Cafe Analysis Tutorial

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MSU workshop

Wiki Page: https://plone4.fnal.gov/P1/D0Wiki/caf/ManchesterCafeTutorial

- What you should know already
- What I'm going to cover
- Data Analysis
- Monte Carlo Analysis
- Other stuff

CAFÉ Tutorial
How to get what you need?

Michael Kirby
Radboud University, Nijmegen
NIKHEF

The bill of sale you just bought

- Drawing heavily on Gavin's Tutorial
- Things you should already know
  - CAF framework from Vancouver Tutorial
  - http://www-d0.fnal.gov/Run2Physics/cs/caf/docs/Tutorial-Vancouver.pdf
  - structure of processors, config file structure
- Will be working within the vjets_café package
- https://plone4.fnal.gov/P1/D0Wiki/physics/VplusJets/
- Tools, code, default configs are dynamic
  - once a week check to see if you are current updates listed here:
- Subscribe to d0cafusers & d0rug, read the Wiki's
  - look in the archives for past problems

Outline

- p21 Data - skims, datasets, etc.
- p20 MC - what's there, what's coming, how to get more
- Setting up a release
- Simple Analysis in VJets (surprise! $Z \rightarrow \mu\mu$)
  - Data Quality
  - Trigger
  - Object Corrections
  - Object Selection
- How to get your luminosity
- Building a processor
- Other tools to use with your CAFÉ output

Where's all that data?

- CSG P20 Pass 2 Data and MC Page
  - http://www-d0.fnal.gov/Run2Physics/cs/skimming/p20_pass2.html
- Use the command line sam interface to look up datasets
- CSskim-XXXXX-PASS2-p21.03.00-summer2007
- CSG_CAF_XXXXX_PASS2_p21.05.00_summer2007
- XXXXX is the skim name (2MUhighpt, EMinclusive, 3JET, etc)

```
<elst-clued0> setup sam
<elst-clued0> sam translate constraints --dim="dataset_def_name
CSG_CAF_2MUhighpt_PASS2_p21.05.00_summer2007"
Files:
  CAF-CSGv1-CSskim-2MUhighpt-20070412-120208-
5097329_p21.03.00_232749_p21.05.00.root
  CAF-CSGv1-CSskim-2MUhighpt-20070412-124136-
5097329_p21.03.00_232442_p21.05.00.root
  CAF-CSGv1-CSskim-2MUhighpt-20070323-074932-
4954289_p21.03.00_230929_p21.05.00.root
```

What MC samples are CAF'd?

- MC Request Page where you can get request IDs
- http://www-d0.fnal.gov/~snow/requests_v7_1.html
- CSG_CAF_MCv2-XXXXX_p21.06.00
  - XXXXX is request ID

```
<elst-clued0> setup sam
<elst-clued0> sam translate constraints --dim="dataset_def_name
CSG_CAF_MCv2_66676_p21.06.00"
Files:
   CAF-MCv2-66676-tmb_p20.08.02_NumEv-10000_gam-z+0lp-
mumu+0lp_n.unw_mcc99_mcp20_GridKaV7_66676-118086738132065-
JIM_MERGE_0_p21.06.00.root
   CAF-MCv2-66676-tmb_p20.08.02_NumEv-10000_gam-z+0lp-
mumu+0lp_n.unw_mcc99_mcp20_GridKaV7_66676-118086653126626-
JIM_MERGE_0_p21.06.00.root
```

What if something is missing?

- Talk to you local convener or MC rep
- For me, that's Michiel Sanders…

Samples for this tutorial:

- vjets_dataskim_2mu_v0_p21.05.00_summer2007
- CSG_CAF_MCv2-6667[6-9]_p21.06.00
  - new Alpgen Z + 0,1,2lp excl & 3lp incl samples
  - Current reco, zero bias overlay, etc.

Setting up a release

- Since we're working with p20 data/MC, we'll be using p21.06.00
- Instructions on VJets Starter page
  - VJets Wiki -> CAF Tools -> How to start using p21 cafe
  - https://plone4.fnal.gov/P1/D0Wiki/physics/VplusJets/CAFtools/How%20to%20start
- I've been using modified versions of Gavin's install scripts for a year now
- One to install (setup_once_vjets.csh), and one for all shells (setup_vjets.csh)
- http://www-clued0.fnal.gov/~kirby/MSU_tutorial/

Setting up your CAFÉ release

- setup caf_tools -t
- setup D0RunII p21.06.00 -O SRT_QUAL=maxopt
- newrel p21.06.00 p21_06_vjets
- cd p21_06_vjets
- d0setwa

- # using csh
- setenv PATH ${SRT_PRIVATE_CONTEXT}/shbin/${SRT_SUBDIR}/:${PATH}
- setenv LINK_SHARED y

- setup d0cvs
- cvs co -r p21-06-00 D0reldb/inventory
- autoroot.py tmb_tree cafe

- addpkg cafe_sam p21-br-02
- addpkg cafe p21-br-12 # NEW
- addpkg caf_util p21-br-20 # NEW May 24
- addpkg caf_mc_util p21-br-13 # NEW
- addpkg caf_dq v02-02-01 # NEW
- addpkg dq_util v02-02-01 # NEW
- addpkg dq_defs v2007-05-17 # NEW May 24
- addpkg caf_trigger p21-br-07 # NEW May 24
- addpkg emid_eff v5-preliminary # NEW
- addpkg muid_eff v04-00-01
- addpkg jetid_eff v01-01-02 # NEW
- addpkg jetcorr p21-br-05 # NEW May 24
- addpkg emid_cuts p21-br-03 # NEW
- addpkg vjets_cafe v00-09-05 # NEW May 24

