

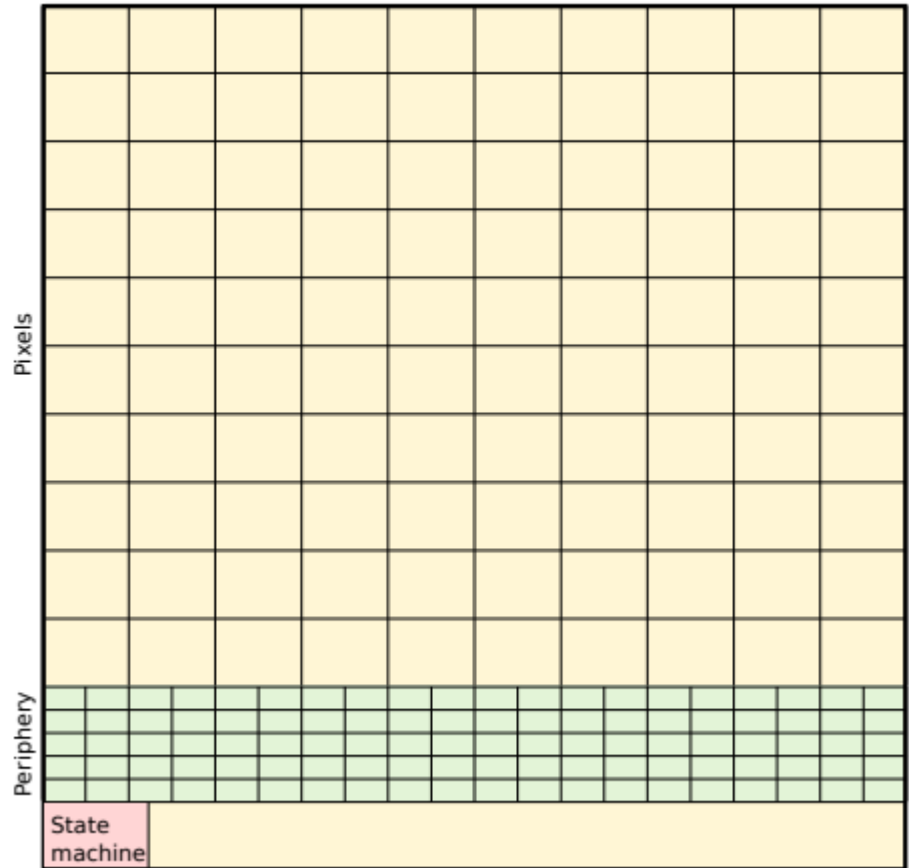
Status of DAQ

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PANDA Meeting
Ruhr-Universität Bochum
GSI, Darmstadt
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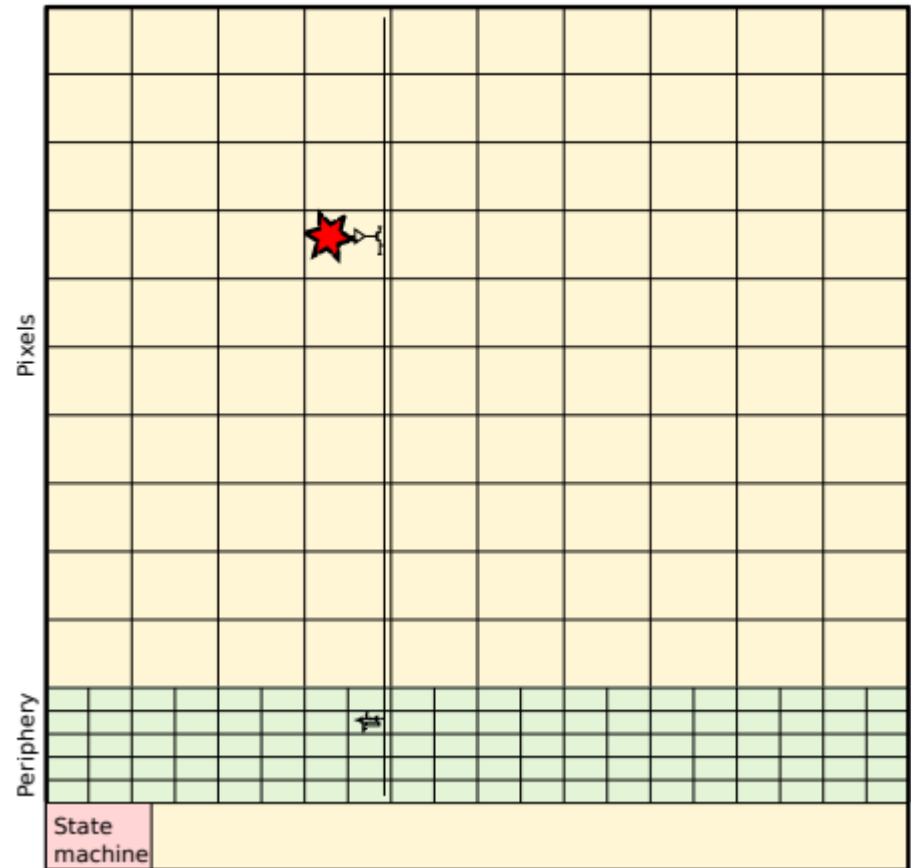
Functionality of MuPix

