



Physics Tools Status

Current and future Physics Tools and PAT Task Force contributors
(in order of appearance)

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Overview

- I won't be spending time giving an overview of PAT or physics tools
 - Given yesterday during the tutorial sessions!
- This is a status talk about recent and upcoming developments



Outline

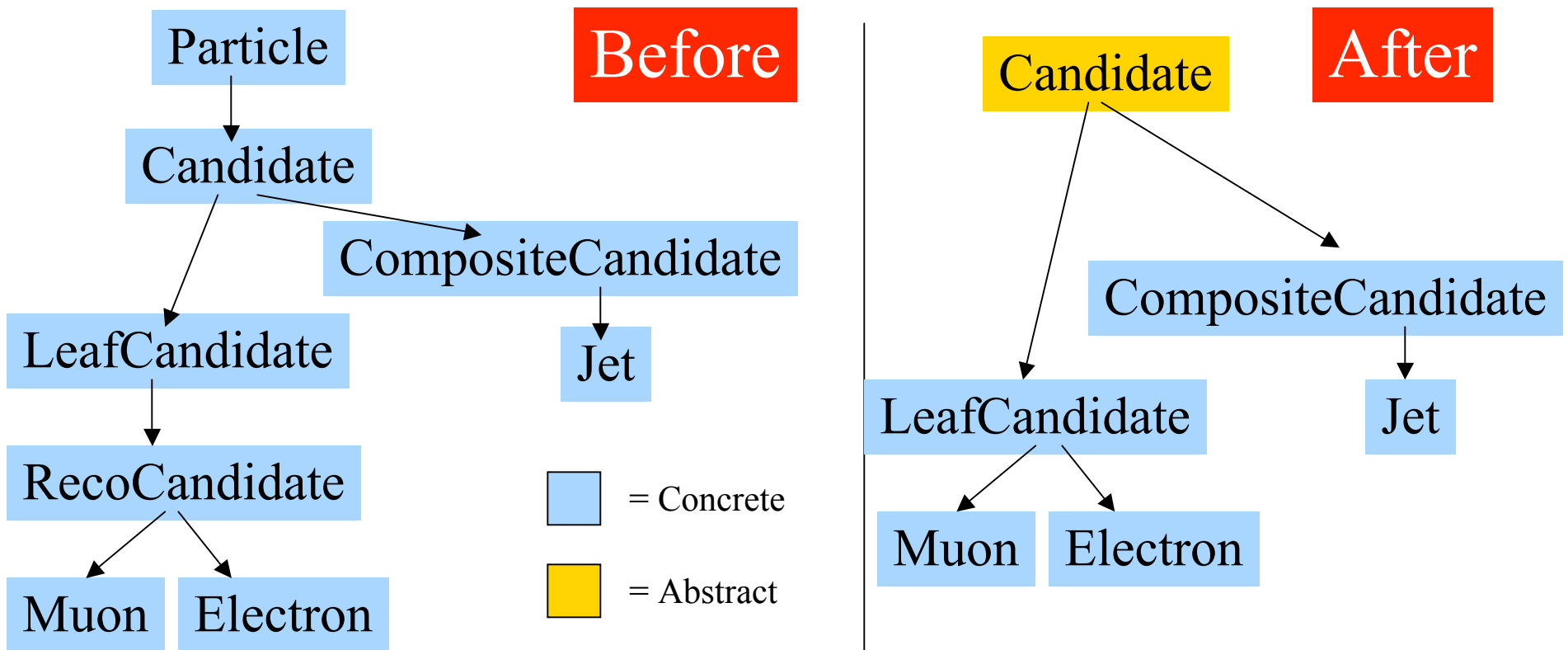
- The Candidate Model
- The Physics Analysis Toolkit
- Browsers
- Statistics Tools
- Conclusions



