

DAQ Update - CM41

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- Event building problems;
- Mock data running;
- New versions of DATE - more problems.

Event building problem

The reprocessing of the December 2011 data revealed a problem in the binary data.

Issues Tracker Bug #1595: Error Reconstructing MICE Data
<http://micewww.pp.rl.ac.uk/issues/1595>

The problem was detected in the following runs:

run 3407 - first corrupted file 03407.008

run 3426 - first corrupted file 03426.017

run 3507 - first corrupted file 03507.014

The problem is presented only in the very long runs.

This isn't a new problem. It was first time reported by Jean-Sebastien (CM24 June 2009)



Event building problem



- ◆ Vassil Verguilov developed software to investigate the problem
 - The Trigger Time Tag and Bunch ID from the TDC can be used to understand what happened
- ◆ Each TDC records
 - Trigger Time Tag (TTT)
 - 27 bits
 - 800 ns LSB
 - ~ 100 s full range
 - Bunch ID (BID)
 - 12 bits
 - 25 ns LSB
 - ~ 50 μ s full range
 - Clock running Independently
- ◆ It is possible to retrieve the absolute time of the particle trigger
 - W.r.t. to board reset (boards not yet synchronized)
 - With some ambiguities... and complications ...

Report for file /data/g4mice/data/784.000

#	LDC0				#	LDC1							
	DAQ #	TDC5		DAQ #		TDC0		TDC1		TDC2			
		TTT	BID			TTT	BID	TTT	BID	TTT	BID		
8	1	8	27583169	2683	8	1	8	44315780	3363	39955689	621	41603557	3872
9	2	8	1531	2515	9	2	8	1531	3194	1531	452	1531	3703
10	3	8	78	916	10	3	8	78	1594	78	2949	78	2103
11	4	8	211	3587	11	4	8	212	170	211	1524	211	679
12	5	8	71	1741	12	5	8	70	2420	70	3774	70	2929
13	6	8	170	3102	13	6	8	170	3781	171	1039	171	194

⋮

26	19	8	46	3698	26	19	8	46	280	46	1634	47	790
27	20	8	47	1106	27	20	8	47	1785	47	3139	47	2295
28	21	8	81	3691	28	21	8	81	274	81	1628	80	783
29	22	8	41	919	29	22	8	41	1598	42	2952	42	2107
30	23	8	105	185	30	23	8	105	864	105	2218	105	1374
36	24	13	30782823	3879	36	24	13	47515414	3943	43155321	1134	44803216	1156
37	25	13	1336	1590	37	25	13	1337	1654	1336	2941	1336	2963
38	26	13	280	2366	38	26	13	280	2430	281	3716	281	3739
39	27	13	675	3488	39	27	13	675	3552	675	743	675	765
40	28	13	365	2882	40	28	13	365	2945	365	136	365	159
41	29	13	143	3350	41	29	13	143	3414	142	605	142	627