- cp ~kirby/public_html/MSU_tutorial/top_cafe/src/VJetsPlots.cpp ./top_cafe/src/
- cp ~kirby/public_html/MSU_tutorial/top_cafe/src/VJetsPlots_linkdef.h ./top_cafe/src/
- cp ~kirby/public_html/MSU_tutorial/top_cafe/src/VJetsPlots_t.cpp ./top_cafe/src/
- cp ~kirby/public_html/MSU_tutorial/top_cafe/src/COMPONENTS ./top_cafe/src/
- cp ~kirby/public_html/MSU_tutorial/top_cafe/top_cafe/VJetsPlots.hpp ./top_cafe/top_cafe/
- cp ~kirby/public_html/MSU_tutorial/top_cafe/scripts/rootrc ./top_cafe/scripts
- cp ~kirby/public_html/MSU_tutorial/vjets_jobs.sh ./
- cp -R ~kirby/public_html/MSU_tutorial/MASTER_configs/ ./

- gmake > gmake.log

[~]source setup_once_vjets.csh

What just happened?

- checked out all needed packages with specified versions, compiled libraries, linked and built a version café (and a few other executables)
- Errors that don't seem to affect anything:

```
ERROR: multiply defined symbol: ranf_ ['libisajet.a', 'libpacklib.so']
ERROR: multiply defined symbol: _ZN7TMBMuon5ClassEv ['libcaf_trigger.a',
    'libtmb_tree.a']
ERROR: multiply defined symbol: __moddi3 ['libHist.so', 'libTreePlayer.so']
ERROR: multiply defined symbol: vzero_ ['libpacklib.so', 'libLHAPDF.a']
```

setup_vjets.csh

```
setup caf_tools -t
setup D0RunII p21.06.00 -O SRT_QUAL=maxopt
setup d0cvs
d0setwa
setenv PATH
   ${SRT_PRIVATE_CONTEXT}/shbin/${SRT_SUBDIR
   }:${PATH}
setenv LINK_SHARED y
```

In every new shell

[~/p21_06_vjets]>source ./setup_vjets.csh

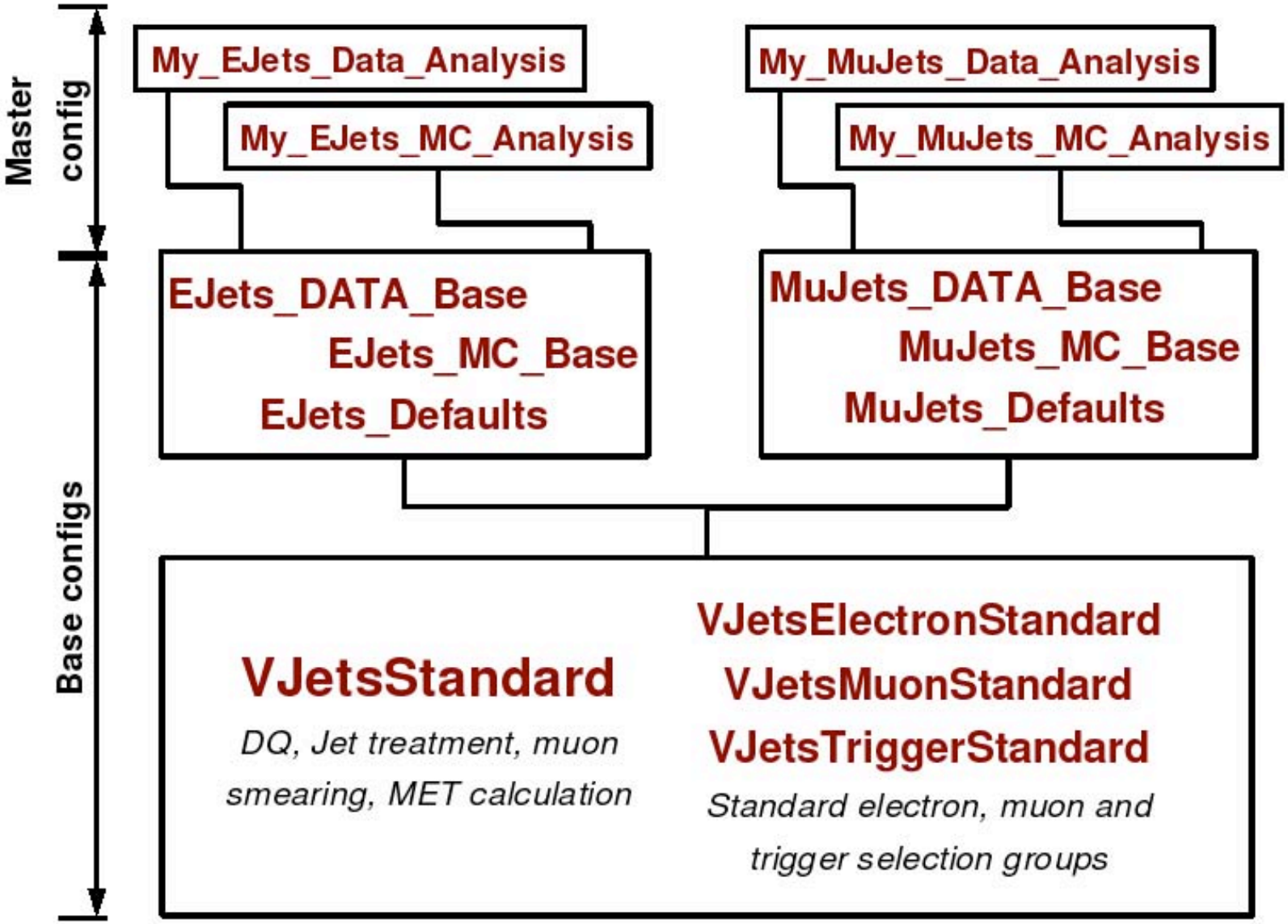
vjets_cafe

- For great overview, see Dag Gillberg's talk in Higgs workshop (June 14th)
- designed for l+jets and dilepton analyses
- works in both p17 and p20
- centralized Object corrections for data/MC
- No code, only config files, sample filelists, and some macros for common tasks