- Matrix of pixels
- Each pixel has its own mirror cell in Periphery
- State machine to provide a clock
- Transmission lines



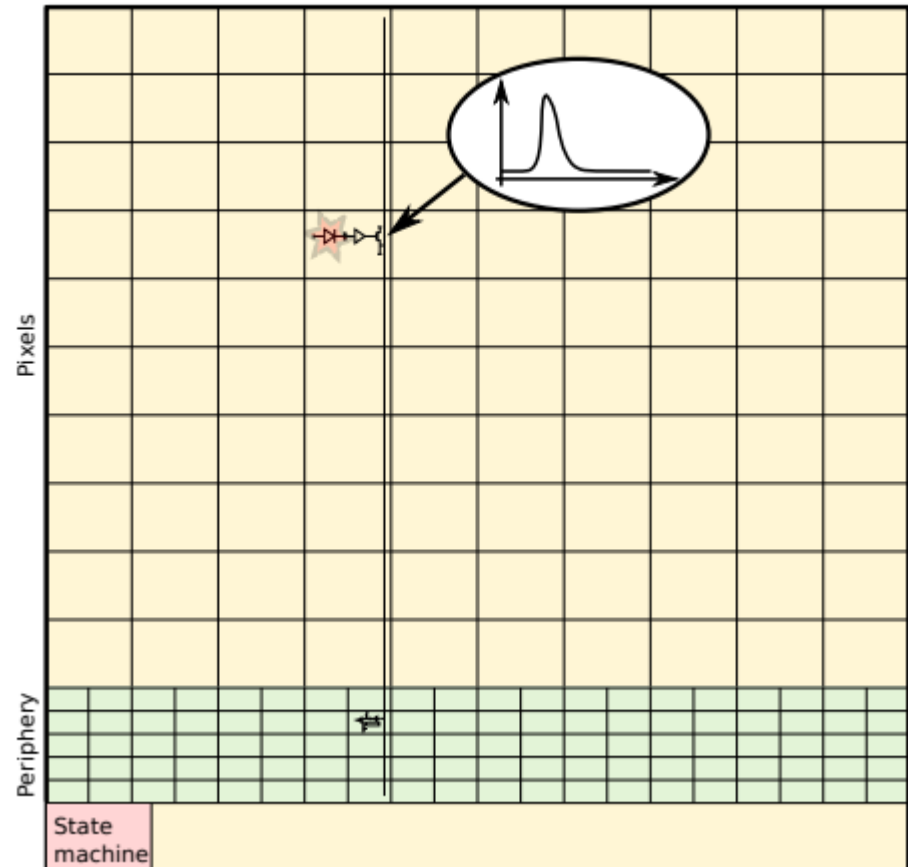
Functionality of MuPix

- A particle passes through a certain Pixel



