal PGun |
| 127231 | Sim08g - 2011 - MU - BcVegPy |
| 127230 | Sim08g - 2011 - MD - BcVegPy |

Edit step 127380

Name: Sim08g - 2012 - MD - Pythia8

Processing pass: Sim08g

Application: Gauss v45r9

System config: NULL

MC TCK:

Option files: \$APPCONFIGOPTS/Gauss/Sim08-Beam4000GeV-md100-2012-nu2.5.py;\$DECFILESROOT/options/{@eventType}.py;\$LBPYTHIA8ROOT/options/Pythia8.py;\$APPCONFIGOPTS/Gau

Options format:

Multicore: N

Extra packages: AppConfig.v3r205;DecFiles.v27r39

Runtime project: Select Runtime Project if desired

CondDB: sim-20130522-1-vc-md100

DDB: dddb-20130929-1

DQTag:

Visible: Y

Usable: Yes

Input File Types

| File type | Visible |
|-----------|---------|
| SIM | N |

Output File Types

| File type | Visible |
|-----------|---------|
| SIM | N |

Save Cancel

After the DecFiles is released and deployed to the Grid a Step is created and registered in the LHCb Bookkeeping System. This Step is an abstraction of an application and its configurations (such as different option files, database tags, etc.) which can be executed during data processing.

Requests' configurations

A Request Manager page allows Simulation Managers to link steps with all application to be executed together, creating models for production requests

And to define simulation conditions

| Id | SimDescription | Visible |
|--------|--|---------|
| 432324 | Beam3500GeV-2011-MagUp-Nu2-Pythia8 | Y |
| 432323 | Beam3500GeV-2011-MagDown-Nu2-Pythia8 | Y |
| 432322 | Beam3500GeV-2011-MagUp-Nu2-Pythia6 | Y |
| 432321 | Beam3500GeV-2011-MagDown-Nu2-Pythia6 | Y |
| 432320 | Beam4000GeV-2012-MagUp-Nu2.5-Pythia8 | Y |
| 432319 | Beam4000GeV-2012-MagDown-Nu2.5-Pythia8 | Y |

BeamCond: beta*=-3m, zpv=25.7mm, xAngle=0.236mrad and yAngle=0.100mrad
BeamEnergy: 4000 GeV
Generator: Pythia8 **MagneticField:** -1
DetectorCond: 2012, Velo Closed around offset beam
Luminosity: pp collisions nu = 2.5, no spillover
G4settings: specified in sim step

Simulation conditions and processing through all applications are fixed while the Event type is left as a free parameter



Request models and request

The screenshot displays the Request Manager interface. On the left, a 'Models List' sidebar shows various model categories like Reconstructing, Simulation, Stripping, etc. The main area shows a table of 'Registered Production Requests' with columns for Id, Type, State, Priority, Name, Sim/Run conditions, and Proc. pass. A green arrow points from the 'Models List' to the 'Request' table. Another green arrow points from the 'Request' table to a detailed view of request 10886. A blue starburst labeled 'Event Types' points to the 'Event' section of the detailed view. The detailed view shows fields for Name, Type, Priority, Author, MC Config, WG, Simulation Conditions, Description, Beam, Beam energy, Generator, G4 settings, Processing Pass, and a list of steps with their respective options and comments.

Models List

Registered Production Requests

| Id | Type | State | Priority | Name | Sim/Run conditions | Proc. pass |
|-------|------------|-------|----------|---|---|--|
| 24832 | Simulation | New | 2b | Model for 2015 early measurements - MU - no spillover - ... | Beam6500GeV-RunII-MagUp-Nu1.6-Pythia8 | Sim08g/Reco15DEV |
| 24779 | Simulation | New | 2b | Model for 2015 early measurements - MD - no spillover - ... | Beam6500GeV-RunII-MagDown-Nu1.6-Pythia8 | Sim08g/Reco15DEV |
| 24009 | Simulation | New | 2b | Sim08g Model for 2012 data - MU - Powheg+P6 | Beam4000GeV-2012-MagUp-Nu2.5-Powheg | Sim08g/Digi13/Trig0x409f0045/Reco14c/Stripping20NoPrescaling |
| 24008 | Simulation | New | 2b | Sim08g Model for 2012 data - MD - Powheg+P6 | Beam4000GeV-2012-MagDown-Nu2.5-Powheg | Sim08g/Digi13/Trig0x409f0045/Reco14c/Stripping20NoPrescaling |
| 24002 | Simulation | New | 2b | Sim08g Model for 2011 data - MU - OniaPairs | Beam3500GeV-2011-MagUp-Fix1-OniaPairs | Sim08g/Digi13/Trig0x40760037/Reco14c/Stripping20r1NoPresca |
| 24001 | Simulation | New | 2b | Sim08g Model for 2011 data - MD - OniaPairs | Beam3500GeV-2011-MagDown-Fix1-OniaPairs | Sim08g/Digi13/Trig0x40760037/Reco14c/Stripping20r1NoPresca |

Request

Request Details:

- Name: Sim08g Model for 2012 data - MD - Pythia8
- Type: Simulation
- Priority: 2b
- Author: gcarti
- MC Config: 2012
- WG:
- Simulation Conditions (ID: 432319): Beam4000GeV-2012-MagDown-Nu2.5-Pythia8
- Description: beta⁺=3m, zpv=25.7mm, xAngle=0 Magnetic field: -1
- Beam: 4000 GeV
- Generator: Pythia8
- G4 settings: specified in sim step

