

DarkLight customConfig

Bishoy H. Dongwi
CFNS Edward Bouchet Fellow

Stony Brook University, Stony Brook NY 11794

May 01, 2025



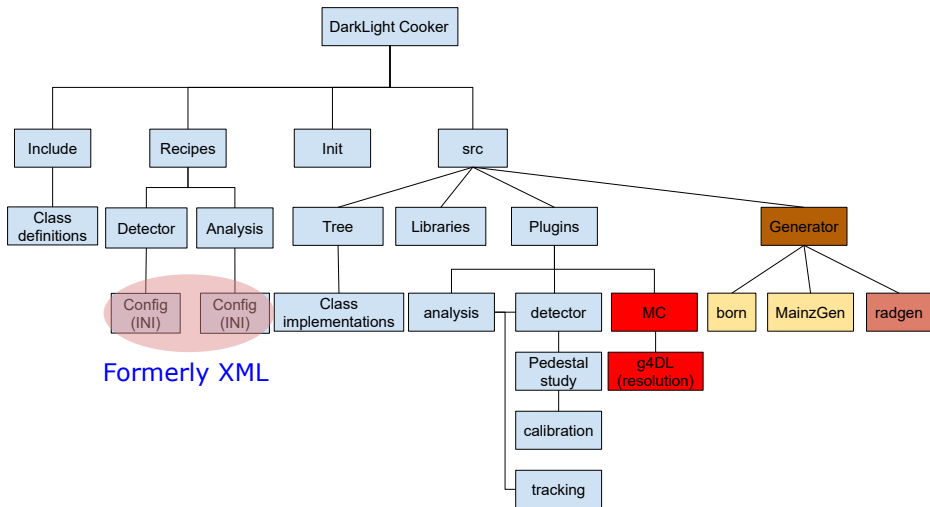
Stony Brook University



Brookhaven
National Laboratory



Center for Frontiers
in Nuclear Science



- Modified g4DL G4UIMessenger methods: update GEM readout board geometry
- Code exists on devel branch [here](#)

customConfig Recipe

- Xqilla is deprecated/discontinued since 2018 and removed from package managers (self-build)
- Need new hierarchical configuration architecture
- Structurally Cooker remains the same
- Human-friendly data serialization
- Get rid of XML parsers
- customConfig: handle loading of plugins and configuration files (init files)
- plugin(s) are keyed by name
- TOML: ✗
- YAML: ✗

GEMini.ini Example

```
[darklight]
  init=$COOKERHOME/.darklight/shared/init/GEMini.ini
  source=T
  destination=DLMT
[plugins]
  GEMini=libGEMini
  DARKLIGHTteleTracker=libDARKLIGHTteleTracker
[defineHistograms]
[startup]
  GEMini=startup_digi
  DARKLIGHTteleTracker=startup_digi
[execute]
  GEMini=process_digi
[finalize]
  GEMini=findPedestals
```

```
[darklight]
```

```
@include: init/all.ini
```

```
source=T
```

```
destination=DLMT
```

```
[plugins]
```

```
  GEMini=libGEMini
```

```
  TrigScint=libTrigScint
```

```
[startup]
```

```
  GEMini=startup_digi
```

```
  TrigScint=startup_digit
```

```
[execute]
```

```
  GEMini=process_digi
```

```
  TrigScint=process_digit
```

```
[finalize]
```

```
  GEMini=findPedestals
```

```
[darklightinit]
@include: GEMini:$COOKERHOME/.darklight/shared/init/GEMini.ini
@include: TrigScint: $COOKERHOME/.darklight/shared/init/TrigScint.ini
~
~
~
~
~
~
```

```
<?xml version="1.0" encoding="UTF-8" ?>
<darklightinit
  xml:base="homedir/.darklight/shared/"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:noNamespaceSchemaLocation='demo.xsd'
  xmlns:xi="http://www.w3.org/2001/XInclude">

  <xi:include href="init/GEMini.xml" parse="xml"/>
  <xi:include href="init/TrigScint.xml" parse="xml"/>

</darklightinit>
~
~
~
```

```
[darklightinit]
@include: GEMini:$COOKERHOME/.darklight/shared/init/GEMini.ini
@include: TrigScint: $COOKERHOME/.darklight/shared/init/TrigScint.ini
~
~
~
~
~
~
```