vjets_cafe contents

1. vjets_cafe/configs/ – main part of vjets_cafe
   Contains many config files which contain cafe Groups
   Each cafe Group perform a task (like appling JES or DQ)
   The Groups are then strung together in the analysis configs
2. vjets_cafe/filelists/ data filelists
3. vjets_cafe/docs/ **will** contain doumentation (under development)
4. vjets_cafe/scripts/ **will** contain helper scritps: AddProcessor.sh
5. vjets_cafe/macros/ helper plotting macros(?)

vjets_cafe config structure



data_z_mumu_tutorial.config

```
#########################################
#  master configuration file
# p21_06_vjets/MASTER_configs/data_z_mumu_tutorial.config
#  - this example is for di-muon DATA
#  - loose preselection
#  - inclusive jet multiplicity
#########################################

cafe.Packages:          caf_dq dq_util jetcorr emid_cuts tau_tmb caf_util
+cafe.Packages:          eff_utils caf_trigger caf_eff_utils top_cafe

cafe.Include:           vjets_cafe/configs/dilepton/DiMU_DATA_Base.config
+cafe.Include:          vjets_cafe/configs/mujets/MuJets_Defaults.config
+cafe.Include:          MASTER_configs/VJetsPlots.config

#cafe.Events:                          100
cafe.Progress:                         1000

 # Output file for histos etc.
cafe.Output:                   %{VJets.SampleName}_Histos.root
```

load libraries

include configs

report progress

filename for output

data_z_mumu_tutorial.config

```
#  ANALYSIS CHAIN
################################

cafe.Run:                          Group(DiMU_Data_Base)

  # Specify trigger selection
+BEGIN.Run:                        Group(DiMU_Triggers_%{VJets.RecoVer})

  # Possible to add to the BEGIN, CUTS and USER groups here

# Write the events that pass to file. Will be named %{VJets.SampleName}_Skim.root
#+USER.Run:                        Group(VJetsSaveOutput)

+USER.Run:                         ZMassSelector(zmass)
+USER.Run:                         Fork(postPlots)

################################
```

Specify analysis order

VJets "BEGIN" is part of each analysis chain

USER also always part of chain

To undertstand the analysis need to dig into DiMU_Data_Base Group…

DiMU_Data_Base.config

```
#######################################################
#
#   -- di-muon data base config --
#
#######################################################

+cafe.Include:          vjets_cafe/configs/VJetsStandard.config
+cafe.Include:          vjets_cafe/configs/VJetsTriggerStandard.config
+cafe.Include:          vjets_cafe/configs/VJetsElectronStandard.config
+cafe.Include:          vjets_cafe/configs/VJetsMuonStandard.config

#  PARAMETERS
#######################################################

  # Defaults for data
VJets.JSSR_UseUniformRemapping:          false
VJets.CorrectedJet_Branch:        %{VJets.JesJet_Branch}
VJets.MuonInput_Branch:        Muon
```

DiMU_Data_Base.config

```
# ANALYSIS CHAIN
DiMU_Data_Base.Run:                FindDuplicateEvents
+DiMU_Data_Base.Run:               Group(VJetsStat)
+DiMU_Data_Base.Run:               Group(VJetsDQ)

+DiMU_Data_Base.Run:               Group(BEGIN)

+DiMU_Data_Base.Run:               Group(PVforJES)
+DiMU_Data_Base.Run:               Group(VJetsJES)
+DiMU_Data_Base.Run:               Group(VJetsJetRemovalElectron)
+DiMU_Data_Base.Run:               Group(VJetsJetSelection)

+DiMU_Data_Base.Run:               Group(VJetsMuIsoJets)
+DiMU_Data_Base.Run:               Group(VJetsLooseMuon)

+DiMU_Data_Base.Run:               Group(VJetsVertexSelection)
+DiMU_Data_Base.Run:               Group(VJetsMet)
+DiMU_Data_Base.Run:               Group(VJetsMetSelection)

+DiMU_Data_Base.Run:               Group(CUTS)
+DiMU_Data_Base.Run:               Group(USER)

##########################################################
```

To understand Group need to look in other included config files

VJetsStandard.config

CONTENTS

A. Global Parameters
B. Object/Event Selection
1. Jet Selection
2. Event Quality
3. Vertex Selection
4. Vertex for JES Selection
5. MET Selection
C. Object Corrections
1. Muon Smearing
2. Jet removal electron selection
3. JES correction
4. Jet smearing
5. JetID efficiency & removal
6. Jet Controller
7. b-fragmentation
8. Z-pT reweighting
D. Missing ET Calculation
1. EMs for MET
2. Jets for MET
3. Muons for MET
4. Deriviation of the corrected MET
5. Calculation of METsignificance

E. Groups
1. MC Object correction group
2. User Groups
3. Saving events to file
4. Saving the event weights
5. Reading the event weights
6. Example analyis chain