Event

Type: 100

Number: 10000000 - incl_b

Comments: 10000010 - incl_b=Biased2BinAcc

Comment by gcarti: 10000020 - incl_b=BiasedDispVert

Model for Sim08g: 10000021 - incl_b=Biased_1DispVert

The beam condition: 10000022 - incl_b=Biased_LifetimeAllSps

This model uses Py: 10000023 - incl_b=Biased_2DispVert

10000025 - incl_b=Biased2DScatter, TightCut

This model uses Py: 10000030 - incl_b=HardQCDScatter, TightCut

10002202 - incl_b=KKGammaX

Comment by gcarti: 10002203 - incl_b=KKGammaX, updated

Updated to use Gauss: 10002213 - incl_b=KpGammaX

Comment by gcarti: 10002213 - incl_b=KpGammaX, updated

Updated to pick up: 10011000 - incl_b=MoonHighPT

Updated to pick up: 10011001 - incl_b=MoonHighPTForceB

Updated to pick up latest DecFiles v27/5 and AppConfig v3r170.

Also change Brunel step to use patch Reco4 for MC

Updated to pick up latest version of Gauss v45r3 that with tests does not seem to stall and AppConfig v3r171

Updated to pick up latest DecFiles v27/6

Comment by gcarti on Jul 08, 2013:

Updated to pick up latest DecFiles v27/8

Updated to pick up latest DecFiles v27/9

Comment by gcarti on Aug 28, 2013:

Updated to pick up latest DecFiles v27/11

Comment by gcarti on Sep 02, 2013:

Reload sim step as there was a problem with the production system that did not show it in the processing pass

Comment by gcarti on Oct 04, 2013:

Updated to pick up Gauss v45r4 and latest DecFiles v27r12p1

Updated to pick up latest Gauss v45r5 and DecFiles v27r13. Also pick up DDBB tag with fix in omega (i.e. Sim08c) and SIMCOND tag (neutral as for analysis smearing).

The Request Manager page also allows users to create their simulation requests which will perform on the Grid 'cloning' existing models and only specifying the event types and statistics

Request customization and filtering

Registered Production Requests | Edit request 10886

Processing Pass (Sim08g/Digi13/Trig0x409f0045/Reco14c/Stripping20NoPrescalingFlagged)

Step 1 Sim08g - 2012 - MD - Pythia8 (127580/Sim08g) : Gauss-v45f9
System config: NULL MC TCK: null
Options: \$APPCONFIGOPTS/Gauss/Sim08-Beam4000GeV-md100-2012-nu2.5.py;\$DECFILESROOT/options/
/@(eventType).py;\$LBPYTHIA8ROOT/options/Pythia8.py;\$APPCONFIGOPTS/Gauss
/G4PL_FTP_BERT_EmNoCuts.py;\$APPCONFIGOPTS/Persistence/Compression-ZLIB-1.py Options format:
null Multicore: N
DDDB: dddb-20130929-1 Condition DB: sim-20130522-1-vc-md100 DQTag: null
Extra: AppConfig.v3r207;DecFiles.v27r41 Runtime projects:
Visible: Y Usable:Yes
Input file types: Output file types: SIM(N)

Step 2 Digi13 with G4 d...
Options: \$APPCONFIGOP...
2012.py;\$APPCONFIGOP...
ZLIB-1.py Options format...
DDDB: fromPreviousStep
Extra: AppConfig.v3r164
Visible: Y Usable:Yes
Input file types: SIM(N)

Step 3 TCK-0x409f0045
Options: \$APPCONFIGOP...
/TCK-0x409f0045.py;\$AP...
Options format: null
DDDB: fromPreviousStep
Extra: AppConfig.v3r164
Visible: Y Usable:Yes
Input file types: DIGI(N)

Step 4 Reco14c for MC -
System config: x86_64-s...
Options: \$APPCONFIGOP...
/MC-WithTruth.py;\$APPC...
DDDB: fromPreviousStep
Extra: AppConfig.v3r207
Visible: Y Usable:Yes
Input file types: DIGI(N)

Step 5 Stripping20-NoPrescalingFlagged for Sim08 - Implicit merging.
(125836/Stripping20NoPrescalingFlagged) : DaVinci-v32r2p1
System config: NULL MC TCK: null
Options: \$APPCONFIGOPTS/DaVinci/DV-Stripping20-Stripping-MC-NoPrescaling.py;\$APPCONFIGOPTS
/DaVinci/DataType-2012.py;\$APPCONFIGOPTS/DaVinci/InputType-DST.py;\$APPCONFIGOPTS/Persistence
/Compression-ZLIB-1.py Options format: null Multicore: N
DDDB: fromPreviousStep Condition DB: fromPreviousStep DQTag: null
Extra: AppConfig.v3r164 Runtime projects:
Visible: Y Usable:Yes
Input file types: DST(N) Output file types: ALLSTREAMS.DST(Y)

Replace

Event
Type: Select event type (if not subrequesting)
Number:

Comments
Comment by gcorti on Mar 28, 2013:
Model for Sim08 for 2012 data taking conditions, Reco14 and
Stripping20.
The beam conditions are those representing the ...