File syntax: all.ini (init)

- include:plugin_name:\$COOKERHOME/.darklight/shared/init/file
- plugin name is the tag to ROOT::TMethodCall() which executes plugin::functions('*')
- Option to include multiple init files
- Error msgs: line #'s and file name

Key Points of New Config

- Branch of new config: default is to use INI
- Default parsing is with XML
- `cmake ../ -DUSE_XML=OFF` to turn off XML parsing and enable customConfig parsing
- Use `std::map` as look-up table
- key: runnumber, id (channel no.), detector element
- Not all detector elements and/or channels are changed for all run numbers
- Changed elements get overwritten
- `eetsumMorConfig` creates a map of runnumber and sequence of config items
- Might be buggy, and some functionality still to be added

Keeping Things the same

GEMini functions

```
Long_t GEMini::setAPV(int id,int off,int ch,int ch_off,const char *name){ ... }  
Long_t GEMini::setPedestals(int id, char *param){ .... }  
Long_t GEMini::setAxis(int id, int apvid1,int offset1, int apvid2,int  
offset2,const char* name){ ... }
```

XML <run nr="10137">

```
<apv id="0">0,128,0,"APV0"</apv>  
<apvped id="0">"229.61 852.181 872.292 855.482 872.207 848.577..."  
<axis id="0">0,0,7,128,"x"</axis>
```

INI: [run:10137]

```
apv:0=0,128,0,"APV0"  
apvped:0="229.61 852.181 872.292 855.482 872.207 848.577..."  
axis:0=0,0,7,128,"x"
```


Keeping Things the same

Example with multiple runs in the config file

INI: [run:10137]

apv:0=0,128,0,"APV0"

apvpd:0="229.61 852.181 872.292 855.482 872.207 848.577..."

axis:0=0,0,7,128,"x"

INI: [run:10157]

apv:0=0,128,0,"APV0"

apvpd:0="229.61 352.181 872.92 855.482 872.2 848.577..."

axis:0=0,0,7,128,"x"

Resultant config file

INI: [run:10157]

apv:0=0,128,0,"APV0"

~~apvpd:0="229.61 852.181 872.292 855.482 872.207 848.577..."~~

apvpd:0="229.61 352.181 872.92 855.482 872.2 848.577..."

axis:0=0,0,7,128,"x"

Keeping Things the same

RecipeReader: XML

```
AutoDelete<XQQuery> qinit(xqilla.parse(X("data(/darklight/init)")));  
AutoDelete<DynamicContext> context (qinit->createDynamicContext());  
Result rinit=qinit->execute(context);  
InitXML=UTF8(rinit->next(context)->asString(context));
```

RecipeReader: CustomConfig

```
topnodename=input.topNode();  
initfile=nodemap[topnodename]["init"];  
// Use install dir from $COOKERHOME  
const fs::path initfileloc((initfile).c_str());  
InitName=initfileloc;
```

G4UIMessenger: UI GEM Boards

Changes in the g4PSIGEM.cc

- Change in the constructor
`g4PSIGEM(G4String, G4LogicalVolume* mv, G4Transform3D trans, G4double, G4double);`
`g4PSIGEM(G4String, G4LogicalVolume* mv, G4Transform3D trans, G4double, G4double, G4String);` ✓
- Last G4String takes input from UI Messenger: select gem readout boards

UI Messenger input

- `/det/gemreadout gemviz` ⇒ for visualization
- `/det/gemreadout gembatch` ⇒ for batch mode
- `/det/update` Update the geometry and needs to be run before:
`/run/initialize`

Eet-Sum-Mor Init File

```
[ config ]  
apvped=setPedestals  
apvgain=setGains  
apv=setAPV  
axis=setAxis  
format=setDataFormat  
  
[ run:10137 ]  
apv:13=0,128,0,"APV0"  
apv:14=128,128,0,"APV1"  
apv:15=256,128,0,"APV2"  
apv:16=384,128,0,"APV3"  
  
axis:0=0,0,7,128,"x"  
axis:1=8,0,12,128,"y"
```