Candidate Model

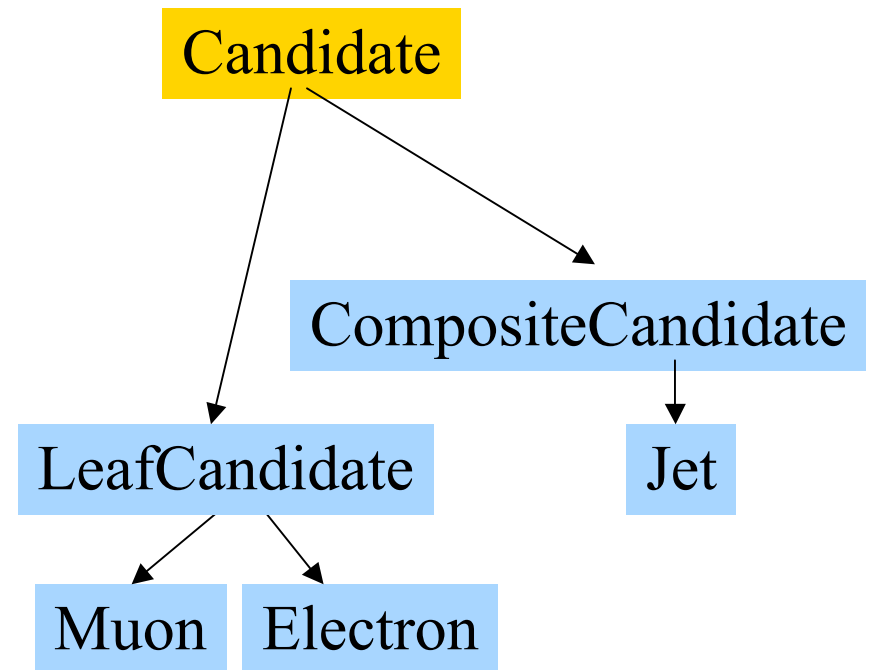
New Candidate Model

- Candidate model has a (too) complicated inheritance tree
- All classes were concrete, which disallows many developments
- B. Hegner recently implemented a better object design



New Candidate Model Details

- Removed dead weight
 - Particle
 - RecoCandidate
- Base class is abstract
 - Interface only
 - Allows users to overwrite methods in simple ways
 - Also allows a diamond inheritance for PAT objects (which would otherwise be disallowed)
- Two main types:
 - LeafCandidate
 - Has no daughters
 - Base class for "non-composite" reco objects, etc
 - CompositeCandidate
 - Has daughters
 - Base class for "composite" reco objects, etc





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PAT-Tuples

- A PAT-tuple is an EDM file containing PAT objects
- Several PAGs have collaborated to have centrally-produced PAT-tuples made from the Summer 08 samples
- Status: <http://mthomas.web.cern.ch/mthomas/rereco/Summer08ProductionPATrereco.html>
- Recipe: https://twiki.cern.ch/twiki/bin/view/CMS/SWGuideTQAFRecipes#CMSSW_2_2_X