Replace Step (125836) Replace v20r2

Show also non-coinciding steps:

| ID | Name | Processing pass | App. | Step details |
|--------|--------------------------------------|-------------------|---------|--|
| 127342 | Stripping20r1Filtered for B2OC W... | Stripping20r1F... | DaVinci | Stripping20r1Filtered for Charm WG (Hampson) (126093/Stripping20r1Filtered) : DaVinci-v32r2p3
System config: NULL MC TCK: null
Options: \$CHARMCONFIGNOPTS/MCFiltering /Dstar2D02HHHStripTriggerFiltering-noPID-2011.py;\$APPCONFIGOPTS/DaVinci/DataType-2011.py Options format: null Multicore: N
DDDB: fromPreviousStep Condition DB: fromPreviousStep DQTag: null
Extra: AppConfig.v3r164;CharmConfig.v3r5 Runtime projects: Visible: Y Usable:Yes
Input file types: DST(N) Output file types: D02HHH.STRIPTRIG.DST(N) |
| 125613 | Stripping20r1Filtered for BNoC W... | Stripping20r1F... | DaVinci | |
| 125354 | Stripping20r1Filtered for Charm W... | Stripping20r1F... | DaVinci | |
| 126012 | Stripping20r1Filtered for Charm W... | Stripping20r1F... | DaVinci | |
| 126093 | Stripping20r1Filtered for Charm W... | Stripping20r1F... | DaVinci | |
| 125971 | Stripping20r1Filtered for Charm W... | Stripping20r1F... | DaVinci | |
| 127362 | Stripping20r1Filtered for Charm W... | Stripping20r1F... | DaVinci | |
| 125803 | Stripping20r1Filtered for Charm W... | Stripping20r1F... | DaVinci | |
| 125358 | Stripping20r1Filtered for Charm W... | Stripping20r1F... | DaVinci | |
| 126643 | Stripping20r1Filtered for Charm W... | Stripping20r1F... | DaVinci | |
| 127082 | Stripping20r1Filtered for RDWG (F... | Stripping20r1F... | DaVinci | |
| 125856 | Stripping20r1p1-NoPrescalingFlag... | Stripping20r1p... | DaVinci | |

Page 1 of 8 | Displaying 1 - 150 of 1172

Replace Cancel

Updated to pick up latest DecFiles v27r9

Comment by gcorti on Aug 28, 2013:
Updated to pick up latest DecFiles v27r11

Comment by gcorti on Sep 02, 2013:
Reload sim step as there was a problem with the production system that did not show it in the processing pass

Requests can be modified to replace a single step

- Used for deployment of new decay files versions
- Used for MC filtering on a specific stripping line

MC filter Manager sets up different configurations from specific WG packages, e.g. B2OCConfig



LHCbDirac Production System

The screenshot displays the LHCbDirac Production System interface. It is divided into several sections:

- Steps:** A form for defining a production step, including fields for Name, Processing pass, Application, Option files, Options format, Extra packages, Runtime project, CandDB, and DOB.
- Requests:** A form for defining a production request, including fields for Name, Type, State, Author, and Event.
- Production Templates:** A table for defining production parameters and their values.

The **Production Templates** table is as follows:

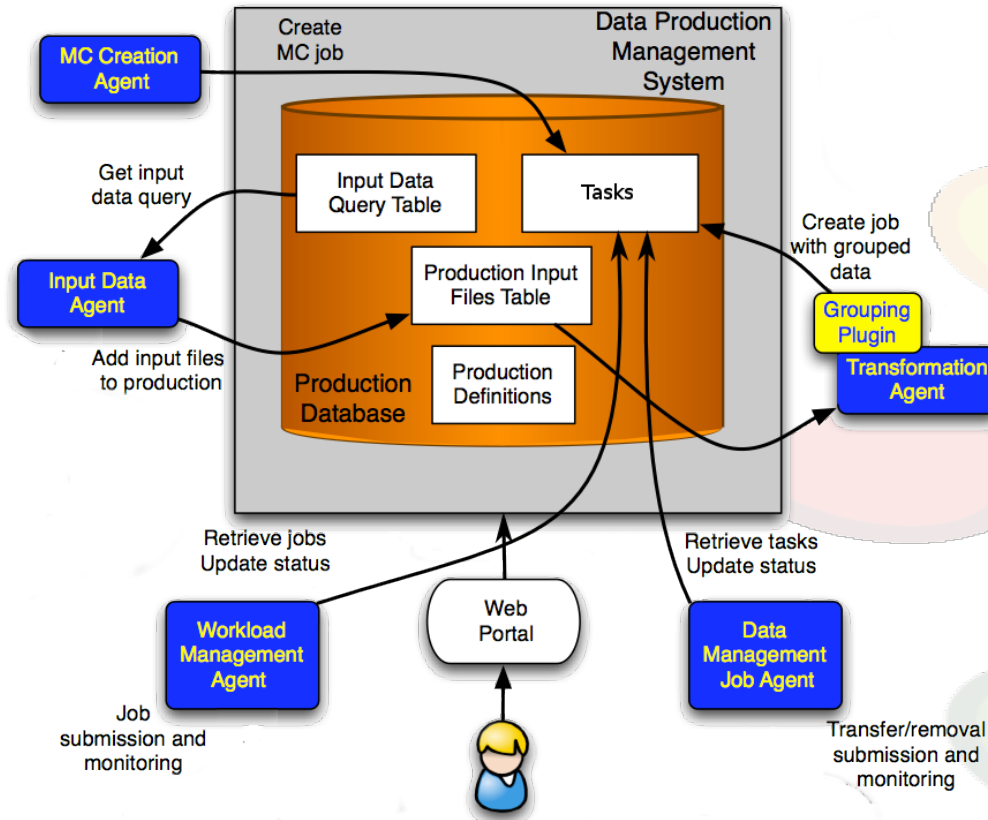
| Parameter | Value |
|--|--------------------|
| GENERAL: Set True for EXPRESS (Run at C... | False |
| GENERAL: Set True for certification test | False |
| GENERAL: Set True for local test | False |
| GENERAL: Set True to create validation pro... | False |
| GENERAL: Use Oracle | True |
| GENERAL: Workflow string to append to pr... | 1 |
| GENERAL: Workflow system config e.g. x8... | ANY |
| PROD-RECO: DataReconstruction or DataRe... | DataReconstruction |
| PROD-RECO: Group size or number of files ... | 1 |
| PROD-RECO: Max CPU time in secs | 1000000 |
| PROD-RECO: Number of Files | -1 |
| PROD-RECO: Output Data Storage Element | Tier1-RDST |
| PROD-RECO: ancestor production if any | 0 |
| PROD-RECO: discrete list of run numbers (do... | |
| PROD-RECO: distribute output data True/Fal... | False |
| PROD-RECO: priority | 7 |
| PROD-RECO: production plugin name | AtomicRun |
| PROD-RECO: run end, to set the end of the ... | 0 |
| PROD-RECO: run start, to set the start run | 0 |

