

ROD FIRMWARE ERROR REPORTING

Nico Giangiacomi - Gabriele Balbi - Davide Falchieri

Università di Bologna, Dipartimento di Fisica e Astronomia
Istituto Nazionale di Fisica Nucleare - sezione Bologna

nico.giangiacomi@bo.infn.it

October 9, 2017



S-Link Header (IBL)

BIT	Word 0	Word 1	Word 2	Word 3	Word 4	Word 5	Word 6	Word 7	Word 8	Word 9		
31	B	E	0	0	Source ID	Run number	Ext L1ID	0	0	0		
30												
29	0	E	0	3				0	0	0		
28												
27												
26	0	E	0	3				0	0	0		
25												
24												
23	F	1	0	0				0	0	0		
22												
21												
20												
19	0	2	0	1				0	0	Rod Event Type		
18												
17												
16												
15	0	3	0	0				0	0	0		
14												
13												
12												
11												
10	0	4	0	0					0	0		
9												
8												
7												
6												
5	0	E	0	0				BCID		0		
4												
3												
2												
1	0	E	9	0	Slave ID	EFB ID		ATLAS Event Type	0	0		
0											Tim Event Type	

Legend

	Hard-coded
	From register
	From TIM

S-Link Trailer (IBL)

BIT

	Word 0	Word 1	Word 2	Word 3	Word 4	Word 5
31	FE triple redundant mismatch FE data bus address error FE SEU upset detected in command decoder FE command decoder error FE address error FE write register data error FE triple redundant mismatch FE readout processor error	0	0	0	0	E
30						
29						
28						
27	FE L1_in counter error, L1 request error, L1 register error, L1 trigger ID error FE Hamming code error in word0, word1, word2 FE BCD counter error there are skipped triggers in the FE	0	0	0	0	0
26						
25						
24						
23	row/column error raw data preamble error in the FE non sequential order between the FE's data	0				
22		0	0	0	0	0
21						
20						
19	0					
18						
17						
16						
15	0					
14						
13						
12						
11	0					
10						
9						
8						
7	0					
6						
5						
4						
3	Header trailer limit error Trailer timeout error logical OR of bits 15 and 14 logical OR of bits 31 down to 14 timeout error l1id error bcid error					
2						
1						
0						

Legend

	Hard-coded
	From Rod Logic
	From Module
	From TIM

ERROR COUNT = (non sequential order) + (raw data) + (l1id err OR bcid err OR trailer TO err OR rowcol err OR skipped triggers) + TO err + preamble err + L1ID error + BCD|err + Trailer TO err + HT limit err + rowcol err + FE error + TO err ----- sum over each module

Module output (IBL)

NORMAL				IBL
	Header	HIT	FE FLAG	Trailer
31-29	001	100	000	010
28	Slave ID	Slave ID	Slave ID	Slave ID
27	etf ID	etf ID	etf ID	etf ID
26	formatter ID	formatter ID	formatter ID	formatter ID
25	n	n	n	n
24	n	n	n	n
23	F	T	0	E
22	L	T	S	c
21	L	T	S	P
20	L	T	S	p
19	L	T	S	l
18	L	T	S	b
17	L	T	S	z
16	L	T	0	h
15	L	C	0	v
14	L	C	0	M
13	L	C	0	M
12	L	C	0	M
11	L	C	0	M
10	L	C	0	M
9	B	C	D	M
8	B	R	D	M
7	B	R	D	M
6	B	R	D	M
5	B	R	D	M
4	B	R	D	B
3	B	R	D	B
2	B	R	D	B
1	B	R	D	B
0	B	R	D	B

BAD	
Header	Trailer
001	010
<u>Slave ID</u>	<u>Slave ID</u>
<u>etf ID</u>	<u>etf ID</u>
formatter ID	formatter ID
n	n
n	n
0	1
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
B	B
A	A
D	D

