

Near Detector Simulation

Kevin Yarritu
Los Alamos National Laboratory
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LArSoft Simulation meeting

Current Status

- the following applies to the fine-grained tracker portion of the code
- to check out issue

```
svn checkout svn+ssh://p-lpne-ndc@cdcvs.fnal.gov/cvs/projects/lbne-ndc
```
- using the ART framework
- Code has only been tested on lbne machines (64 bit, SL5)
- using scons as the build system, SVN as the repository (other choices include SRT, cmake, CVS)
- Fermilab is developing a cmake-based build system. Possibly could change?

setup.sh

- must source from bash
- finds and establishes appropriate packages using ups/upd, sets up local environment
- external packages
 - using /nusoft/app/externals
 - ROOT, boost, CLHEP
- also use mu2e externals for scones
 - plan to add scones to /nusoft/app/externals
- check out complete release
 - no concept of a test release yet

Running the code

- art
 - the executable
- workdir/near_detector.fcl
 - the run time configuration file for the framework, modules, services
- workdir/geom.txt, workdir/genconfig.txt
 - configuration files

Configuration files

- workdir/geom.txt
 - contains geometry description

```
double tracker.waterTargetRadius = 6.35;  
double tracker.waterAluminumThickness = 0.127;  
string tracker.waterTargetEdgeMaterialName = "G4_Al";
```

- workdir/genconfig.txt
 - contains configuration information for generators

```
bool particleGun.do = true;  
int particleGun.num = 1;  
int particleGun.id = 13;
```