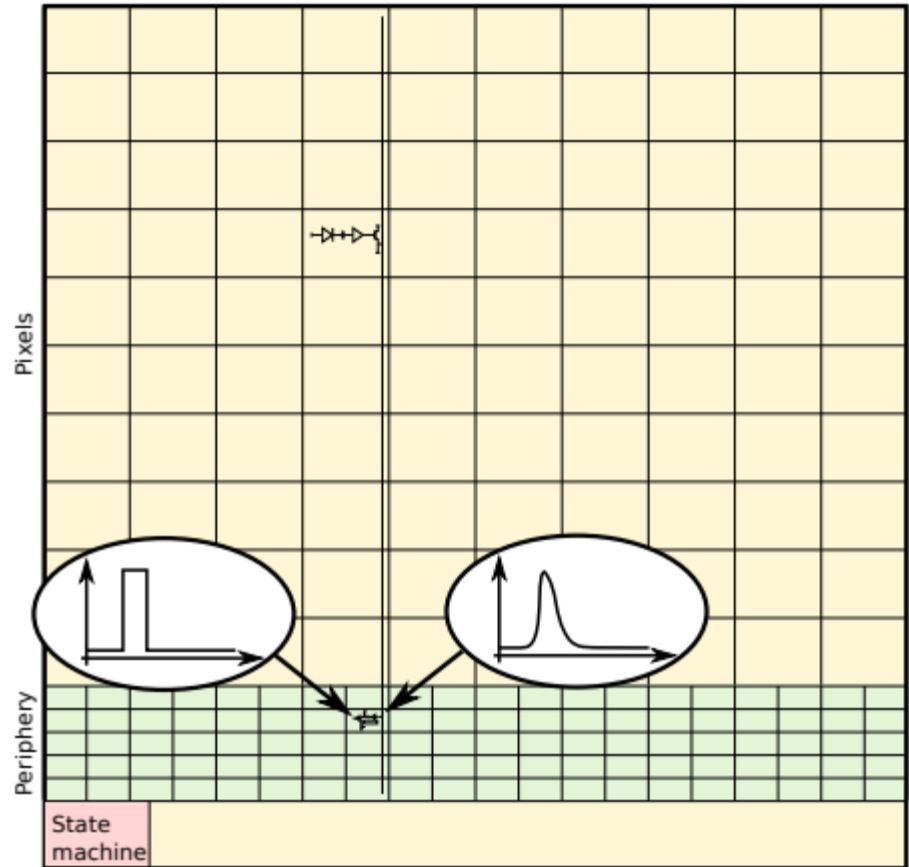
Functionality of MuPix

- Analog signal created and amplified



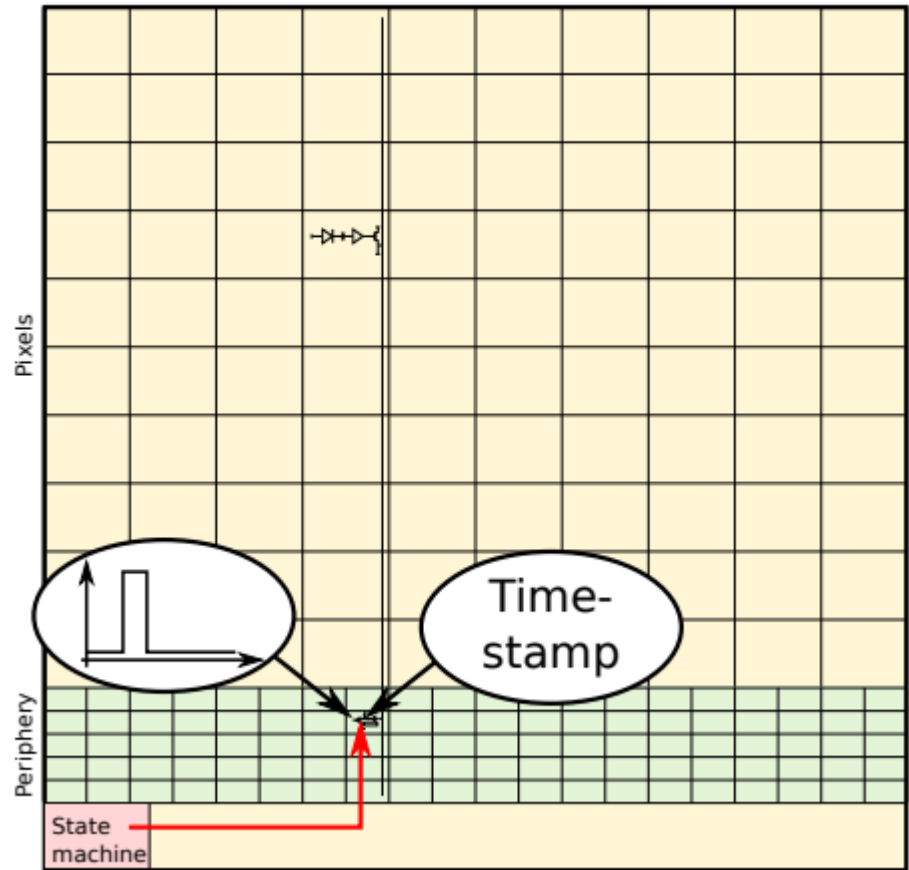
Functionality of MuPix

- Send to the mirror cell in periphery via transmission lines
- Digitized according to a certain threshold



