

Generating and Reconstructing EVIO data in GlueX

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EVIO vs. HDDM

EVIO

- Designed by DAQ group for use in all halls to be compact and fast
small footprint, fast I/O
- Native format output by CODA DAQ system and will be used for raw data
- Optional dictionary can be stored with file to convert tag/num keys into strings

HDDM

- Designed for GlueX to allow easy and compact description of a data model
fast, concise description of data model
- Native format of Hall-D simulated data and "REST" summary files
- Schema for data model built into file and executables with automatic compatibility checks

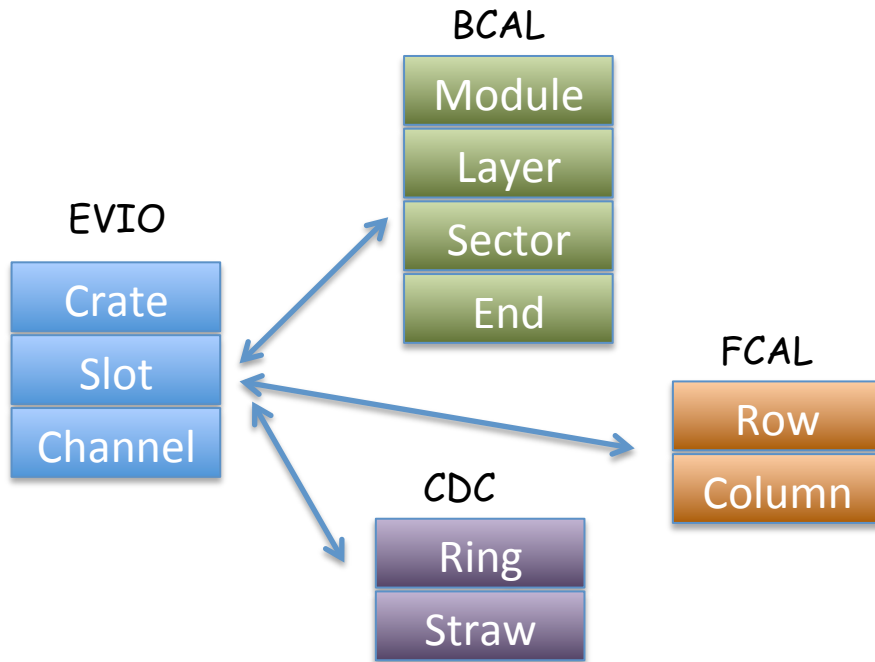
Both have C and C++ APIs. The C++ interface is more user friendly in both cases.

Converting HDDM to EVIO

- *mc2coda* library was written by Dave Abbott and implemented using GlueX simulated data by Elliott Wolin
 - Generates raw data format EVIO files
- Bug fixes and bomb-proofing done by us and implemented in our repository as part of *rawevent* plugin
 - <https://halldsvn.jlab.org/repos/trunk/sim-recon/src/programs/Utilities/plugins/rawevent>
 - Requires EVIO -> not built as part of standard *sim-recon*
 - > *cd \$HALLD_HOME/src/programs/Utilities/plugins/rawevent*
 - > *scons -u install*
- Use like all other JANA plugins:
 - > *hd_ana -PPLUGINS=rawevent hdgeant_smeared.hddm*
- Produces file: ***rawevent00002.evio***

Produces single-block events ONLY!

Translation Table



- *mc2coda* creates raw data formatted files indexed by crate, slot, and channel
- Simulated data is produced with detector indexing and must be converted
- This is done using a *translation table* (TT) stored in the CCDB
- The TT is stored as a single item, an XML string:

snippet

```
<halld_online_translation_table version="0.2">
  <crate number="2" type="VXS">
    <slot number="1" type="CPU">
      </slot>
    <slot number="3" type="fADC250">
      <channel number="0" detector="ST" sector="1"/>
      <channel number="1" detector="ST" sector="2"/>
      <channel number="2" detector="ST" sector="3"/>
      <channel number="3" detector="ST" sector="4"/>
    </slot>
  </crate>
</halld_online_translation_table>
```

```
>ccdb info Translation/DAQ2detector
+-----+
| Type table information |
+-----+
Name      : DAQ2detector
Full path : /Translation/DAQ2detector
Rows      : 1
Columns   : 1
Created   : 2014-02-19 14-31-31
Modified  : 2014-02-19 14-31-31
DB Id     : 121
.
```