Collection	items/event	kb/event	kb/item	plot	%
recoGenParticles_genParticles__HLT	766.55	16.18	0.02		29.3%
CaloTowersSorted_towerMaker__RECO	440.02	13.74	0.03		24.9%
recoTracks_generalTracks__RECO	105.41	10.46	0.10		19.0%
patJets_selectedLayer1Jets__TEST	6.38	6.05	0.95		11.0%
patElectrons_selectedLayer1Electrons__TEST	1.26	3.09	2.45		5.6%
patPhotons_selectedLayer1Photons__TEST	2.80	2.97	1.06		5.4%
patMuons_selectedLayer1Muons__TEST	1.41	1.60	1.13		2.9%
recoVertexs_offlinePrimaryVertices__RECO	1.07	0.70	0.66		1.3%
patMETs_selectedLayer1METs__TEST	1.00	0.22	0.22		0.4%
patTaus_selectedLayer1Taus__TEST	0.38	0.07	0.18		0.1%
patHemispheres_selectedLayer1Hemispheres__TEST	2.00	0.06	0.03		0.1%
recoPdfInfo_genEventPdfInfo__HLT	1.00	0.02	0.02		0.0%
recoBeamSpot_offlineBeamSpot__RECO	1.00	0.01	0.01		0.0%
triggerTriggerEvent_hltTriggerSummaryAOD__HLT	1.00	0.00	0.00		0.0%
int_genEventProcID__TEST	1.00	0.00	0.00		0.0%
ints_genParticles__HLT	1.00	0.00	0.00		0.0%
double_genEventScale__HLT	1.00	0.00	0.00		0.0%
edmTriggerResults_TriggerResults__HLT	1.00	0.00	0.00		0.0%
double_genEventWeight__HLT	1.00	0.00	0.00		0.0%
EventMetaData + EventHistory	1.00	0.11	0.11		0.2%

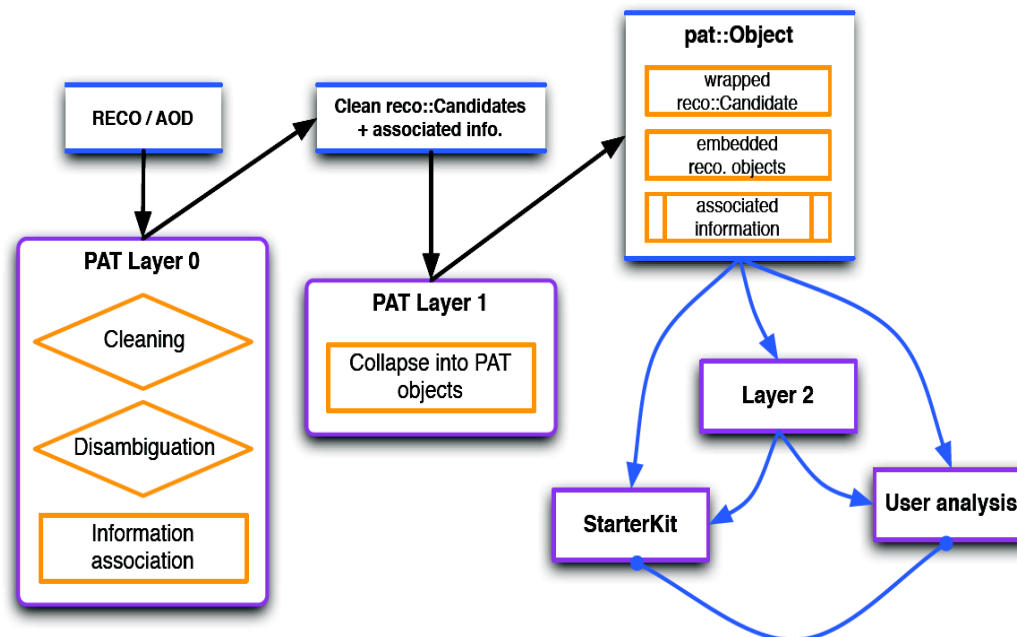


PAT Course

- Being offered now, too late for this iteration :)
- 25 students, 5 tutors
- Designed so that users can be guided as to the “best” way to use PAT and physics tools to their advantage
- 12 week course, 2x per week
- Will be offered again after this first iteration
- If you want to follow along without support:
 - <https://espace.cern.ch/learncms/pat/default.aspx>

