

Information in EventMetaData and 'Error event'

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1, Storing data in EventMetaData
object by online DAQ

Member variables of EventMetaData

Rev. 28703 ([framework/dataobjects/include/EventMetaData.h](#))

private:

unsigned int m_event; /**< Event number ('normal' data has values > 0). */

int m_run; /**< Run number (usually > 0, run-independent MC has run == 0). */

int m_subrun; /**< Sub-run number, increases indicate recovery from DAQ-internal trouble without change to detector constants.

Not supposed to be used by offline analysis. */

int m_experiment; /**< Experiment number. (valid values: [0, 1023], run-independent MC has exp == 0) */

int m_production; /**< Unique identifier of the production of the event. */

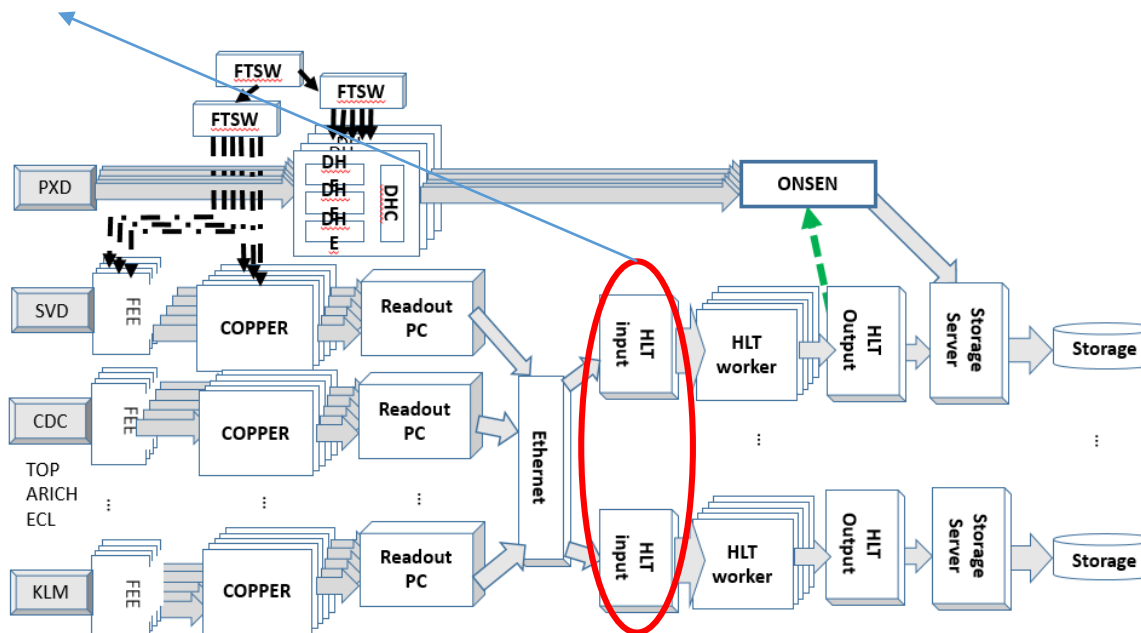
unsigned long long int m_time; /**< Time in ns since epoch (1970-01-01). */

std::string m_parentLfn; /**< LFN of the parent file */

double m_generatedWeight; /**< Generated weight. */

unsigned int m_errorFlag; /**< Indicator of error conditions during data taking, ORed combination of EventErrorFlag values. */

Red variables are supposed to be stored in EventMetadata by [Raw2DsModule.cc](#) of online DAQ program at [an HLT input server](#). Currently m_time and m_production are not filled yet.



What daq/rfarm/event/modules/src/Raw2DsModule.cc is doing :

Fill values in each variable as follows :

```
evtmetadata->setExperiment(sndhdr.GetExpNum()); // -> Added at rev. 8338  
evtmetadata->setRun(sndhdr.GetRunNum()); // -> Added at rev. 8701  
evtmetadata->setSubrun(sndhdr.GetSubRunNum()); // -> Added at rev. 28343  
evtmetadata->setEvent(sndhdr.GetEventNumber()); // -> Added at rev. 8338  
if (error_flag) evtmetadata->addErrorFlag(EventMetaData::c_B2LinkCRCError); // Added at rev.18569
```

Pocket DAQ case :

- There is no HLT input server and filling EventMetaData is done by DeSerializerPC.cc not Raw2DsModule.cc.
- EventMetaData->getErrorFlag() can work if you use the DAQ program for data-taking after rev. 29676.

2, Definition of 'Error event' and how to avoid the event

Type of errors

‘Error event’ in this slides means that its EventMetaData.m_errorFlag is nonzero.