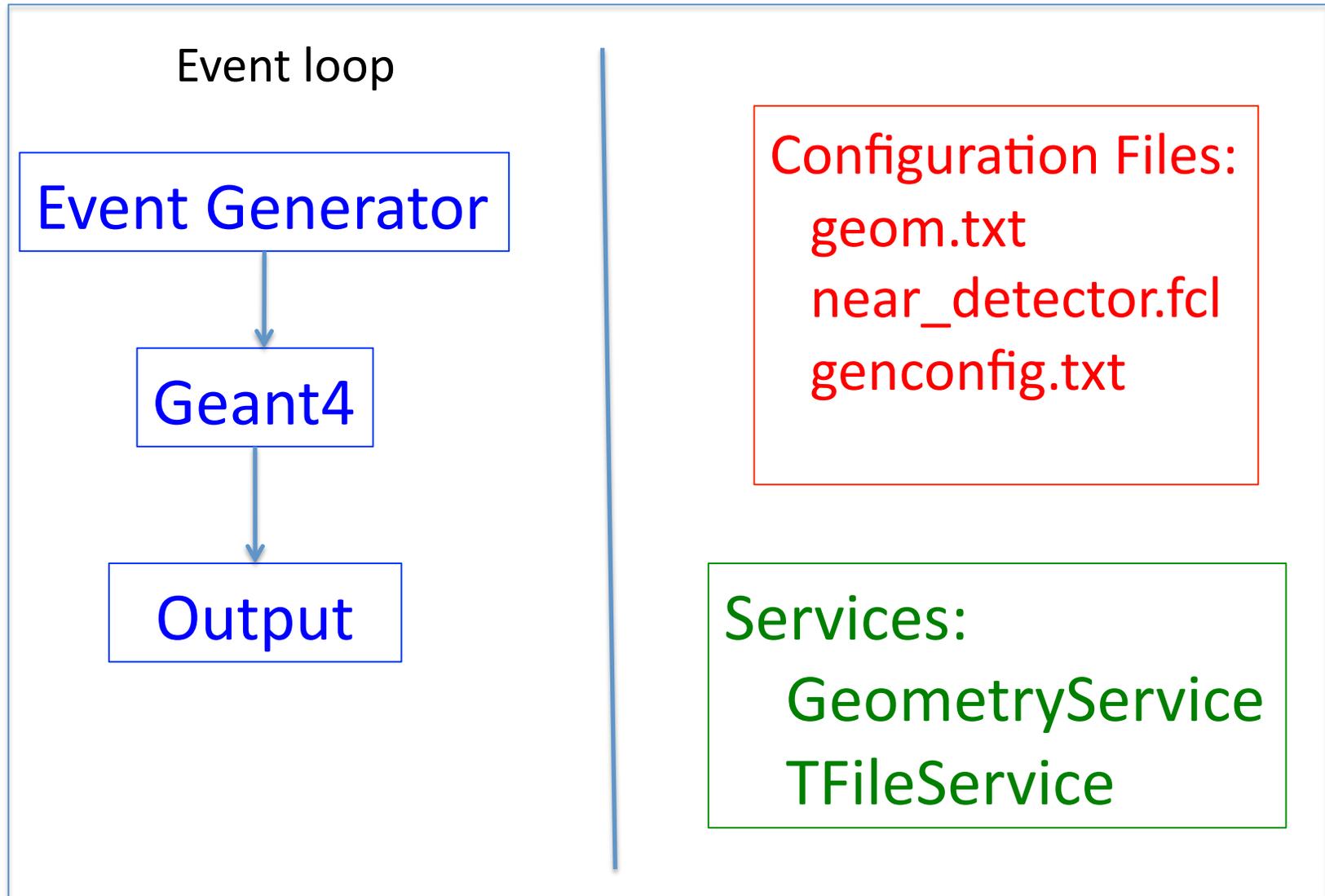
Configuration files

- workdir/near_detector.fcl

```
physics : {  
  producers: {  
    generate : {  
      module_type: EventGenerator  
      inputfile: "workdir/genconfig.txt"  
      .....  
    }  
  }  
}
```

- Identifies this module as a generating data