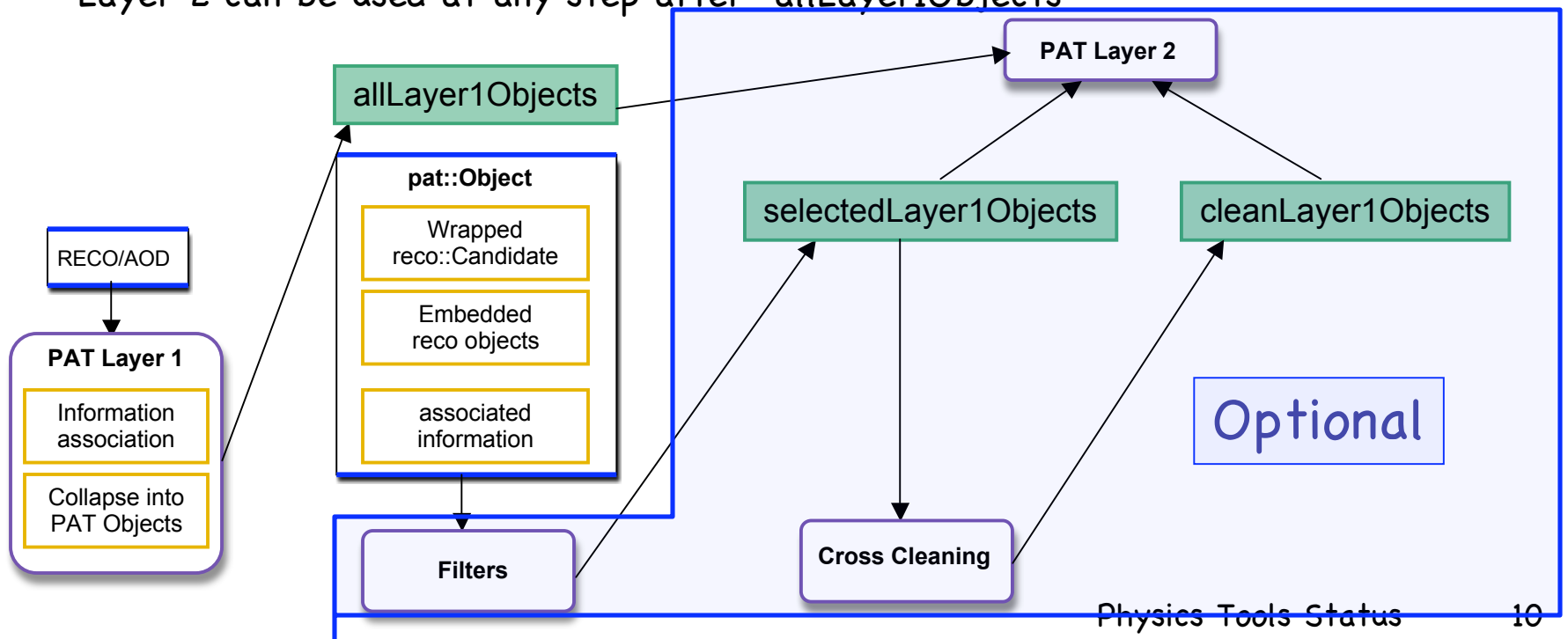
PAT Version 1.0

- Layer 0
 - Disambiguation
 - Information association (swizzles objects)
 - Cross Cleaning
- Layer 1
 - Swizzled objects collapsed into large monolithic objects
- Layer 2
 - User layer for event hypothesis and plots



PAT Version 2.0

- Layer 0 is removed
 - Disambiguation done now by POGs
 - Information association done at Layer 1
 - Cross-cleaning postponed until last step
- Layer 1 is revamped
 - At simplest level, just de-swizzles objects
 - Optionally: Filter, and cross-clean
- Layer 2 can be used at any step after “allLayer1Objects”