Legend

n	link number
F	FEI14 flag
L	L1ID
B	<u>B</u> CID
T	<u>T</u> oT
C	Column
R	Row
S	service code
D	service code counter
E	timeout error
c	condensed mode (not yet implemented)
P	link masked by <u>P</u> PC (not yet implemented)
p	Preamble error (bitlip in header)
l	L1ID error
b	<u>B</u> CID error
z	Trailer timeout
h	Header Trailer limit error
v	row/column error (row/column value > maximum)
M	skipped trigger

Hard-coded
 From Rod Logic
 From Module

S-Link Header (Pixel)

PIXEL											
Word 0	Word 1	Word 2	Word 3	Word 4	Word 5	Word 6	Word 7	Word 8	Word 9		
31	B	E	0	0	Source ID	Run number	Ext L1ID	0	0	0	
30											
29	0	E	0	3				0	0	0	
28											
27	F	1	0	0				0	0	0	
26											
25	0	2	0	1				0	0	Rod Event Type	
24											
23	0	3	0	0				0	0	0	
22											
21	0	4	0	0				0	0	0	
20											
19	0	E	0	0	Slave ID			BCID	ATLAS Event Type	0	
18											
17	0	E	9	0	Source ID					0	Tim Event Type
16											
15	0	E	9	0	Source ID					0	Tim Event Type
14											
13	0	E	9	0	Source ID					0	Tim Event Type
12											
11	0	E	9	0	Source ID					0	Tim Event Type
10											
9	0	E	9	0	Source ID					0	Tim Event Type
8											
7	0	E	9	0	Source ID					0	Tim Event Type
6											
5	0	E	9	0	Source ID					0	Tim Event Type
4											
3	0	E	9	0	Source ID					0	Tim Event Type
2											
1	0	E	9	0	Source ID					0	Tim Event Type
0											

Legend

	Hard-coded
	From register
	From TIM

S-Link Trailer (Pixel)

		NORMAL				
	Word 0	Word 1	Word 2	Word 3	Word 4	Word 5
31	L1CHKFAILGLOBAL					
30	BCIDCHKFAIL	0	0	0	0	E
29	L1CHKFAILFE					
28	EEOVERFLOW					
27	HITOVERFLOW					
26	BITLEIP	0	0	0	0	0
25	HITPARITY					
24	REGPARITY					
23	HAMMINGCODE					
22	EEOVERFLOW	0	0	0	0	F
21	0			0		
20	row/column error					
19	raw data	0				
18	preamble error	0				
17	0	BOC clock error	0	0	0	0
16	header trailer limit error	Tim clock error				
15	0	0	0	0	0	
14	0	Error count	0	Word count	0	0
13	0					
12	0		0		0	0
11	0					
10	0		0		0	0
9	0					
8	0					
7	0					
6	0					
5	Trailer error (always '0')		0		0	0
4	0					
3	0					
2	timeout error		2		1	0
1	l1id error					
0	bcid error					

	FAKE TRAILER					
	Word 0	Word 1	Word 2	Word 3	Word 4	Word 5
	0	E	0	0	0	E
	0	C	0	0	0	0
	0	0	0	0	0	F
	1	0	0	0	0	0
	0	0	0	Word count	0	0
	0	0	0		0	0
	0	0	0		0	0
	0	0	0		0	0
	8	0	2		1	0

ERROR COUNT = (preamble error or L1id error or BCID error) + (HT Limit error or Trailer TO err) +

Timeout error + raw data + Rowcol error + FE error ----- sum over each module

Legend

	Hard-coded
	From Rod Logic
	From Module
	From TIM

Module output (Pixel)