- **Module identifier**
- Parameters
 - class name of module
 - input file
 - developer can add and subtract parameters
- end of file contains how user wants to organize modules that were defined above

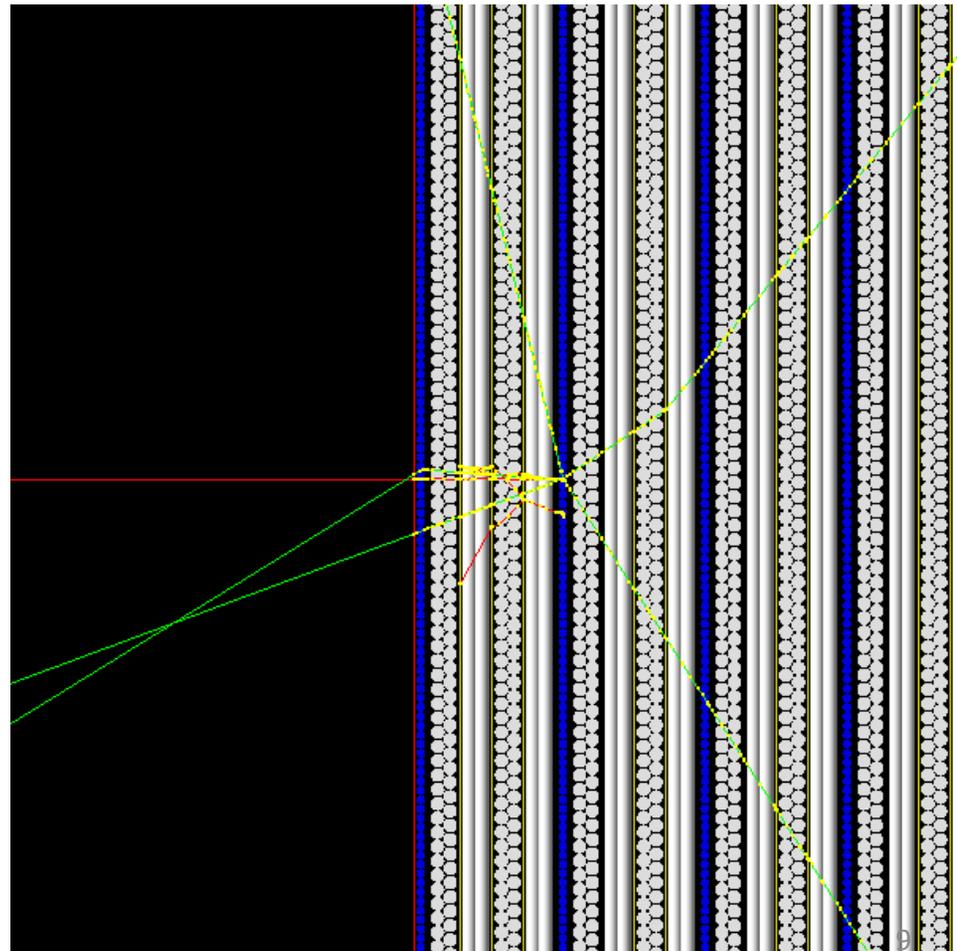
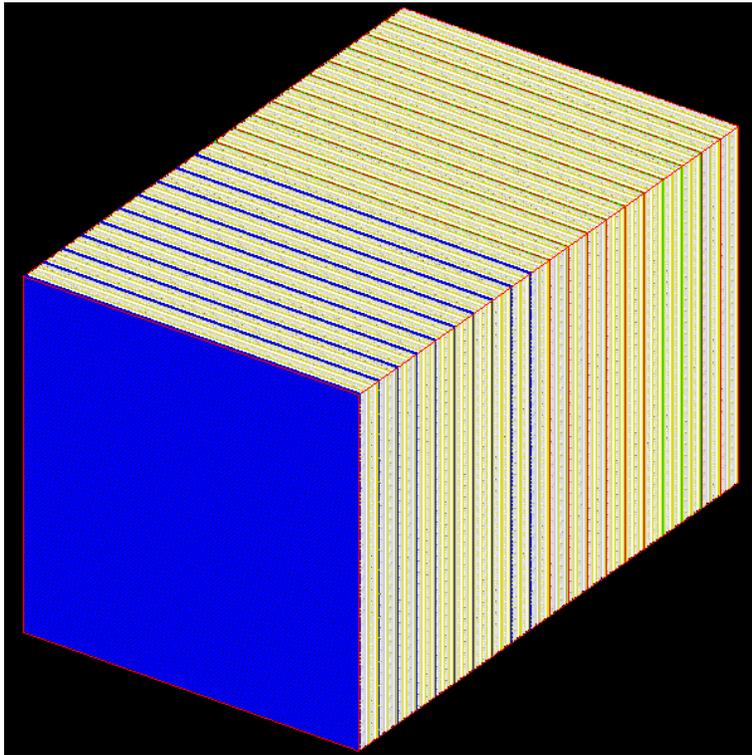
The Framework