1. Application Managers generate application steps: a job step description
2. Simulation Managers link steps together, creating production requests
3. Physics WG make request for given even types by using a model and selecting the event type

4. Production Managers submit the production requests, monitored by the production team



LHCbDirac Production System cont.



Production requests description becomes workflows, and then DIRAC jobs, executed on the available computing resources.

Productions are extended, and closed automatically when the requested events are produced (elastic grid jobs)

see F. Stagni, "Jobs masonry with elastic Grid Jobs"

Track #4 (Distributed Computing), Session #2, on Mon. 13th



MC requests workflow



Physics WG Liaison

Collects needs and submit requests

[New/Submitted](#)

MC requests workflow



Physics WG Liaison

Collects needs and submit requests

New/Submitted

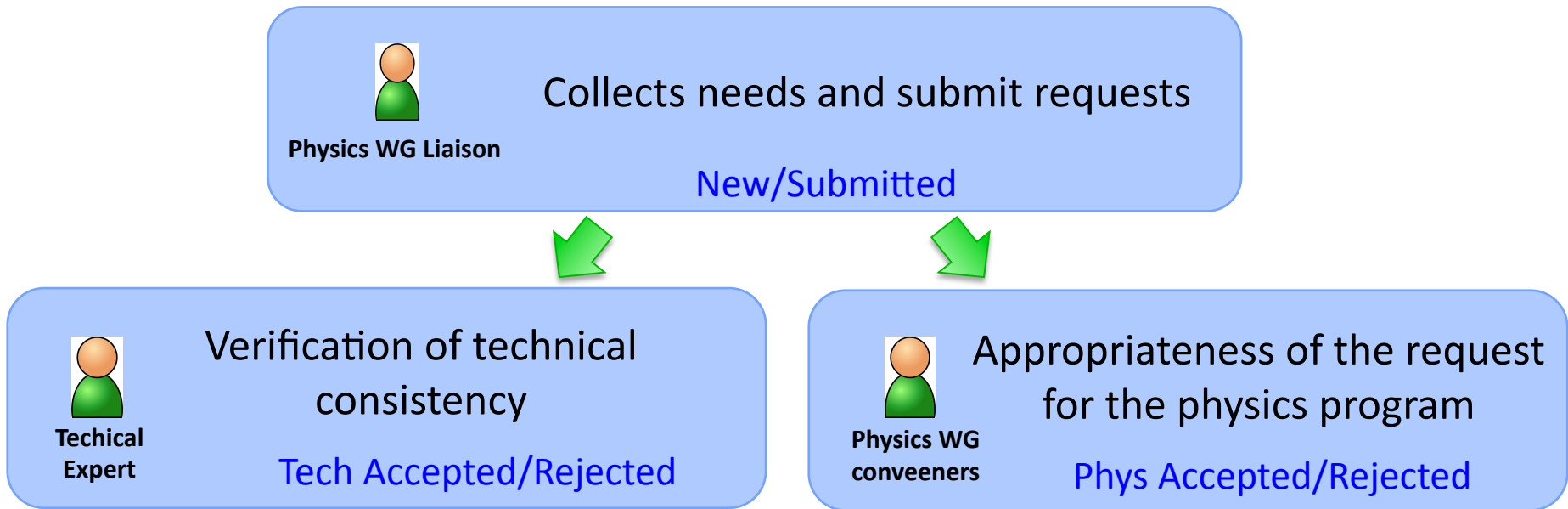


Technical
Expert

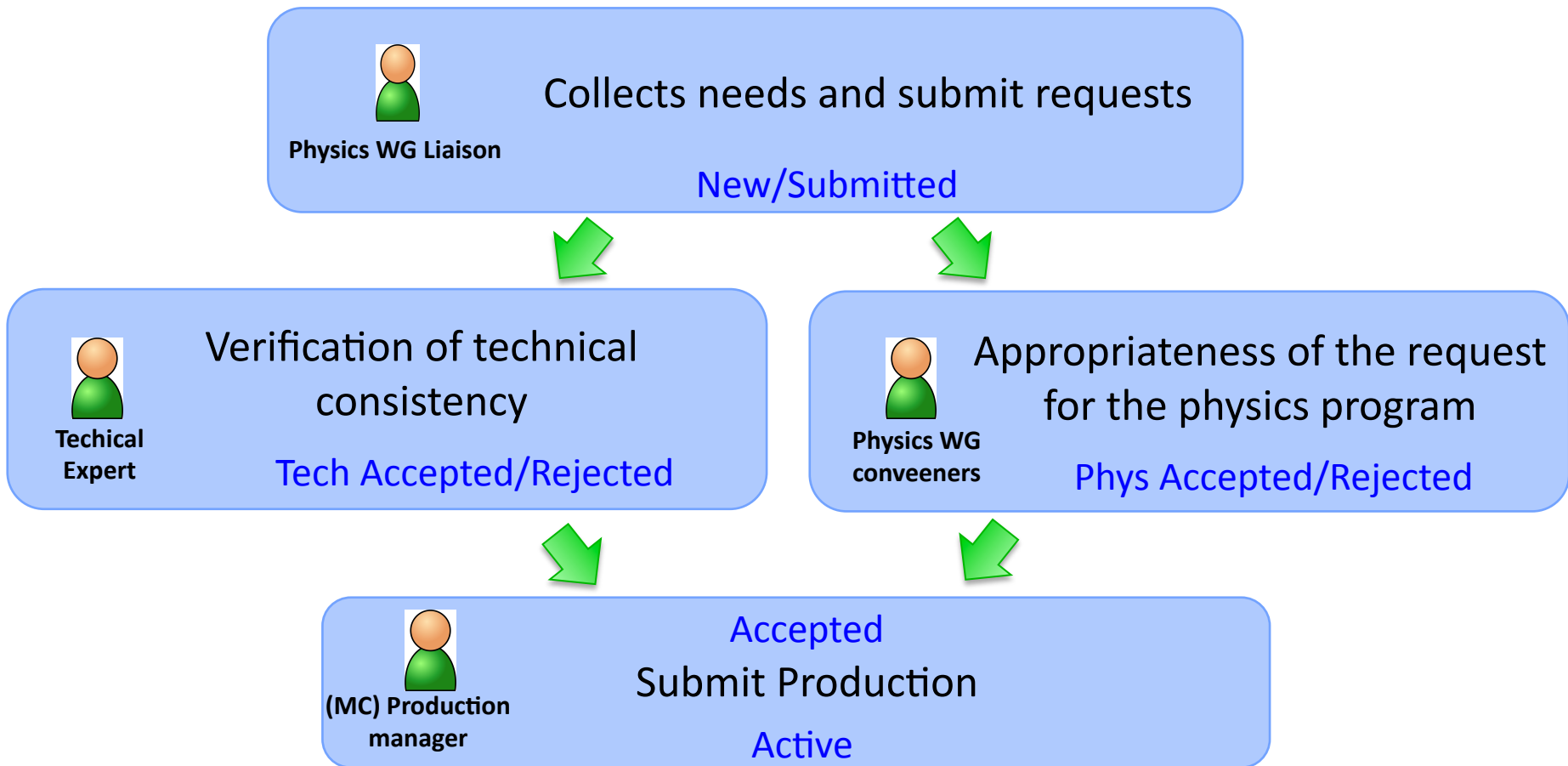
Verification of technical
consistency

Tech Accepted/Rejected

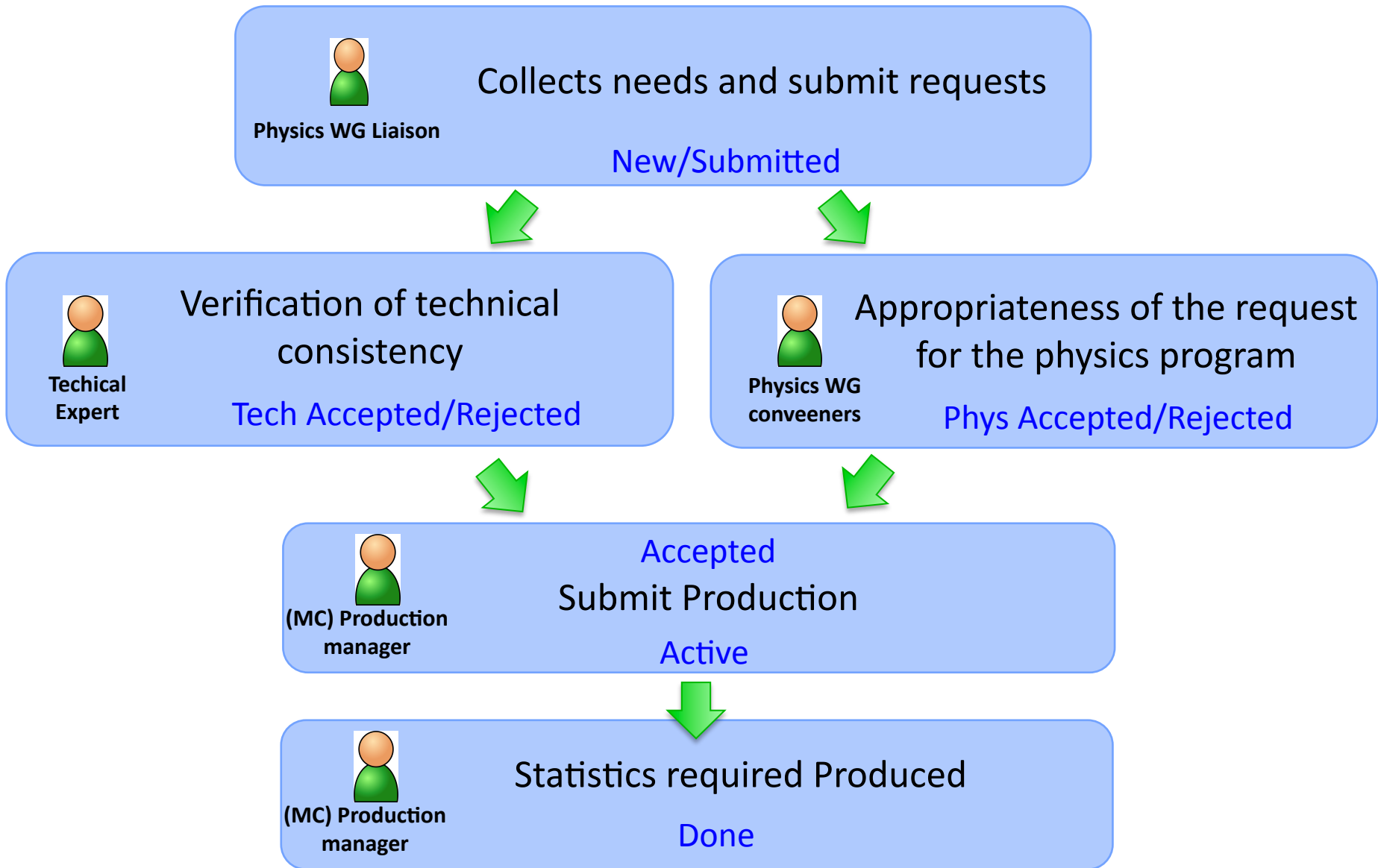
MC requests workflow



MC requests workflow

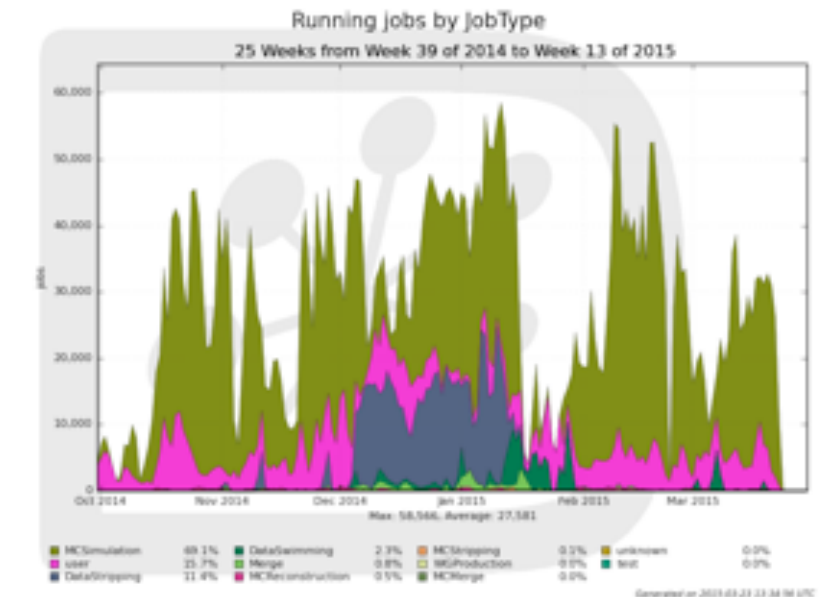


MC requests workflow



Priorities

- Relevance and urgency of a production request are evaluated by the Physics WG group conveners
- The MC production manager does final verification with small statistics to verify the request can be processed. The size of the jobs is determined automatically
- With both information the MC production manager checks the computing resources available and gives priority to the various requests for Monte Carlo samples
 - Taking also into account processing activities for real data



Finding MC datasets

The metadata information of the tasks executed on the Grid will be uploaded to the Bookkeeping Metadata catalog at the end of the job as provenance of the data