Configuration Parameters for *rawevent* plugin

Parameter Name	Description
TT:NO_CCDB	Don't try getting translation table from CCDB and just look for file. Only useful if you want to force reading tt.xml. This is automatically set if you specify a different filename via the TT:XML_FILENAME parameter.
TT:XML_FILENAME	Fallback filename of translation table XML file. If set to non-default, CCDB will not be checked.
RAWEVENT:FILEBASE	Basename of output EVIO file (will have run number and ".evio" suffix appended)
RAWEVENT:TRIGTIME	Trigger time of event in picoseconds (default is 3.2E7)
RAWEVENT:TMIN	Minimum hit time in picoseconds (default is -1E5)
RAWEVENT:NOMC2CODA	Set to non-zero to skip all calls to mc2coda library routines. This is only used for development of the rawevent plugin itself.
RAWEVENT:NOROOT	Set to non-zero to skip generating and filling of ROOT histograms
RAWEVENT:DUMPHITS	Set to non-zero to dump to screen info on every conversion. This is only used for development of the rawevent plugin itself.
RAWEVENT:DUMPMAP	Dump map of translation table map to file (for debugging)
RAWEVENT:RUNNUMBER	Override run number from input file with this one which will be written to every event in output file

Reading EVIO data into DANA

- Use the DAQ plugin to parse EVIO data

```
> janadump -PPLUGINS=DAQ rawevent_000002.evio
```

```
Event: 1
```

```
JANA >>
```

```
JANA >>Registered factories: (12 total)
```

```
JANA >>
```

```
JANA >>Name:                nrows:  tag:
```

```
JANA >>-----
```

```
JANA >>Df250PulseIntegral  183
```

```
JANA >>Df250TriggerTime   328
```

```
JANA >>Df250PulseTime     183
```

```
JANA >>Df125PulseIntegral 263
```

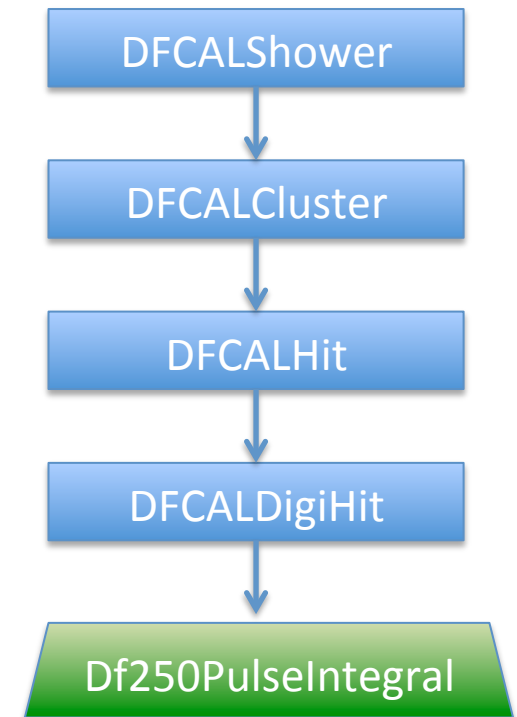
```
JANA >>Df125TriggerTime   194
```

```
JANA >>Df125PulseTime     263
```

```
JANA >>DF1TDCHit          60
```

```
JANA >>DF1TDCTriggerTime  98
```

- Use the TTab plugin to convert into detector-specific hits



Reading EVIO data into DANA

- Use the DAQ plugin to parse EVIO data
- Use the TTab plugin to convert into detector-specific hits

```
> hd_dump -PPLUGINS=DAQ,TTAB rawevent_000002.evio
```

```
<----- snip off first part ----->
```

```
JANA >>
```

```
JANA >>Registered factories: (136 total)
```

```
JANA >>
```

```
JANA >>Name:                nrows:  tag:
```

```
JANA >>-----
```

```
JANA >>Df250PulseIntegral  183
```

```
JANA >>Df250TriggerTime   328
```

```
JANA >>Df250PulseTime     183
```

```
JANA >>Df125PulseIntegral 263
```

```
JANA >>Df125TriggerTime  194
```

```
JANA >>Df125PulseTime     263
```

```
JANA >>DF1TDCHit         60
```

```
JANA >>DF1TDCTriggerTime  98
```