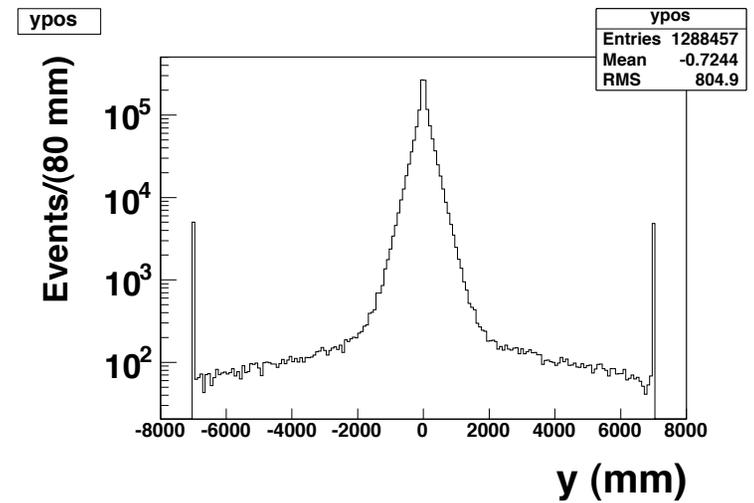
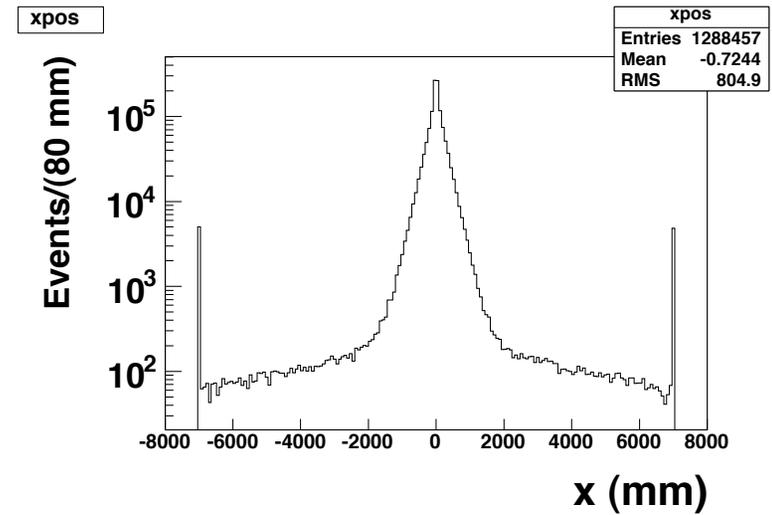
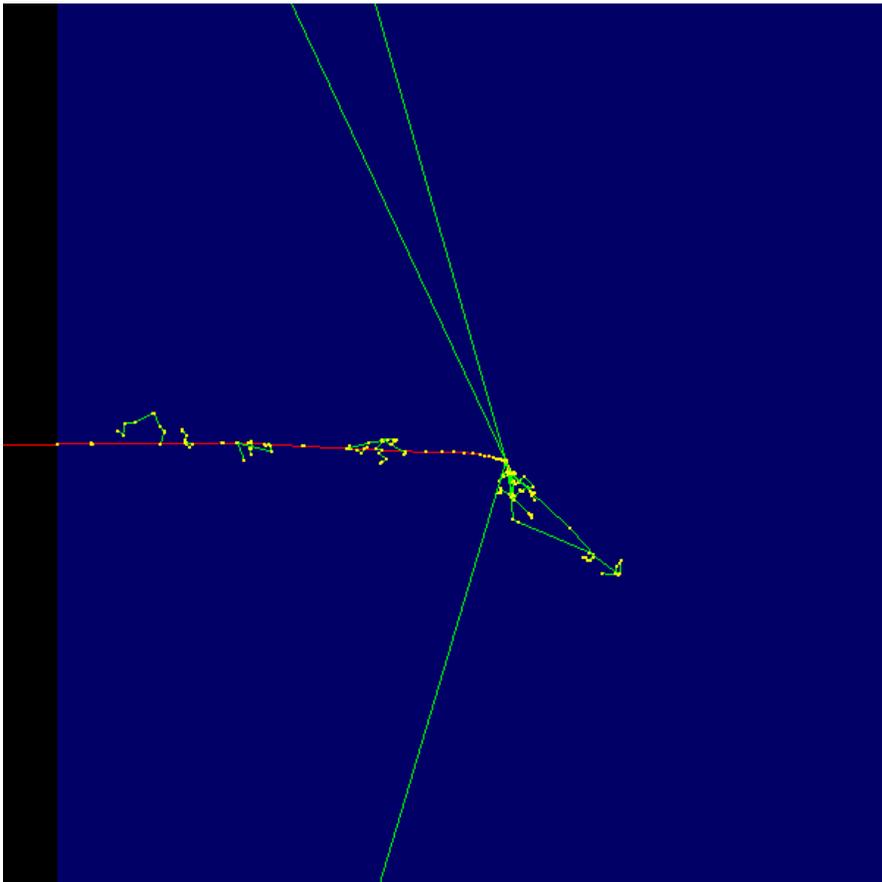
The Framework

- **Modules**
 - contain most of the code
 - use information from **configuration files**
- **Services**
 - **Geometry Service** handles the geometry information
 - **TFileService** provides a mechanism for creating a representation of the output

Fine Grained Tracker



Liquid Argon



- plots show the transverse distributions of the end of the track

LArSoft

- the reference design for CDR is a liquid argon TPC
- geometry file has been put into LArSoft
 - 1.8m x 1.8m x 4m
 - 3mm wire spacing
- apply magnetic field and drift electrons
- want to understand how reconstruction is different for near detector
- progress from there....

Places where contributions are needed

- need to integrate LArSoft with the code (hybrid design)
- muon identifier
- reconstruction
- cryostat
- GENIE interface
- understand backgrounds associated with the detector

- effort so far comprised of:
 - Kevin Yarritu, Elena Guardincerri, Xinchun Tian
- help wanted! if interested contact me: ayarritu@lanl.gov

Conclusions

- Near detector simulation has been converted to the ART framework
 - provides a way for event loop to proceed
- able to run events and obtain output for a given geometry
- work using LArSoft just beginning
- so far have two code bases (FGT, Liquid Argon)
- much more work needs to be done.