NORMAL				
	Header	HIT	FE Flag	Trailer
31-29	001	100	000	010
28	P	0	1	Z
27	t	F	F	H
26	l	F	F	V "or" A
25	b	F	F	0
24	0	F	F	0
23	0	T	0	0
22	efb_spin	T	0	0
21	MCC_num1	T	0	0
20	MCC_num0	T	1	0
19	0	T	1	0
18	QUAD_num	T	1	0
17	MCC_num1	T	1	0
16	MCC_num0	T	1	0
15	S	0	0	efb_spin
14	S	0	0	QUAD_num
13	S	0	0	MCC_num1
12	S	C	c	MCC_num0
11	L	C	d	0
10	L	C	e	0
9	L	C	f	0
8	L	C	g	0
7	B	R	q	0
6	B	R	q	0
5	B	R	q	0
4	B	R	q	0
3	B	R	p	0
2	B	R	o	BCID Offset
1	B	R	n	BCID Offset
0	B	R	m	BCID Offset

NO ROW/COLUMN ERROR REPORTED (HERE)

TO BE SEPARATED:

BAD	
Header	Trailer
001	010
0	0
1	0
0	0
0	0
1	1
0	0
efb_spin	0
MCC_num1	0
MCC_num0	0
0	0
QUAD_num	0
MCC_num1	0
MCC_num0	0
0	0
QUAD_num	0
MCC_num1	0
MCC_num0	0
0	efb_spin
0	QUAD_num
0	MCC_num1
0	MCC_num0
B	B
A	A
D	D

EMPTY SKIPPED EVENT	
Header	Trailer
2	4
0	0
0	0
0	0
0	0
0	0
efb_spin	0
MCC_num1	0
MCC_num0	0
0	0
QUAD_num	C
MCC_num1	0
MCC_num0	0
0	0
0	A
E	C
E	C
E	A

Legend

P	Preamble error (bitflip in header)
t	timeout error
l	L1ID error
b	BCID error
S	Skipped Trigger
L	L1ID
B	BCID
F	FEI3 ID
T	ToT
C	Coloum
R	Row
Z	Trailer error
H	Header Trailer limit error
V	Data overflow error
A	Formatter Fifo almost full

c	L1ID EoE check err
d	BCID EoE check err
e	L1ID check err
f	EoE overflow
g	Hit overflow
q	FE error flag
p	hit parity err
o	Com/glob. reg. Parity
n	Hamming code err
m	EoC overflow

	Hard-coded
	From Rod Logic
	From Module
	From Register

Backup Slides

Description

- **Different** from old readout!!
- Cut on **event size** **before** filling the fifos
- Acting on **link_encoder** (IBL) or **quad_link_formatter** (Pixel)
 - ① per **each event** number of **hits** per module is counted
 - ② if **number of hits** \geq **header_trailer_limit** \rightarrow hits are **not propagated** to fifos
- does **not** depend on **fifo_occupancy**
- similar to old readout **data overflow limit**

TO DO

- **RENAME** in **data overflow limit** (to avoid confusion)

Description

- Cut on **event size AFTER** filling the fifos
- **Redundant** → almost same purpose of Header Trailer Limit
- Acting on **fifo_readout_controller**
 - ① per **each event** number of **words** per module is counted
 - ② if **number of words** \geq **data_overflow_limit** → switch to next link **without freeing the FIFO**
- **Dangerous** → data are stuck in fifos
- **DO NOT USE** (set the value to maximum)

TO DO

- **DELETE**

Description

- Purpose: **protection** against situation where modules suddenly **stop sending data**
- Acting on **link_encoder**
 - ① per each module count clock cycles after module header (reset at trailer)
 - ② if **clock cycles** \geq **trailer.timeout** \rightarrow close event with trailer
- **Warning:** could activate while reading out module if event is **very long** \rightarrow **proper configuration** needed to avoid this

Timeout (1)

