Data issues found and tests

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Issues found during last data taking

1. GEMDC packet L1 count not increasing when working with dummy GEMROC data.
2. The first GEMDC packet length is wrong.
3. The GEMROC data format in the first GEMDC data packet is wrong.
4. Found DC buffer pile up, multiple DC packets has been read out in one DMARun.
5. GEMROC L1 counter not start from 0.
6. GEMROC L1 counter is increasing by 4 most time, sometimes by 3 or 5.
7. DAQ software is able to acquire data for 2 minutes, after that, no interrupts happened.

Our Analysis:

1. 1 maybe cause to 2 different GEMROC data formats: confirming with Pawel if the DC firmware support two GEMROC data format .
2. 2,3,5 maybe due to the same problem.
3. 4 is correct according to current design of DC firmware.
4. 6 , 7 still need to research.

Tests in Hall 3 room 106

- Test DC board buffer length: 128KB
- Read out data directly when no interrupt happens:
  - Read out ~50KB data and the interrupt recovers
  - DC Buffer empty and the interrupt does not recover
- Do not use interrupt mode, read out data directly:
  - For single DC board, if works ok.
  - For two DC boards, DC buffer empty and no data happens.

summary

- The no interrupt issue has two causes:
  1. When no interrupt happens, the DC buffer is not empty. We can read out the data in buffer directly and the interrupt will be received again.
  2. When no interrupt happens, the DC buffer is empty. The interrupt can not recover. At this time, the buffer CSR=0x130000.
- When we take data without interrupt, we also meet that the buffer CSR=0x130000 and no data can be read out problem.
- So we need to understand why the buffer CSR become 0x130000 and why the DC buffer become empty .

- backup

测试一： 测试DC板的buffer大小

- 测试过程：
  - GEMROC start trigger, 等15sec, stop trigger
  - DC1Test3 收数据，直到buffer为空
- 测试结果有两种情况:
  1) buffer直接读空，长度为128KB.
  2) buffer csr=0x130000.

  每次读出8byte.

  Pawel 回复 csr=0x130000时，buffer为空，和慢控有通信。

```
-> DC1Test3
>>Initializing D64 CBLT Transfers
DC1:buffer not empty. CSR : 0xc0003 , readout size = 131072, totsize=131072
DC1:buffer is empty. CSR : 0x30000
DC 1 buffer size: 131072
value = 25 = 0x19
-> DC1Test3
>>Initializing D64 CBLT Transfers
DC1:buffer is empty. CSR : 0x30000
DC 1 buffer size: 0
value = 20 = 0x14
-> DC1Test3
>>Initializing D64 CBLT Transfers
DC1:buffer not empty. CSR : 0xc0003 , readout size = 131072, totsize=131072
DC1:buffer is empty. CSR : 0x30000
DC 1 buffer size: 131072
value = 25 = 0x19
-> DC1Test3
>>Initializing D64 CBLT Transfers
DC1:buffer is empty. CSR : 0x30000
DC 1 buffer size: 0
value = 20 = 0x14
-> DC1Test3
>>Initializing D64 CBLT Transfers
DC1:buffer not empty. CSR : 0xc0003 , readout size = 131072, totsize=131072
DC1:buffer is empty. CSR : 0x30000
DC 1 buffer size: 131072
value = 25 = 0x19
->
```

测试二：在等不到中断的时候，直接读出数据

- 测试过程：
  - 单板测试， 当等不到中断发生的时候，检查buffer状态，如果非空，就直接读出数据，再次等中断
- 测试结果有两种情况：

  1）读出50KB左右的数据，然后就能等到中断了，能继续中断读出。

  2）读出8byte, 然后buffer为空，但还是等不到中断。

```
DC 1 : my event id = 4299, event size = 600
DC 1 : my event id = 4399, event size = 936
DC 1 : my event id = 4499, event size = 1416
DC 1 : my event id = 4599, event size = 832
DC 1 : my event id = 4699, event size = 520
DC 1 : my event id = 4799, event size = 904
DC 1 : my event id = 4899, event size = 712
DC 1 : my event id = 4999, event size = 968
DC1 semTake(Sem_Interrupt, 1) times out 181 times
DC1 buffer not empty. CSR : 0x130000, readout 8 byte data from DC 1
DC1 semTake(Sem_Interrupt, 1) times out 181 times
DC1 buffer empty. CSR : 0x30000
DC1 semTake(Sem_Interrupt, 1) times out 181 times
DC1 buffer empty. CSR : 0x30000
DC1 semTake(Sem_Interrupt, 1) times out 181 times
DC1 buffer not empty. CSR : 0x130000, readout 8 byte data from DC 1
DC1 semTake(Sem_Interrupt, 1) times out 181 times
DC1 buffer empty. CSR : 0x30000
DC1 semTake(Sem_Interrupt, 1) times out 181 times
```

```
DC_Sem_Interrupt1 doesn/t need to delete
*****DC_Sem_Interrupt1 created*****
DC1 semTake(Sem_Interrupt, 1) times out 181 times
DC1 buffer empty. CSR : 0x30000
DC1 semTake(Sem_Interrupt, 1) times out 181 times
DC1 buffer empty. CSR : 0x30000
DC1 semTake(Sem_Interrupt, 1) times out 181 times
DC1 buffer empty. CSR : 0x30000
DC 1 two trailer: 0x66660052
DC 1 three trailer: 0x66660052
DC 1 data length not consistent! uDataTemp: 0x58,datum: 0x51 for 1 times
DC 1 : my event id = 99, event size = 464
DC 1 : my event id = 199, event size = 712
DC1 semTake(Sem_Interrupt, 1) times out 181 times
DC1 buffer not empty. CSR : 0x22ee9, readout 48040 byte data from DC 1
DC 1 : my event id = 299, event size = 1024
DC 1 : my event id = 399, event size = 552
DC 1 : my event id = 499, event size = 768
DC 1 : my event id = 599, event size = 568
DC 1 : my event id = 699, event size = 536
DC 1 : my event id = 799, event size = 864
DC 1 : my event id = 899, event size = 960
```