File Structure

VJetsStandard.config

```
#  - B.2 - Event Quality
#######################################################

VJetsDQ.Run:                CafeDataQualityProcessor(data_qual)
data_qual.mode:             Data
data_qual.dqdef:            dq_defs/common/example.dqdef

VJetsDQMC.Run:              CafeDataQualityProcessor(mc_qual)
mc_qual.mode:               MonteCarlo
mc_qual.dqdef:              dq_defs/common/example.dqdef

DQEJets.Run:                CafeDataQualityProcessor(data_ejets_qual)
data_ejets_qual.mode:Data
data_ejets_qual.dqdef:      dq_defs/common/example.dqdef

VJetsDQMuJets.Run:          CafeDataQualityProcessor(data_mujets_qual)
data_mujets_qual.mode:      Data
data_mujets_qual.dqdef:     dq_defs/common/example.dqdef
```

Data Quality

VJetsStandard.config

```
cafe.PartialReads:                    false
VJets.JetAlgo:                        JCCB
#VJets.JetAlgo_Number:                2    # 1=JCCA, 2=JCCB
VJets.JetAlgo_ConeSize:               0.5
VJets.JesJet_Branch:                  CorrMu%{VJets.JetAlgo}
VJets.SmearedJet_Branch:              %{VJets.JesJet_Branch}Kept
VJets.GoodJet_Branch:                 Good%{VJets.JetAlgo}
VJets.RejectedJet_Branch:             Rejected%{VJets.JetAlgo}
VJets.MatchedJet_Branch:              Matched%{VJets.JetAlgo}
# threshold for considering jets as reconstructed (a-la JSSR):
VJets.JetThreshold:                   15
VJets.JetRemovalEM_Branch:            JetRemovalElectron
VJets.JetRemovalEM_Pt:                15.0
VJets.JesMuon_Branch:                 JesMuon
VJets.Vertex_Branch:                  GoodVertex
VJets.MET_Branch:                     CorrMet
VJets.MetEM_Branch:                   MetEM
VJets.MatchedJetForMet_Branch:        MatchedForMet%{VJets.JetAlgo}
VJets.MetJet_Branch:                  Met%{VJets.JetAlgo}
VJets.MetMuon_Branch:                 MetMuon
VJets.ObjectTree:                     TMBTree
VJets.TempTree:                       TempTree
```

