Common Backgrounds

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Snowmass NP bi-weekly meeting

Contributors:

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Common Backgrounds

- At the UCI meeting, we discussed strategy for generating large backgrounds with the computing group (L. Bauerdick)
- Since then, we mounted a concerted effort to setup a LHE production environment on the Open Science Grid, using opportunistic cycles.
    - Peak (~100M events/day)
    - Average (~30M events/day)
- We also setup methods for distribution of these files
    - not an easy task due to the amount of resources needed, coupled with the security of the systems

Production Steps

- Generate 10-100 million events per background with <u>Madgraph</u>
  - This is the some CPU consuming step
  - use gridpacks (generated by S. Padhi)
- Use <u>Pythia</u> for fragmentation and hadronization
  - matching efficiency is around 25-40%, so about 2.5-25M events for further analysis
- Perform fast reconstruction with <u>Delphes</u>
  - A single "LHC-like" detector
- Make resulting MC accessible to anyone

Current Status of LHE production

- ## background processes:

Process	directory name	13 TeV	33TeV
ttbarJets - 0, 1,2,3	TTBAR	127	202
W(-> lnu)Jets - 0,1,2,3,4	WJETS	157	124
Z(-> l+l-)Jets - 0,1,2,3,4	ZJETS		
WWJets (single+dilepton modes) - 0,1,2	WWJETS	127	127
WZJets (W -> l nu with leptonic decay) - 0,1,2	WZJETS	31	126
ZZJets (Z -> l+ l- (nu nu); Z-> all) - 0,1,2	ZZJETS	57	64
W(-> l nu)GammaJets - 0,1,2	WGJETS	111	108
Z(->l+ l-)GammaJets - 0,1,2	ZGJETS	105	107
Photon + Jets - 0,1,2,3,4	PHOTONJETS	97	98
DiPhoton + Jets - 0,1,2	DIPHOTONS	85	108

Current Status of LHE production

- ## background processes:
  - ### just started

Process	directory name
WZ -> lllnu	WZ3LNUJETS
ZZ -> llll	ZZ4LJETS
same-sign W pair + 2 jets, both W's -> lnu	SSWWJETS
WWW	WWW
ttbarW	TTBARW
ttbarZ	TTBARZ
ttbarWW	TTBARWW
ZZZ	ZZZ
WWZ	WWZ
WZZ	WZZ

Fast Reconstruction : DELPHES

- Recipe:
  - developed by Hirschauer, Padhi, Stupak
  - http://www.snowmass2013.org/tiki-index.php?page=Energy_Frontier_FastSimulation
  - includes common detector and pileup scenarios, provided 4/21/13 by Technical Team coordinator S. Padhi

  - Generic LHC-like detector
  - Pileup mixing
    - $<n_{PU}>$ = 0,50, 140
  - Using slightly modified version of Delphes-3.0.6
    - Default version produces artificial spikes in the jet η distribution
    - Also modified to reduce output size
- QCUT=40 for ttbar and 20 for all other backgrounds.
  - volunteers to tune this value?

Fast Reconstruction : DELPHES

- Since BNL effort devoted in validating DELPHES with large samples.
- Found a few issues which were fixed with promptly by the DELPHES team
  - mostly with jets and some other issues
- Also effort to

Many thanks to:
Jim Hirschauer
John Stupak
Sanjay Padhi
the Delphes team

  - include information about boosted objects, jet substructure
  - reduce output size (x3), due to limited storage
    - still the file size is 100kb/delphes event.

Fast Reconstruction : DELPHES

John Stupak
Sanjay Padhi
and
the OSG team

- Will require about 30-40 TB for the backgrounds.
  - or possibly more?
    - this is an issue we need to figure out. Currently at UNL we only have 2TB and at BNL we have a 10TB quota. More @FNAL/LPC.
- Took a while to iron out issues to run Delphes on OSG with non-zero pileup sceanrios.
  - the size of the pileup files
    - transfer to random Worker OSG nodes for processing takes time and is inefficient.
      - solution to stage the files to known "clusters" permanently.
    - exceeded local storage on worker nodes
      - nodes are configured for 10-40 GB
    - a probable solution provided over the last few days/weekend

Output Storage

- Writing Delphes output to FNAL, BNL, and UNL
  - Accessible via SRM, XRootD, and http

Index of /Snowmass/Delphes-3.0.6.1

[ICO]	Name	Last modified	Size	Description
[DIR]	Parent Directory		-	
[DIR]	50PileUp/	21-Apr-2013 19:28	-	
[DIR]	140PileUp/	21-Apr-2013 19:30	-	
[DIR]	NoPileUp/	21-Apr-2013 19:27	-	

Apache/2.2.15 (Scientific Linux) Server at red-gridftp11.unl.edu Port 80

  - Production by John Stupak, Sanjay Padhi, Meenakshi Narain
    - with help from the OSG team