Functionality of MuPix

- Timestamp created for the hit by state machine



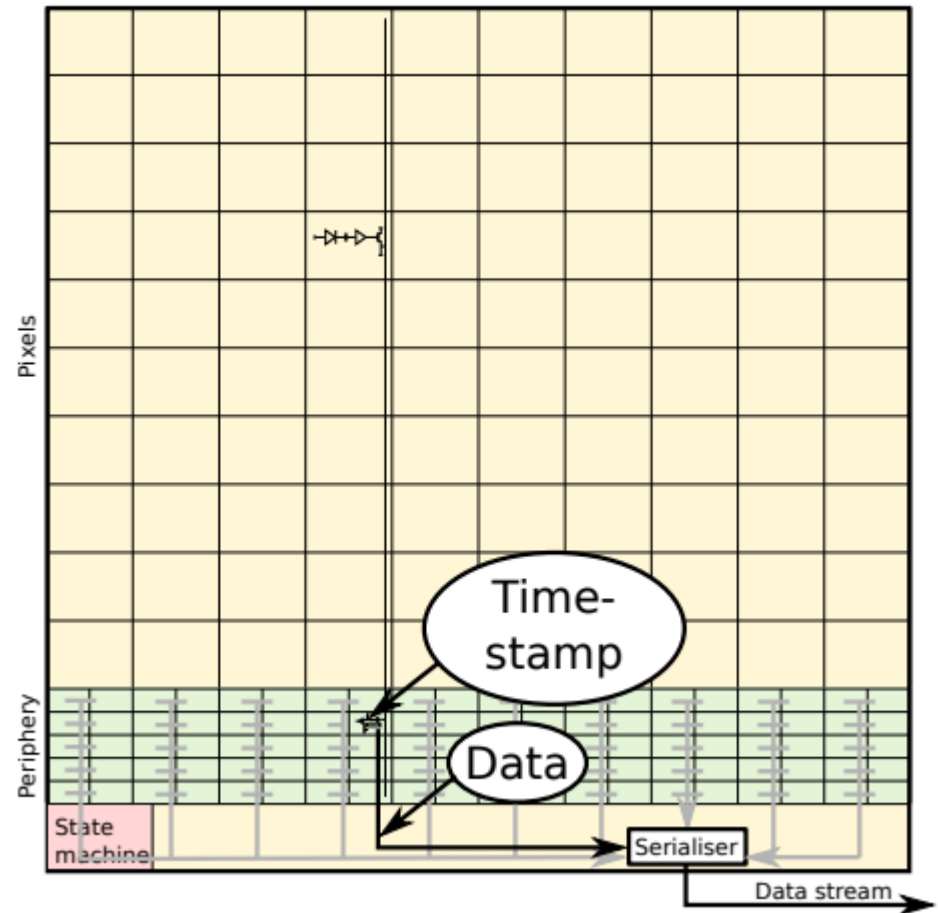
Functionality of MuPix

- Data 8bit/10bit encoded and serialized
- Send to readout electronics via LVDS cables (400Mbit/s)