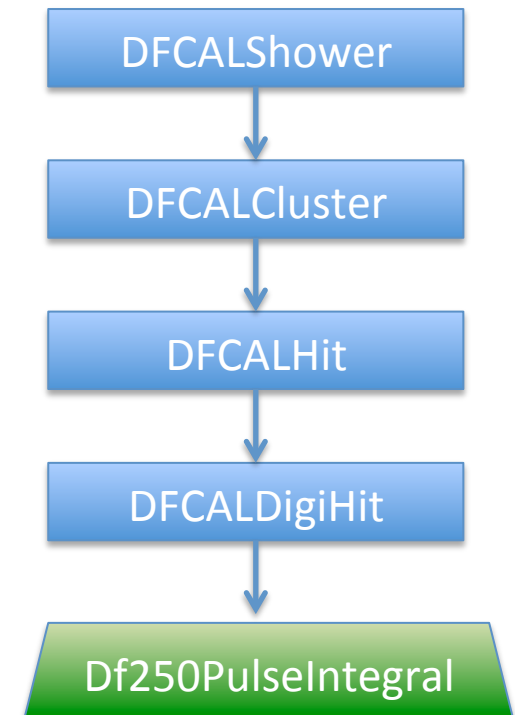
```
JANA >>DTranslationTable  1
```

```
JANA >>DBCALDigiHit       89
```

```
JANA >>DBCALTDCDigiHit   21
```

```
JANA >>DBCALHit          89
```

```
JANA >>DBCALTDCHit      21
```



Configuration Parameters for *DAQ* plugin

Parameter Name	Description
EVIO:AUTODETECT_MODULE_TYPES	Try and guess the module type tag,num values for which there is no module map entry.
EVIO:DUMP_MODULE_MAP	Write module map used to file when source is destroyed. n.b. If more than one input file is used, the map file will be overwritten!
EVIO:MAKE_DOM_TREE	Set this to 0 to disable generation of EVIO DOM Tree and parsing of event. (for benchmarking/debugging)
EVIO:PARSE_EVIO_EVENTS	Set this to 0 to disable parsing of event but still make the DOM tree, so long as MAKE_DOM_TREE isn't set to 0. (for benchmarking/debugging)
EVIO:BUFFER_SIZE	Size in bytes to allocate for holding a single EVIO event.
EVIO:ET_STATION_NEVENTS	Number of events to use if we have to create the ET station. Ignored if station already exists.
EVIO:ET_STATION_CREATE_BLOCKING	Set this to 0 to create station in non-blocking mode (default is to create it in blocking mode). Ignored if station already exists.
EVIO:VERBOSE	Set verbosity level for processing and debugging statements while parsing. 0=no debugging messages. 10=all messages
EVIO:EMULATE_PULSE_INTEGRAL_MODE	If non-zero, and Df250WindowRawData objects exist in the event AND no Df250PulseIntegral objects exist, then use the waveform data to generate Df250PulseIntegral objects. Default is for this feature to be on. Set this to zero to disable it.
EVIO:EMULATE_SPARSIFICATION_THRESHOLD	If EVIO:EMULATE_PULSE_INTEGRAL_MODE is on, then this is used to apply a cut on the non-pedestal-subtracted integral to determine if a Df250PulseIntegral is produced or not.
ET:TIMEOUT	Set the timeout in seconds for each attempt at reading from ET system (repeated attempts will still be made indefinitely until program quits or the quit_on_et_timeout flag is set.
EVIO:MODTYPE_MAP_FILENAME	Optional module type conversion map for use with files generated with the non-standard module types

Still to Do

- DAQ plugin (~3k lines of code) should be made into standard DANA library
- TTab plugin (~1.3k lines of code) should be made into standard DANA library
- No support for CAEN TDCs yet
- *mc2coda* does not produce multi-event blocks
- EVIO parser only tested with *WindowRawData* mode of real data (i.e. read from DAQ)
- Conversion factors for all systems should be revisited by detector system experts!

Summary

- Code to generate EVIO from HDDM exists in *sim-recon* as a plugin (*rawevent*)
- Code to generate low-level digitized hit objects from EVIO data exists in *sim-recon* as plugin (*DAQ*)
- Code to generate detector hit objects from low-level digitized hits exists in *sim-recon* as a plugin (*TTab*)
- Documented on wiki at:
https://halldweb1.jlab.org/wiki/index.php/HOWTO_convert_MC_data_to_EVIO_and_replay_it