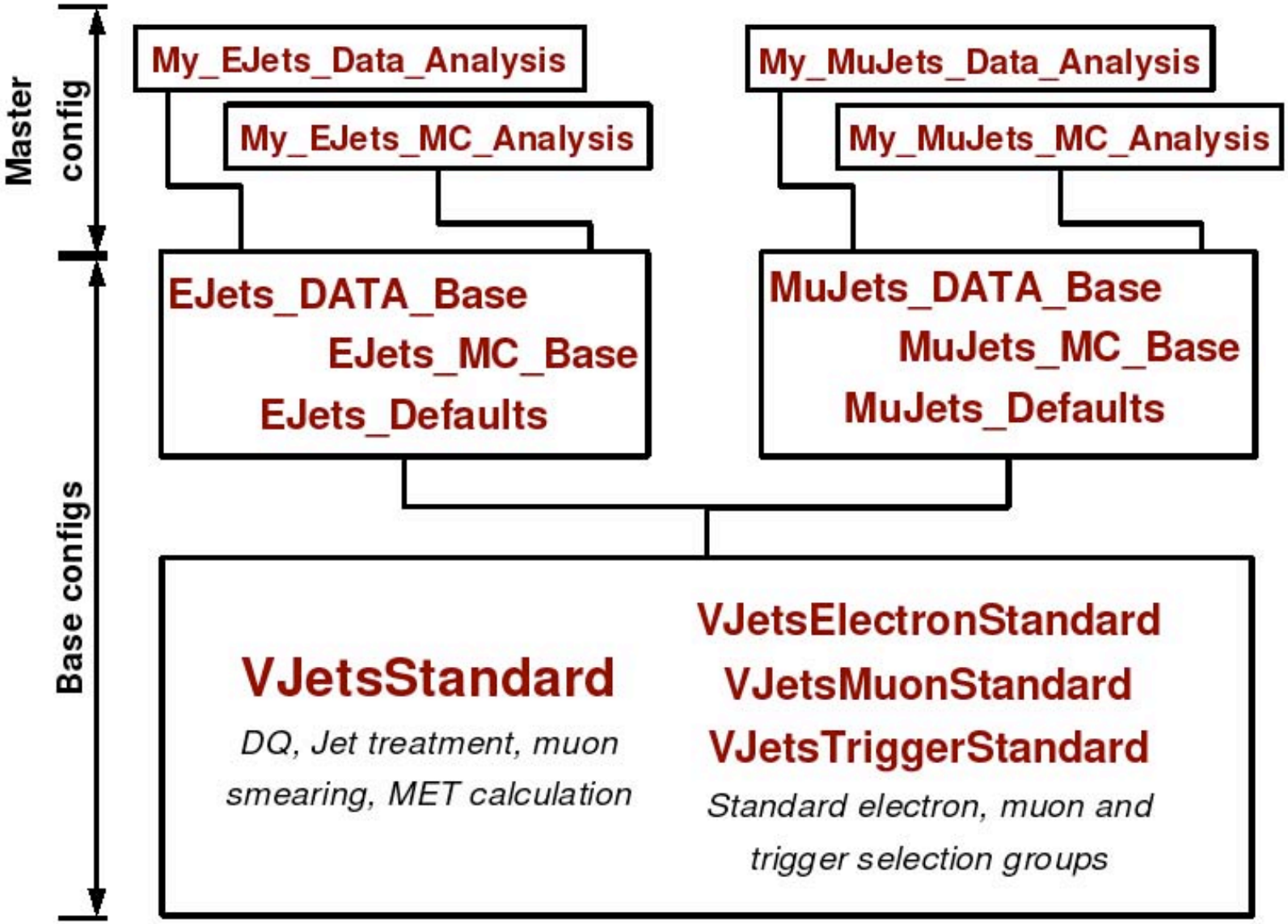
Global Defaults

MuJets_Default.config

```
# Jets -- Nmin, Nmax and pT must be defined in master config!
VJets.GoodJet_etaCut:          10
VJets.GoodJet_detEtaCut:       2.5
 # Muon default parameters - many more in master config
VJets.LooseMuon_Branch:        LooseMuon
VJets.LooseMuon_NoHole:        false
VJets.TightMuonInput_Branch:   %{VJets.SignalMuon_Branch}
VJets.TightMuon_Branch:        TightMuon
VJets.VetoMuon_Branch:         VetoMuon
VJets.MuonCorr_IsoQuality:     iso_TopP14
 # Standard vertex parameters
VJets.Vertex_AbsZmax:          60 # (cm)
VJets.Vertex_NminTracks:       3
VJets.Vertex_EM_DeltaZ:        -1
VJets.Vertex_EMBranch:         no_electron
VJets.Vertex_Muon_DeltaZ:      1
VJets.Vertex_MuonBranch:       %{VJets.SignalMuon_Branch}
```

Default values needed even if processors not run

vjets_cafe config structure



data_z_mumu_tutorial.config

```
# SELECTION PARAMETERS
################################
VJets.InputJet_Branch:        %{VJets.JetAlgo}
VJets.RecoVer:                p20

#VJets.GoodJet_PtCut:         15.0
VJets.GoodJet_Nmin:           0
VJets.GoodJet_Nmax:           -1
# Branch for vetex matching, tight muon selection, trigger matching etc.
VJets.SignalMuon_Branch:      %{VJets.LooseMuon_Branch}
VJets.LooseMuon_Quality:      MediumNSeg3
VJets.LooseMuon_TrkQuality:   Medium
VJets.LooseMuon_IsoQuality:   TopScaledLooseDeltaR
VJets.LooseMuon_Pt:           15
VJets.LooseMuon_Eta:          2.0
VJets.LooseMuon_Nmin:         2
VJets.LooseMuon_Nmax:         -1  # no cut
VJets.LooseMuon_NoHole:       false

VJets.Met_Min:                0
VJets.Met_Max:                -1
```

Will set this selection on the command line

Set Muon selection cuts here in master config

for now, look in top_café/muid_cuts/

data_z_mumu_tutorial.config

ZMassSelector is a processor from top_cafe

```
+USER.Run:              ZMassSelector(zmass)

zmass.LeptonType: Muon
zmass.Branch1: %{VJets.LooseMuon_Branch}
zmass.Branch2: %{VJets.LooseMuon_Branch}
zmass.Veto: false
zmass.MinZMass: 70.
zmass.MaxZMass: 110.
zmass.DoGridSearch: true
```

Can use two branches (tight and loose branch)