测试三：重复实验室的模拟测试

- 测试过程：使用Angelo的发数脚本发模拟数据，看取dummy数据时DC包头的L1 count不涨的问题是否能复现。
- 需要修改GEMROC的firmware。
- 需要和Angelo, Giulio说一下。

- 直接问问Pawel 是否兼容两种GEMROC数据格式

测试四：测试直接取数的模式，不使用中断的情况

- 测试过程：直接循环读出，不等中断
- 测试结果：
  - 1）单块板时，能正常工作
  - 2）两块板一起工作时，总是有数据格式错误发生，数据头不对，且读出长度一直为8 byte. 如果读出为8byte时，不检查数据，发现输出为空，说明是一直读出8byte.

```
-> DC3Test2
>>Initializing D64 CBLT Transfers
DC 3 reset done
DC3 : buffer not empty. CSR : 0x209b8
DC3: buffer is empty now
DC3: initialize succ

DC 3 : data format right:  my event id = 99, event size = 696, event rate = 0.410004
DC 3 : data format right:  my event id = 199, event size = 592, event rate = 23.623907
DC 3 : data format right:  my event id = 299, event size = 936, event rate = 22.815423
DC 3 : data format right:  my event id = 399, event size = 872, event rate = 21.052632
DC 3 : data format right:  my event id = 499, event size = 936, event rate = 22.988506
DC 3 : data format right:  my event id = 599, event size = 656, event rate = 18.635855
DC 3 : data format right:  my event id = 699, event size = 608, event rate = 20.479214
DC 3 : data format right:  my event id = 799, event size = 656, event rate = 24.390244
DC 3 : data format right:  my event id = 899, event size = 768, event rate = 22.060446
DC 3 : data format right:  my event id = 999, event size = 528, event rate = 21.431633
DC 3 : data format right:  my event id = 1099, event size = 1184, event rate = 22.391402
DC 3 : data format right:  my event id = 1199, event size = 976, event rate = 24.594196
DC 3 : data format right:  my event id = 1299, event size = 672, event rate = 19.607843
DC 3 : data format right:  my event id = 1399, event size = 408, event rate = 20.550760
DC 3 : data format right:  my event id = 1499, event size = 568, event rate = 22.644928
```

```
-> DC1Test2
>>Initializing D64 CBLT Transfers
DC 1 reset done
DC1 : buffer not empty. CSR : 0x20c57
DC1: buffer is empty now
DC1: initialize succ
DC1: Press Enter to continue
DC 1 data format right : my event id = 99, event size = 968
DC 1 data format right : my event id = 199, event size = 1496
DC 1 data format right : my event id = 299, event size = 696
DC 1 data format right : my event id = 399, event size = 520
DC 1 data format right : my event id = 499, event size = 560
DC 1 data format right : my event id = 599, event size = 488
DC 1 data format right : my event id = 699, event size = 1408
DC 1 data format right : my event id = 799, event size = 1296
DC 1 data format right : my event id = 899, event size = 568
DC 1 data format right : my event id = 999, event size = 680
DC 1 data format right : my event id = 1099, event size = 464
DC 1 data format right : my event id = 1199, event size = 504
DC 1 data format right : my event id = 1299, event size = 712
```

```
DC 1 data header check failed! 0x66660104
DC 3: data format error 151999 times!!!
DC 3 data length not consistent! uDataTemp: 0x10e,datum: 0x10d fo
DC 1: data format error 151999 times !!!
DC 1 data header check failed! 0x66660058
DC 3: data format error 152999 times!!!
DC 3 data header check failed! 0x66660094
DC 1: data format error 152999 times !!!
DC 1 data length not consistent! uDataTemp: 0x7a,datum: 0xf4 for
DC 3: data format error 153999 times!!!
DC 3 data header check failed! 0x66660098
DC 1: data format error 153999 times !!!
DC 1 data length not consistent! uDataTemp: 0xcc,datum: 0x1be for
DC 3: data format error 154999 times!!!
DC 3 data header check failed! 0x66660124
DC 1: data format error 154999 times !!!
DC 1 data header check failed! 0x66660070

-> DCTest2
>>Initializing D64 CBLT Transfers
DC 1 reset done
```