The whole of LHCb has access to all MC samples via the Bookkeeping

Bookkeeping tree

SimConditions first

- MC
 - 2009
 - 2010
 - 2011
 - 2012
 - Beam4000GeV-2012-MagDown-Nu2.5-BcVegPy
 - Beam4000GeV-2012-MagDown-Nu2.5-Powheg
 - Beam4000GeV-2012-MagDown-Nu2.5-Pythia6
 - Beam4000GeV-2012-MagDown-Nu2.5-Pythia8
 - Beam4000GeV-2012-MagUp-Nu2.5-BcVegPy
 - Beam4000GeV-2012-MagUp-Nu2.5-Powheg
 - Beam4000GeV-2012-MagUp-Nu2.5-Pythia6
 - Beam4000GeV-2012-MagUp-Nu2.5-Pythia8
 - Beam4000GeV-2012-MagUp-Nu2.5-Pythia8
 - Beam4000GeV-Apr2012-MagDown-Fix1-EmNoCuts
 - Beam4000GeV-Apr2012-MagDown-Nu2-EmNoCuts
 - Beam4000GeV-JulSep2012-MagDown-Nu2.5-EmNoCuts
 - Beam4000GeV-JulSep2012-MagDown-Nu2.5-EmNoCuts-BcVegPy
 - Beam4000GeV-JulSep2012-MagUp-Nu2.5-EmNoCuts
 - Beam4000GeV-JulSep2012-MagUp-Nu2.5-EmNoCuts-BcVegPy
 - Beam4000GeV-MayJune2012-MagDown-Nu2.5-EmNoCuts
 - Beam4000GeV-MayJune2012-MagDown-Nu2.5-EmNoCuts-BcVegPy
 - Beam4000GeV-MayJune2012-MagUp-Nu2.5-EmNoCuts
 - Beam4000GeV-MayJune2012-MagUp-Nu2.5-EmNoCuts-BcVegPy
 - 2013
 - Dev
 - Upgrade

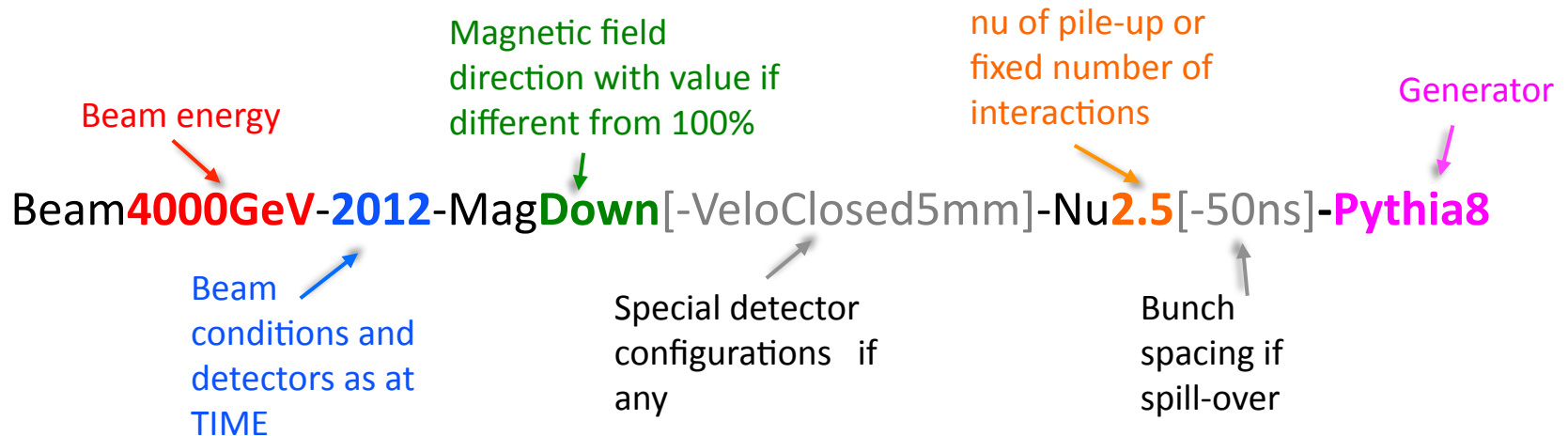
Bookkeeping tree

Event type first

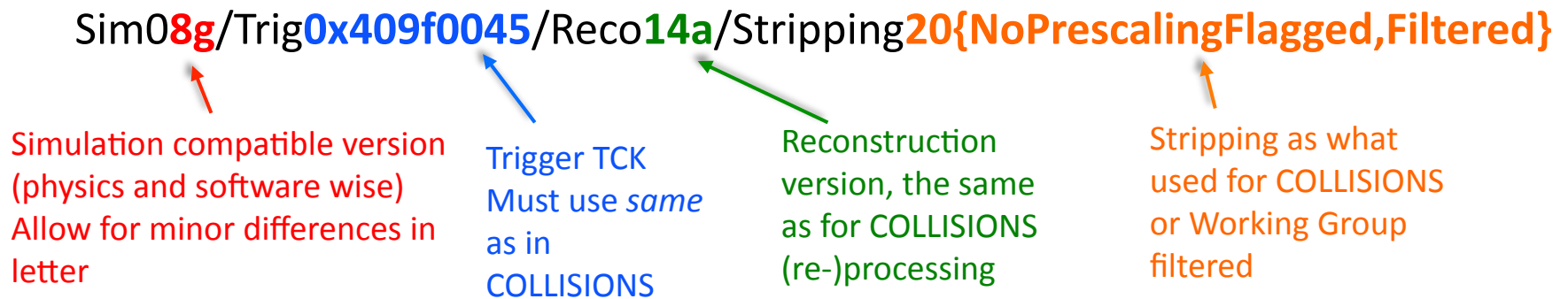
- MC
 - 2009
 - 2010
 - 2011
 - 2012
 - 10000000 (incl_b)
 - Beam4000GeV-2012-MagDown-Nu2.5-Pythia6
 - Sim08a
 - Digi13
 - Trig0x409f0045
 - Reco14a
 - Stripping20NoPrescalingFlagged
 - Beam4000GeV-2012-MagDown-Nu2.5-Pythia8
 - Beam4000GeV-2012-MagUp-Nu2.5-Pythia6
 - Beam4000GeV-2012-MagUp-Nu2.5-Pythia8
 - 10000025 (incl_b=Biased2BinAcc,powheg)
 - 10002202 (incl_b=KKGammaX)
 - 10002212 (incl_b=KpiGammaX)
 - 10011001 (incl_b=MuonHighPTForceB)
 - 10012008 (incl_b=DiMuon,OppositeSign,p3GeV,m4.7GeV,m6GeV)
 - 10012009 (incl_b=DiMuon,OppositeSign,p3GeV,m4.7GeV,m6GeV,doca0.4mm,PtProd)
 - 10012011 (incl_b=DiMuon,OppositeSign,p3GeV,m4.7GeV,m6GeV,doca0.4mm,HighPtProd)
 - 10012013 (incl_b=DiMuon,tau23mu_cuts)
 - 11100001 (Bd_Kst0rho0,KsPi0pi+pi-=DecProdCut)
 - 11100003 (Bd_Kspi+pi-gamma=DecProdCut)
 - 11102001 (Bd_K+pi-=DecProdCut)