VJetsPlots.config

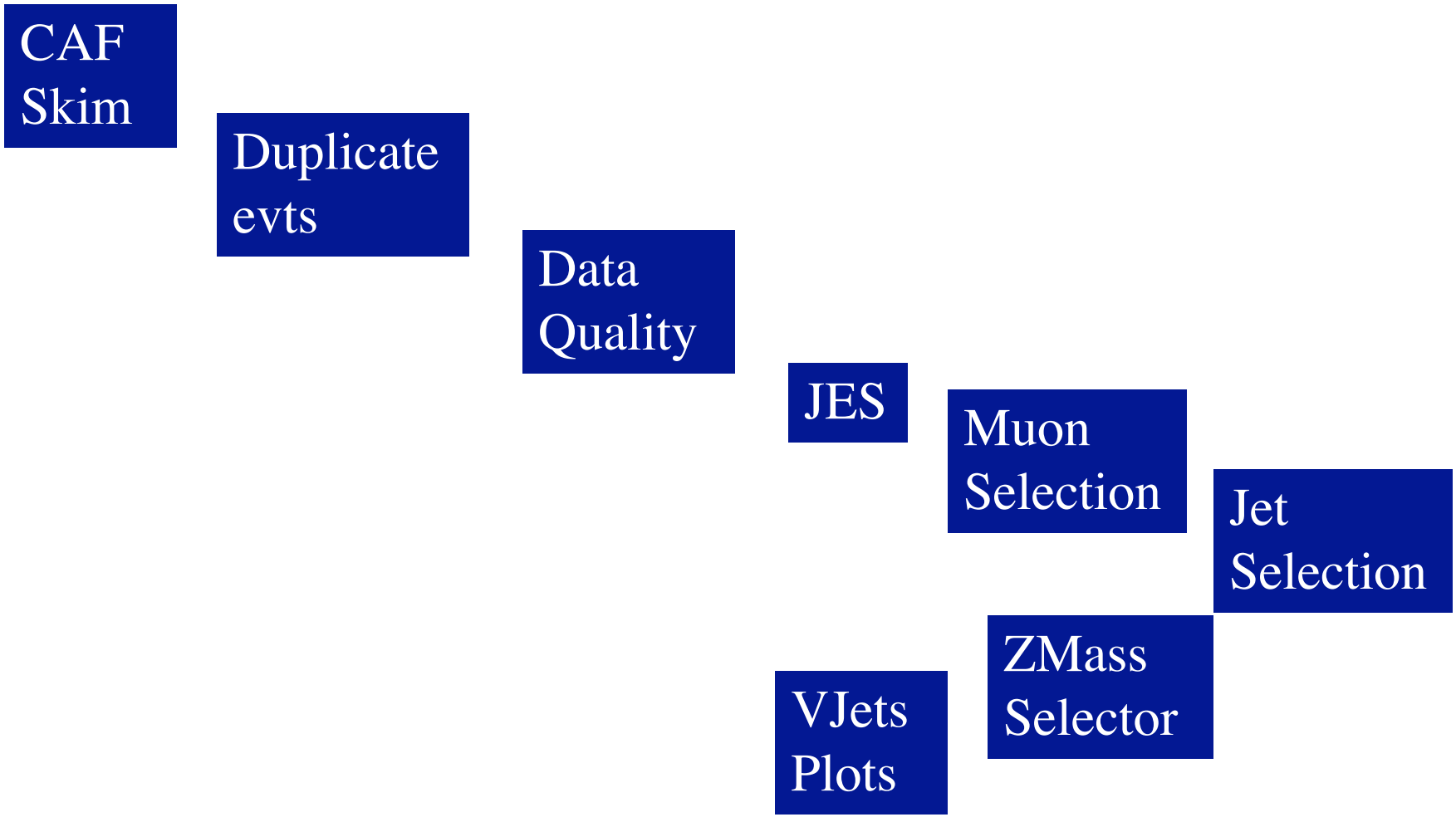
+USER.Run: Fork(postPlots) ← data_z_mumu_tutorial.config

```
postPlots.Run: Group(postInclJets) Group(postZeroJets) Group(postOneJet)
Group(postTwoJets)

+postInclJets.Run: VJetsPlots(postInclJetsPlots)
postInclJetsPlots.JetBranch: %{VJets.GoodJet_Branch}
postInclJetsPlots.EMBranch: %{VJets.VetoEM_Branch}
postInclJetsPlots.MuonBranch: %{VJets.LooseMuon_Branch}
postInclJetsPlots.VertexBranch: %{VJets.Vertex_Branch}
postInclJetsPlots.MyDirectory: post_InclJetPlots

+postZeroJets.Run: NJetsCut(postzerojets) VJetsPlots(postZeroJetPlots)
postzerojets.JetBranch: %{VJets.GoodJet_Branch}
postzerojets.nJetsMin: 0
postzerojets.nJetsMax: 0
postZeroJetPlots.JetBranch: %{VJets.GoodJet_Branch}
postZeroJetPlots.EMBranch: %{VJets.VetoEM_Branch}
postZeroJetPlots.MuonBranch: %{VJets.LooseMuon_Branch}
postZeroJetsPlots.VertexBranch: %{VJets.Vertex_Branch}
postZeroJetPlots.MyDirectory: post_ZeroJetPlots
```

A Fork sends all events into parallel processors for analysis

This configures a processor in top_café/src/VJetsPlots.cpp

Visualisation



Making a Processor

- This is where you have to do the work
- Scripts available to help make processor
- top_café/scripts/AddProcessor.sh package_name ProcessorName
- vjets_café will shortly have its own version of this
- Creates a skeleton .cpp, .hpp, linkdef.h and _t.cpp files in ${package_name}
- Also modifies COMPONENTS, rootrc, etc. for compilation and linking

Job submission (vjets_job.sh)

change output dir

```
#!/bin/sh
DATE=`date +%d%m%Y`
if [ -d /work/elst-clued0/kirby/p21_outdir/$DATE ]
then
   echo "Output directory already exists. No problem..."
   echo ""
else
   echo "Making output directory $DATE"
   mkdir /work/elst-clued0/kirby/p21_outdir/$DATE;
fi
outdir=/work/elst-clued0/kirby/p21_outdir/$DATE/

name=vjets_dimu_skim; echo "Definition $name ";
runcafe -clued0 -cput=2:00:00 -mem=500mb -outdir=${outdir} -name=${name} -
def=vjets_dataskim_2mu_v0_p21.05.00_summer2007 -outfiles='
cafe.out cafe.err *.html *.root' -- ./MASTER_configs/data_z_mumu_tutorial.config "eff.Output:
${name} eff.TexTitle: ${name} VJets.Samp
leName: ${name} VJets.GoodJet_PtCut: 15"
```

Job submission (vjets_job.sh)

```
runcafe -clued0                Where is it going to run
-cput=2:00:00                  How long is it going to run
-mem=500mb                     How much memory
-outdir=${outdir}
-name=${name}
-def=vjets_dataskim_2mu_v0_p21.05.00_summer2007 set the dataset
          could also be a filelist for CAF files on disk
-outfiles='cafe.out cafe.err *.html *.root'      What to copy back over to outdir
 -- ./MASTER_configs/data_z_mumu_tutorial.config
"eff.Output: ${name} eff.TexTitle: ${name} VJets.SampleName: ${name}
VJets.GoodJet_PtCut: 15"
```

A quick aside about triggers…

- DiMU_Triggers_p20.Run: Trigger(vjets_dimu_triggers_p20)