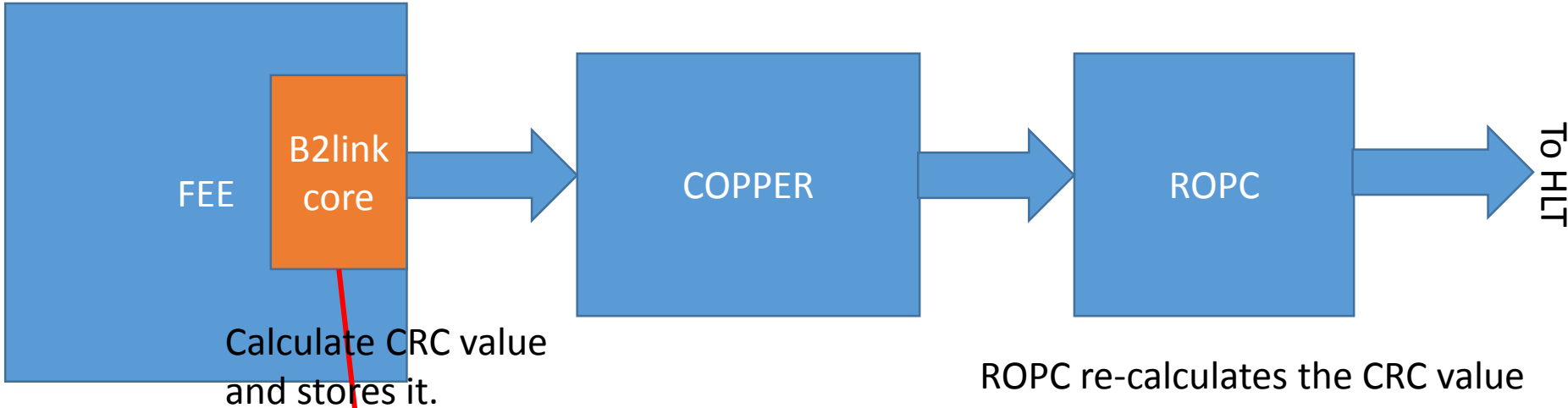
In EventMetaData.h,

```
/** bit-flag format of m_error_flag */  
enum EventErrorFlag {  
    c_B2LinkCRCError = 0x1, /**< Belle2link CRC error is detected in the event */  
    c_HLTError       = 0x2 /**< Error is returned from HLT modules. */  
};
```

As of Jun. 2016, only c_B2LinkCRCError is implemented if using rev. 18569 or later.

What is 'm_errorFlag= c_B2LinkCRCError = 0x1'

- Data-corruption during B2link data transfer is detected by CRC check.
-> m_errorFlag = 1
- Data-corruption during B2link data transfer is not detected by CRC check.
-> m_errorFlag = 0



HSL: 0xFFAA(16) -- B2L header	HSLB-tag(16)	B2link HSLB header
B2L: '0'(1) TT-ctime(27)	TT-type(4)	B2link FEE header
B2L: TT-tag(32)		
B2L: TT-utime(32)		
B2L: TT-exprun(32)		
B2L: '0' B2L-ctime(27)	reserved(4)	B2link FEE trailer
FEE: Data #0 (32)		
FEE: Data #1 (32)		
FEE:		
FEE: Data #n (32)		
B2L: '0'(1) TT-ctime(27)	TT-type(4)	B2link HSLB trailer
B2L: TT-tag(16)	B2L-CRC16(16)	
HSL: 0xFF55(16)	CRC error count(16)	

ROPC re-calculates the CRC value and compare it with the CRC value in a trailer.
If they don't coincide, error bit in the RawCOPPER header(not EventMetaData) is set.
Later, the header is checked by Raw2DsModule on HLT and m_errorFlag is set to 1.

How to avoid CRC 'error events' :

call `getErrorFlag()` of `EventMetaData`:

```
event(){  
...  
    if( EventMetaData->getErrorFlag() == 0 ){  
        // No CRC error  
    }else{  
        // CRC error event }  
... }
```

If the ver. of your DAQ program is old: (PocketDAQ before 29676, Belle2DAQ before rev. 18569)

You need to check every `Raw***` objects except for `RawPXD`.

- For data taken with older DAQ program, you need to check each `Raw***` object like the following; (`***` is COPPER/SVD/CDC/TOP/ARICH/KLM)

```
StoreArray<Raw***> raw_***array;  
for (int i = 0; i < raw_*** array.getEntries(); i++) {  
    for (int k = 0; k < raw_*** array[ i ]->GetNumEntries(); j++) {  
        if (raw_***array[ i ]->GetEventCRCError(k) != 0 ){  
            // CRC Error event !!  
        }  
    }  
}
```


Test program to check error flag in EventMetaData in .(s)root files

```
$ cd ${BELLE2_LOCAL_DIR}/daq/rawdata/examples  
$ basf2 CheckErrorEvent.py -i <.sroot file>
```

```
...  
[INFO] Reading StreamerInfo  
[INFO] SeqRootInput: initialized.  
[INFO] CheckErrorEvent: initialize() started.  
[INFO] CheckErrorEvent: initialize() done.  
[INFO] SeqRootInput: beginRun called.  
[INFO] Begin of new run  
[INFO] Processed: 1 runs, 1 events  
[INFO] Processed: 1 runs, 2 events  
...  
[INFO] Processed: 1 runs, 7000 events  
[INFO] Seq File 1 closed  
[INFO] SeqRootInput : 7984 events read with total bytes of 113506 kB  
[INFO] SeqRootInput : event rate = 10.2758 (KHz)  
[INFO] SeqRootInput : flow rate = 146.088 (MB/s)  
[INFO] SeqRootInput : event size = 14.2167 +- 1.26828 (kB)  
[INFO] SeqRootInput: endRun done.
```

Event CRC error 0 CPRs 0 Events (obtained by checking each Raw*** header)

Event CRC error 0 Events (obtained by checking EventMetaData. it should be equal to the above value.)

-> In this case, No CRC 'error events' stored in EventMetaData are detected.

end