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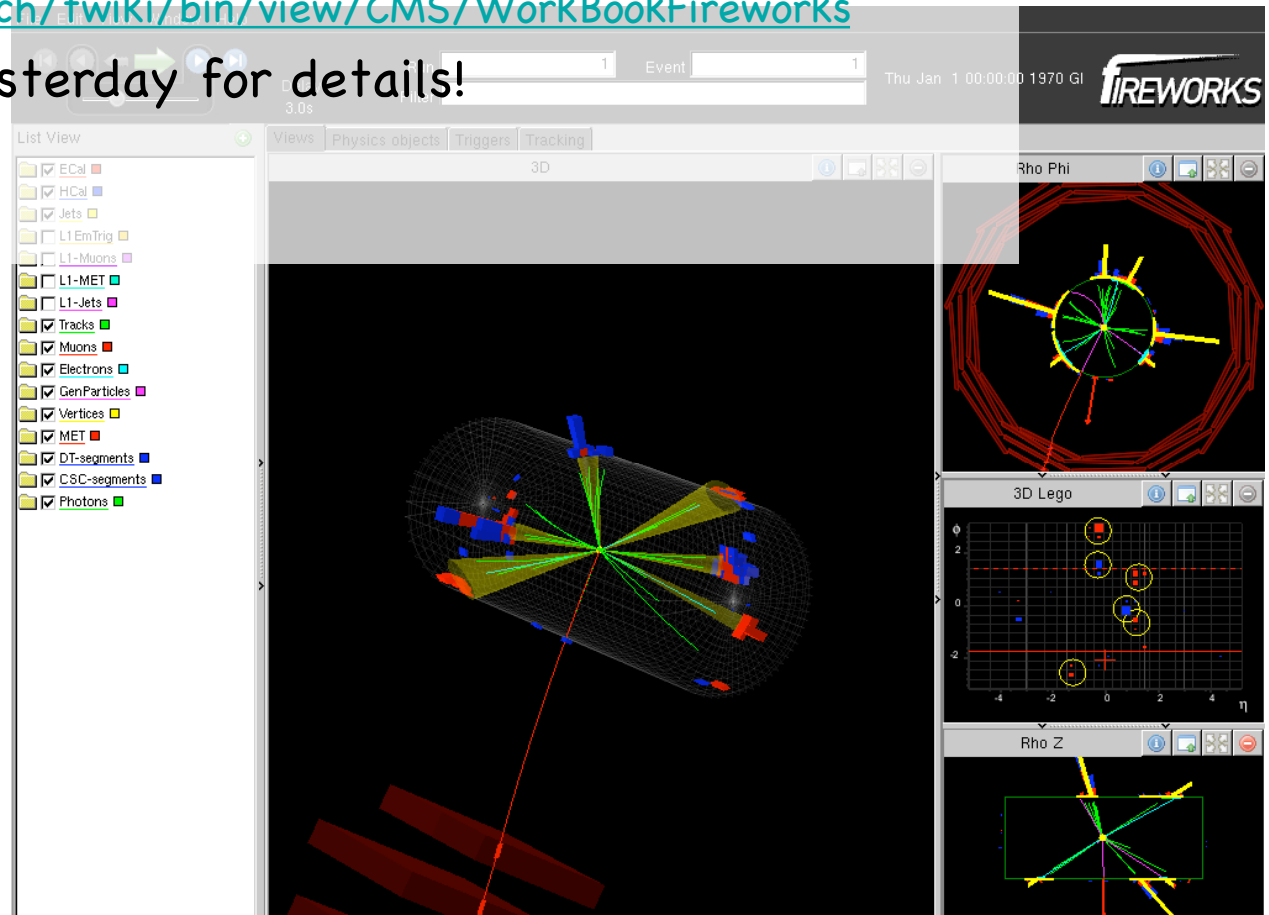
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Browsers

Fireworks / cmsShow

- Analysis Level event display
- Deployed widely already
- Much progress done to get a 2.2.x release
- <https://twiki.cern.ch/twiki/bin/view/CMS/WorkBookFireworks>
- See tutorial yesterday for details!