- # All single muon triggers will be included in the OR (from D0 TSG Wiki page)
- vjets_dimu_triggers_p20.Triggers: MUHI1_ITLM10 MUHI1_TK12_TLM12
- +vjets_dimu_triggers_p20.Triggers: MUHI1_ILM15 MUHI2_ITLM10
- +vjets_dimu_triggers_p20.Triggers: MUHI2_TK12_TLM12 MUHI2_ILM15

- # All dimuon triggers (from D0 TSG Wiki page)
- +vjets_dimu_triggers_p20.Triggers: DMU1_1L1MM2 DMU1_2LM0MM0TLM3
- +vjets_dimu_triggers_p20.Triggers: DMU1_LM6_TK12 DMU1_TK10_2LM3
- +vjets_dimu_triggers_p20.Triggers: DMU1_ITK10_ILM6 DMU1_TK8_TLM8
- +vjets_dimu_triggers_p20.Triggers: DMU1_2LM6 DMU1_2TK3TK5TLM3
- +vjets_dimu_triggers_p20.Triggers: DMU2_1L1MM2 DMU2_2LM0MM0TLM3
- +vjets_dimu_triggers_p20.Triggers: DMU2_LM6_TK12 DMU2_TK10_2LM3
- +vjets_dimu_triggers_p20.Triggers: DMU2_ITK10_ILM6 DMU2_TK8_TLM8
- +vjets_dimu_triggers_p20.Triggers: DMU2_2LM6 DMU2_2TK3TK5TLM3
- +vjets_dimu_triggers_p20.Triggers: DMU4_1L1MM2 DMU4_2LM0MM0TLM3

Having an OR'd trigger is intimately intertwined with your lumi determination and efficiency

Moving on to MC

- Switch over to vjets_cafe MC processors
  - Data Quality
  - Muon ID efficiency
  - JES
  - Z pt reweighting
- Most things stay the same…

mc_z_mumu_tutorial.config

```
##########################################

cafe.Packages:          caf_dq dq_util jetcorr emid_cuts tau_tmb caf_util
+cafe.Packages:         eff_utils caf_trigger caf_mc_util caf_eff_utils top_cafe

cafe.Include:           vjets_cafe/configs/dilepton/DiMU_MC_Base.config
+cafe.Include:          vjets_cafe/configs/mujets/MuJets_Defaults.config
+cafe.Include:          MASTER_configs/VJetsPlots.config

#cafe.Events:                          300000
cafe.Progress:                         1000

  # Output file for histos etc.
cafe.Output:                           %{VJets.SampleName}_Histos.root
```

mc_z_mumu_tutorial.config

```
#  ANALYSIS CHAIN
################################

cafe.Run:                          Group(DiMU_MC_Base)


 # Saving of all event weights
+USER.Run:                         Group(VJetsZPtReWeight)
+USER.Run:                         Group(VJetsSaveWeights)
+USER.Run:                         ZMassSelector(zmass)
+USER.Run:                         Fork(postPlots)

################################
#  SELECTION PARAMETERS
################################

VJets.InputJet_Branch:        %{VJets.JetAlgo}
VJets.RecoVer:                              p20
```

Config p17Pythia or p17Alpgen

DiMU_MC_Base.config

```
#  ANALYSIS CHAIN
#################################################

DiMU_MC_Base.Run:                    Group(VJetsDQMC)
+DiMU_MC_Base.Run:                   FindDuplicateEvents
+DiMU_MC_Base.Run:                   Group(VJetsStat)

+DiMU_MC_Base.Run:                   Group(BEGIN)

+DiMU_MC_Base.Run:                   Group(VJetsObjectCorrection)

+DiMU_MC_Base.Run:                   Group(VJetsMuIsoJets)
+DiMU_MC_Base.Run:                   Group(VJetsLooseMuon)
#+DiMU_MC_Base.Run:                  Group(VJetsTightMuon)
#+DiMU_MC_Base.Run:                  Group(VJetsVetoElectron)
#+DiMU_MC_Base.Run:                  Group(VJetsVetoMuon)

+DiMU_MC_Base.Run:                   Group(VJetsVertexSelection)
+DiMU_MC_Base.Run:                   Group(VJetsMet)
+DiMU_MC_Base.Run:                   Group(VJetsMetSelection)

+DiMU_MC_Base.Run:                   Group(CUTS)
+DiMU_MC_Base.Run:                   Group(VJetsMuonCorr_%{VJets.RecoVer})
+DiMU_MC_Base.Run:                   Group(USER)
```

VJetsStandard.config

```
VJetsObjectCorrection.Run:        Group(VJetsMuSmear)
+VJetsObjectCorrection.Run:       Group(VJetsJetRemovalElectron)
+VJetsObjectCorrection.Run:       Group(VJetsJES)
+VJetsObjectCorrection.Run:       Group(VJetsJSSR)
+VJetsObjectCorrection.Run:       Group(VJetsRemoveMCJets)
+VJetsObjectCorrection.Run:       Group(VJetsJetSelection)
```

Does most of the object corrections for you

Don't use this as a black box, make sure that the groups called are configured the way you want

(medium muons, smearing parameters,)

MC Job submission (vjets_job.sh)

```
runcafe -clued0                Where is it going to run
-cput=2:00:00                  How long is it going to run
-mem=500mb                     How much memory
-outdir=${outdir}
-name=${name}
-def=CSG_CAF_MCv2-66676_p21.06.00
-outfiles='cafe.out cafe.err *.html *.root'
-- ./MASTER_configs/mc_z_mumu_tutorial.config "eff.Output: ${name}
eff.TexTitle: ${name} VJets.SampleName: ${name}
VJets.ZMCType: p17Alpgen"
```