Output Storage

- Writing Delphes output to FNAL, BNL, and UNL

Index of /Snowmass/Delphes-3.0.6.1/NoPileUp

[ICO]	Name	Last modified	Size	Description
[DIR]	Parent Directory		-	
[DIR]	DIPHOTONS_13TEV/	21-Apr-2013 21:43	-	
[DIR]	DIPHOTONS_33TEV/	21-Apr-2013 21:43	-	
[DIR]	PHOTONJETS_13TEV/	21-Apr-2013 21:47	-	
[DIR]	PHOTONJETS_33TEV/	21-Apr-2013 21:43	-	
[DIR]	TTBARJets_33TEV/	21-Apr-2013 21:47	-	
[DIR]	TTBAR_13TEV/	21-Apr-2013 21:43	-	
[DIR]	WGJETS_13TEV/	21-Apr-2013 21:48	-	
[DIR]	WGJETS_33TEV/	21-Apr-2013 21:43	-	
[DIR]	WJETS_13TEV/	21-Apr-2013 21:48	-	
[DIR]	WWJETS_13TEV/	21-Apr-2013 21:07	-	
[DIR]	WW_33TeV/	21-Apr-2013 21:43	-	
[DIR]	WZJETS_13TEV/	21-Apr-2013 21:42	-	
[DIR]	WZ_33TeV/	21-Apr-2013 21:47	-	
[DIR]	ZGJETS_13TEV/	21-Apr-2013 21:47	-	
[DIR]	ZGJETS_33TEV/	21-Apr-2013 21:43	-	
[DIR]	ZJETS_13TEV/	21-Apr-2013 21:48	-	
[DIR]	ZJETS_33TEV/	21-Apr-2013 21:10	-	
[DIR]	ZZJETS_13TEV/	21-Apr-2013 21:42	-	
[DIR]	ZZJETS_33TEV/	21-Apr-2013 21:43	-	
[DIR]	wjetsmad_33TEV/	21-Apr-2013 21:43	-	

Delphes output   Metadata

[ICO]	Name	Las
[DIR]	Parent Directory	
[ ]	TTBAR_13TEV_NoPileUp_49299.root	21-Ap
[TXT]	TTBAR_13TEV_NoPileUp_49299.txt	21-Ap
[ ]	TTBAR_13TEV_NoPileUp_366702156.root	21-Ap
[TXT]	TTBAR_13TEV_NoPileUp_366702156.txt	21-Ap

Apache/2.2.15 (Scientific Linux) Server at red-gridftp11.unl

4/22/13

10

Apache/2.2.15 (Scientific Linux) Server at red-gridftp11.unl.edu Port 80

DELPHES Output Storage

- Delphes MC samples are currently being stored at FNAL, BNL, and UNL.
  - At BNL and UNL, the data is accesible through SRM, XRootD, and http.
  - At FNAL, the data is is only accessible through SRM and XRootD.

- Example of the copy commands on
  http://snowmass2013.org/tiki-index.php?page=NPBackgroundSamplesTwiki

- **FNAL (requires grid certificate)**
  - SRM: srm://cmssrm.fnal.gov:8443/srm/managerv2?SFN=/11/store/user/snowmass
  - XRootD: root://cmssrv32.fnal.gov//store/user/snowmass

DELPHES Output

- **BNL (requires grid certificate)**
  - SRM: srm://dcsrm.usatlas.bnl.gov:8443/srm/managerv2?SFN=/pnfs/usatlas.bnl.gov/osg/snowmass
  - XRootD: root://dcdoor10.usatlas.bnl.gov:1094//pnfs/usatlas.bnl.gov/osg/snowmass
  - https://dcdoor10.usatlas.bnl.gov:2881/pnfs/usatlas.bnl.gov/osg/snowmass

- **UNL**
  - SRM srm://srm.unl.edu:8443/srm/v2/server?SFN=/mnt/hadoop/user/Snowmass
  - XRootD: root://red-gridftp11.unl.edu//mnt/hadoop/user/Snowmass
  - http://red-gridftp11.unl.edu/Snowmass

DELPHES Output

- Started the production of the Delphes output using the detector config and cards agreed upon by the technical team.

- The files are appearing on FNAL, UNL and BNL sites.

- Please try to access them, analyze/validate and report any issues to us
  snowmass-ef-cern@cern.ch

- We plan to have reasonable stats with PU=0 and PU=50 by the end of the week and PU=140 by the end of the month.
  - as of now: 1-2M events for 0 PU, ~0.5-1 for 50 PU, and ~0 for 140 PU
  - about 3-4 M events (corresponding to 10M-15M LHE events) for each subprocess and PU scenario (0, 50, 140) end of this week.
  - will continue to be populated..