⋮

Report for file /data/g4mice/data/860.000

#	LDC0				#	LDC1									
	DAQ #	TDC5		#		DAQ #	TDC0		TDC1		TDC2		TDC3		
		TTT	BID				TTT	BID	TTT	BID	TTT	BID	TTT	BID	
3	1	8	38406974	2793	8	1	8	75729705	1335	68996684	3100	102454405	1018	72800822	162
4	2	8	26	3626	9	2	8	26	2169	27	3934	26	1852	26	245
5	3	13	41606615	3564	15	3	13	78929329	1586	72196306	3261	105654052	2027	76000440	169
6	4	13	204	1911	16	4	13	204	4029	204	1608	205	374	204	46
7	5	13	51	3551	17	5	13	52	1573	51	3248	51	2014	52	168
8	6	13	297	762	18	6	13	296	2879	297	458	297	3321	296	299
9	7	18	44807328	1807	24	7	18	82130026	3404	75397000	893	108854773	506	79201131	339
10	8	18	435	3457	25	8	18	435	959	435	2543	436	2157	436	899
11	9	18	248	3198	26	9	18	248	699	248	2284	247	1898	248	639
12	10	25	48006482	3421	34	10	25	85329164	404	78596135	1898	112053935	2358	82400264	162
13	11	25	530	4006	35	11	25	530	988	530	2482	530	2942	530	746
14	12	30	51205177	2628	36	12	30	3198149	3187	3198146	494	3198172	1801	3198143	276
15	13	30	2833	3165	37	13	30	2833	3724	2833	1032	2833	2339	2833	330
16	14	35	54405085	3765	43	14	30	91727734	3806	84994700	1022	118452552	3176	88798823	320
17	15	35	1564	580	44	15	30	1565	621	1564	1933	1565	4087	1565	22
18	16	35	1216	2624	45	16	30	1216	2665	1216	3977	1216	2035	1215	206
19	17	40	57605613	196	51	17	35	94928247	3815	88195209	940	121653088	3940	91999330	309
20	18	40	921	992	52	18	35	920	514	921	1735	921	639	921	389
21	19	40	1003	300	53	19	35	1003	3918	1002	1043	1002	4043	1002	313
22	20	40	203	2704	54	20	35	203	2226	203	3447	204	2351	203	146
23	21	45	60805202	3425	60	21	40	98127819	2428	91394779	3558	124852684	3308	95198897	147
24	22	45	98	2475	61	22	40	99	1479	98	2609	99	2358	98	520
25	23	45	308	38	62	23	40	307	3137	308	171	308	4017	308	217
26	24	45	82	2648	63	24	40	82	1651	82	2781	81	2531	82	690



Event Building



- ◆ **The synchronization problem between the two crates persists**
 - We incriminate the PCI/VME interface
 - It couldn't be replaced because
 - all the spares used for the mirror DAQ system
 - Massive failure of boards: 4 out of 10 boards had to be send for repair

- ◆ **In the meanwhile**
 - Online monitoring histogram allow to spot the problem
 - A VME and PC power cycle solve it temporarily
 - **Shifter's attention is required**

Event building problems

- Good news: No data is lost, all spills are recorded in the binary files.
- Bad news: After the first appearance of the bug in a given run the data is messy (corrupted).
- Good news: It is possible to recover the corrupted data offline.

Event building problems

The software for recovering of the corrupted data was implemented as part of the Unpacking library.

Two standalone programs are available:

- Very fast program that can test the quality of the data of a given run (1-2 min for testing one run).
- A program for rebuilding of the problematic runs (5-10 min for recovering the run data).

Instructions are available at:

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Event building problem

Do we have this problem now?

I have tested the 10 biggest runs of the EMR commissioning data taking period. No problematic runs have been found.

What has been changed between December 2011 and November 2014?

- New version of DATE (this is the code responsible for the actual processing of the event building).
- New event building computers.
- Completely new version of the readout code.

More changes after November 2014:

- New readout computers.
- New PCI/VME interface boards (new generation of the boards developed by CAEN, that uses a new protocol for the optical communication). These boards are supposed to be much faster.

Event building problem

Are we better protected now?

Not yet, but we work on this.

In the new version of the Unpacking library the ProcessManager performs a check and compare the number of particle trigger in every LDC (VME crate). In the case of a mismatch, it throws an exception with a proper error message.

How to automate the detection of the problem?

One possibility is to make the Online Monitoring to talk to EPICS

DAQ status after the mock data run

- First attempt to run with all the crates being sync by the new trigger system - 90 % successful. A minor issue in the case when running with only one crate in the Hall (EMR or Tracker). To be investigated.
- A very good work with Ed Overton on the implementation of the Tracker veto in the logic of the Particle triggers. [We have a second trigger expert.](#)

We need a real run!!!

New versions of DATE - more problems

Persistent problems with the new versions of the DATE code. Two different versions have been tested. Both found to have bugs. I guess this is because LHC is OFF and ALICE takes only mock data runs ;)

Minor problems (not critical)

- InfoBrowser crashes - the only cure I managed to find is to restart the InfoBrowserServer
- DAQCONTROL GUI doesn't want to start. Some debugging in the shell scripts is needed in order to fix this.

Serious problem (still not critical)

- The new versions of DATE come with a significant changes in the structure of the recorded binary data.
- The consequence of this is, that we will need two different versions of the unpacking library for analysing the StepI and StepIV data.

Conclusion

We need a real run!!!