What you should end up with

- Should have five directories in ${outdir}
- Each directory contains:
  - café.out, café.err, ${name}_Histos.root
- Should look at these log files for errors and dataset information
- Getting the MC event count

  /cafe/DiMU_MC_Base : 104750
  /cafe/DiMU_MC_Base/VJetsDQMC : 104750
  /cafe/DiMU_MC_Base/FindDuplicateEvents : 94848
  /cafe/DiMU_MC_Base/VJetsStat : 94675
  /cafe/DiMU_MC_Base/BEGIN : 94675
- Need MC cross section, data lumi and event count

Getting the Luminosity

I can't improve upon previous documentation

instructions on the web:
D0 at work >physics groups > luminosity > lm_tools
http://www-d0.fnal.gov/d0dist/dist/packages/lm_tools/devel/doc/
example for Gavin's analysis in
manchester_cafe_tutorial/doc/lumi.sh

Please note that you must use p18.09.00!

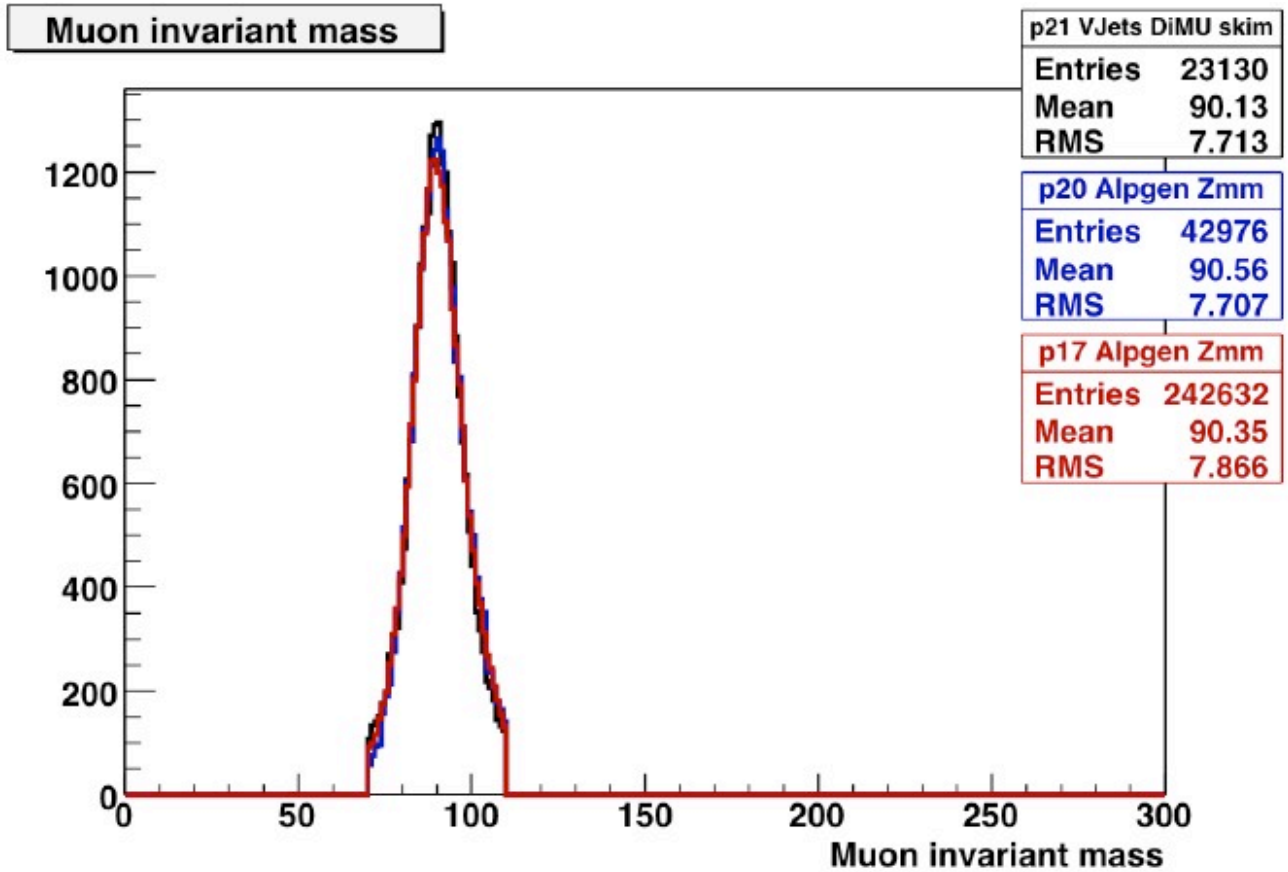
Getting the cross section

setup sam
/d0dist/dist/packages/alpgen_prod/devel/script/getXsection.py req_id

Combining root files

- May need Merge.cpp for large dataset
  - see Gavin's talk
- http://www-clued0.fnal.gov/~kirby/MSU_tutorial/plot_macros/
- Look at add_histos.sh to add weighted histos in a different root files
  - Set the correct input files in alpgen_addhisto_config.list
  - my output root files in output_root_files
  - *.Factor setting is used to properly weight each subsample
- Look at compare_histos.sh to overlay multiple histograms from different root files
  - set input files and scaling in compare_files.list

What should be the end result…



People I need to thank

- Gavin Hesketh for the outline
- Dag Gilbert for vjets_café
- Fu and Marc-Andre for VJets help/advice
- Everyone who's macros I've stolen
- Please email me questions kirby@fnal.gov
- hopefully I'll be able to answer them…