ConfigBrowser

- Can nicely display python configuration
- <https://twiki.cern.ch/twiki/bin/view/CMS/SWGuideConfigBrowser>

The screenshot shows the Config Browser application interface. The window title is "Config Browser - examplesConfigBrowser/patLayer1_cff.py". The interface is divided into three main sections:

- TreeView:** A hierarchical tree structure on the left. The root is "allObjects", which contains "patLayer1". Under "patLayer1", there are "allObjects" and "layer1Muons". The "layer1Muons" node is expanded, showing sub-nodes: "allLayer1Muons", "selectedLayer1Muons", "countLayer1Muons", "minLayer1Muons", and "maxLayer1Muons". Other top-level nodes include "layer1Electrons", "layer1Taus", "countLayer1Taus", "countLayer1Leptons", "layer1Photons", and "selectedLayer1Photons".
- GraphView:** A central diagram showing the relationships between objects. It features a box for "layer1Muons" containing nodes for "allLayer1Muons", "selectedLayer1Muons", "countLayer1Muons", "minLayer1Muons", and "maxLayer1Muons". Red arrows indicate dependencies: "selectedLayer1Muons" depends on "allLayer1Muons", "minLayer1Muons", and "maxLayer1Muons".
- PropertiesView:** A table on the right showing the properties of the selected object, "selectedLayer1Muons".

Property	Value
Object info	
label	selectedLayer1Muons
type	module <PATMuonSelector>
file	muonSelector_cfi
package	PhysicsTools/PatAlgos/selectic
full filename	/home/hinzmann/test/Configf
in sequence	layer1Muons
Connections	
uses	allLayer1Muons
used by	minLayer1Muons, maxLayer1Muons,
Parameters	
cut	cms.string('pt > 0. & abs(eta) < 12.')
src	cms.InputTag("allLayer1Muons

EdmBrowser

- Can have a “snapshot” of the Edm file in question
- <https://twiki.cern.ch/twiki/bin/view/CMS/SWGuideEdmBrowser>

The screenshot shows the EdmBrowser interface with the following components:

- Tree View:** A hierarchical list of event objects. The selected object is `patMuons_selectedLayer1Muons_PAT`.
- Object View:** A detailed view of the selected object, showing its structure and properties. The object is a `patMuons_selectedLayer1Muons_PAT` (vector) containing a `0 <pat::Muon>` element. This element has various sub-objects like `calEnergy`, `covMatrix`, `ecaIsoDeposit`, `efficiencies`, `efficiencyNames`, `efficiencyValues`, `genLepton`, `genParticle`, `genParticleRefs`, `hcalIsoDeposit`, `isolationR03`, `isolationR05`, `matches`, `time`, `trackerIsoDeposit`, `triggerMatches`, and `userIsoDeposit`.
- Property Table:** A table showing the properties of the selected `pat::Muon` object.

Property	Value
Object info	
label	0
branch	patMuons_select
type	pat::Muon
pdgId	-13
charge	1
Vector	
energy	62.8869
px	32.4839
py	-51.3016
pz	16.3613
mass	0.105658
pt	60.7212
eta	0.266292
phi	-1.00633
Values	
All	0
AllArbitrated	5
AllGlobalMuons	1
AllStandAloneMu	2
AllTrackerMuons	3



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Status

- A few statistics packages around
- RooStats + RooStats(CMS):
 - <https://twiki.cern.ch/twiki/bin/view/RooStats/WebHome>
- RooFit:
 - generic framework for likelihood fits
 - <http://roofit.sourceforge.net/>
- A few others scattered about
- We need developers and warm bodies in this seat!
 - We're drastically under-staffed here!



Conclusions

Recent and past development

- PAT course
- PAT-tuples
- Browsers, analysis level event display (Fireworks)

Near-term development

- PAT V2.0
- New candidate model

Far-term development

- Lots of opportunity for new people!
- Carries service credit :)
- Ideas:
 - GUI for configuration writing
 - "Physics level" validation
 - "Zeroing out" data members
 - PAT from PAT objects
 - Statistics tools
 - A plethora of others

Please get involved! We need help!