... and their details

■ in the Simulation Conditions



■ and in the Processing Pass



Conclusions

- Conventions and procedures are implemented in LHCb to handle Monte Carlo productions centrally and in a transparent way
 - LHCb standard tools and common computing infrastructures used throughout the whole
 - Automatisation and tracking between the steps
 - Unique numerical identifier of Monte Carlo event types through all the steps of software deployment and productions is a major key element
- Experts concentrate on their task
 - Physicist and software simulation experts on configuration of application
 - Production team on job submission and follow-up and data storage
- Allows for **massive** transparent and efficient **production** on a world-wide distributed system **with very little manpower**
 - One part time MC production manager
 - Minimal time of three simulation software experts

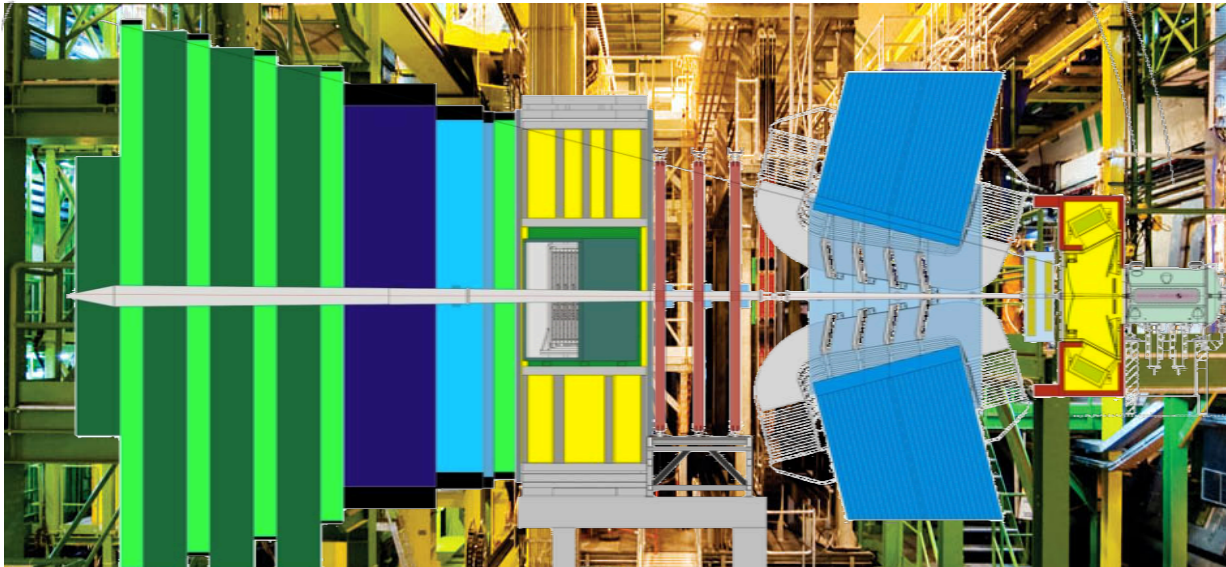
BACKUP



LHCb

- Designed to search for New Physics through precision measurement of CP violation and Rare Decays of heavy flavours at the LHC
 - Initial aim of LHCb was b-physics but also doing charm and QCD physics
- Trigger and reconstruct many different decay modes to make independent and complementary measurements

LHCb is a single arm forward spectrometer



Forward production of $b\bar{b}$, correlated

$12 \text{ mrad} < \theta < 300 \text{ (250) mrad}$

i.e. $2.0 < \eta < 4.9$

EventType and options

- Eight digits number of type “**GSDCTNXU**” to **uniquely identify** each decay file, associated options and samples produced
 - Convention and extensions established and documented in LHCb notes:
 - First six numbers describe the decay and the last two distinguish between similar decays
- G:** General event type and production scheme.
 - S:** Value based on the presence of certain particles.
 - D:** Number depends on the general features of the decay.
 - C:** Based on the number of charm hadrons and leptons.
 - T:** Number of stable charged particles: p , π , K , e and μ .
 - N:** Number of neutrals : K_S , Λ , K_L , γ , n , π and ν .
 - X:** Used to distinguish between different decays that share the same first 6 digits
 - U:** Used to distinguish between the same decay, but different model, cuts, options
- Need to extend to 10 digits: ensure migration to new extended schema for old samples