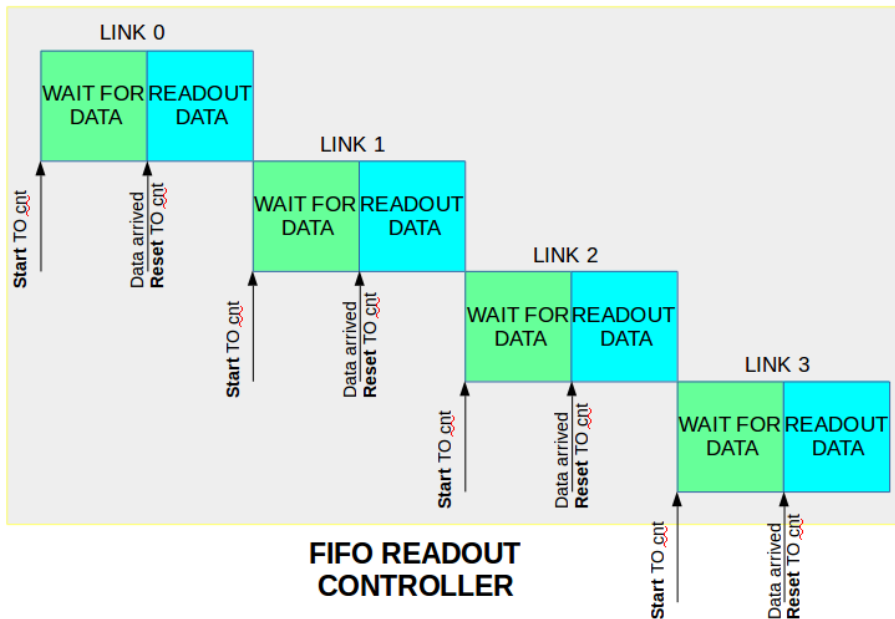
Description

- Purpose: **protection** against situations where modules are too **slow in sending data**
- Acting on **fifo_readout_controller**
 - ① per **each module** count clock cycles between **trigger** and **module header**
 - ② if **clock cycles** \geq **timeout_limit** \longrightarrow **insert empty event**, **reset clock cycles counter** and **switch to next link**
- timeout is **cumulative** per each module (in groups of four)

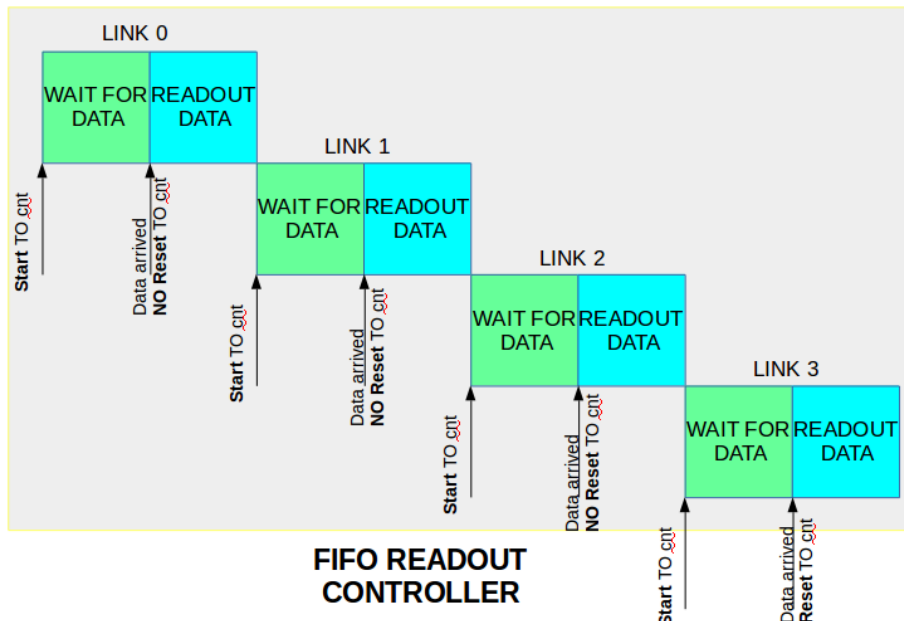
TO DO

- **Change timeout logic** to avoid **cumulative effects**

Timeout (2) - current implementation



Timeout (3) - possible future implementation



Timeout (4) - current VS future implementation

Suppose channel 1, 2 and 3 are NOT sending data!