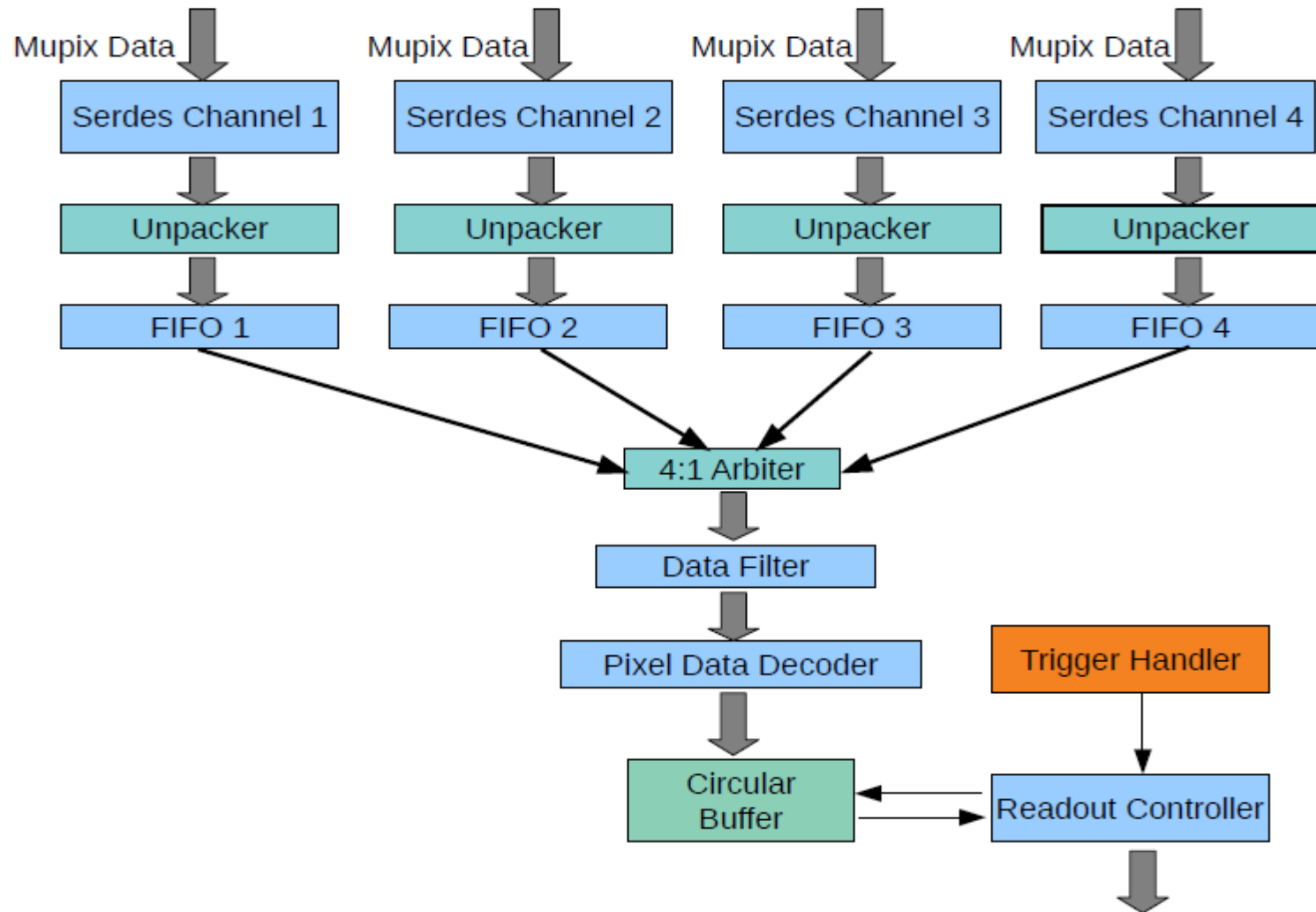
NOTE:

1. 8bit/10bit encoding is a Method that changes [8bit word](#) to [10 bit word](#). It aims to accomplish [DC balance](#) and to Provide state changes for [clock recovery](#).

2. Serialization is a process used to convert a [parallel data](#) interface to [serial data](#) interface



Initial Data Path



Hitsorter

Data hit:

- Hit charge (6bits)
- Hit column position (8bits)
- Hit row position (8bits)
- Timestamp (10bits)

Hitsorter (Done by Ann-Kathrin
Perrvoort - Heidelberg):

- Memory of 8 blocks
- 128 TS / block → 1024 TS
→ 25.6 μ s (TS = 25 ns)
- Sorts data according to timestamp information

Address	TS[9:7]	TS[6:0]	Hitcounter[2:0]							
Time stamp	Block		Hit number							
			0	1	2	3	4	5	6	7
0	Block 0	0	0	1	2	3	4	5	6	7
1		1
2		2								
3		3								
4		4								
5		5								
6		6								
7		7								
8		8								
...		...								
127		127								
128		Block 1	0							
...	...									
255	127									
Blocks 2-6										
896	Block 7	0								
...		...								
1023		127								

Hitsorter

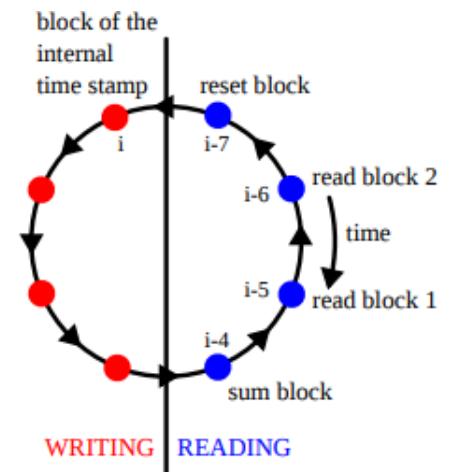
Goal:

Arrangement of data according to its time information.

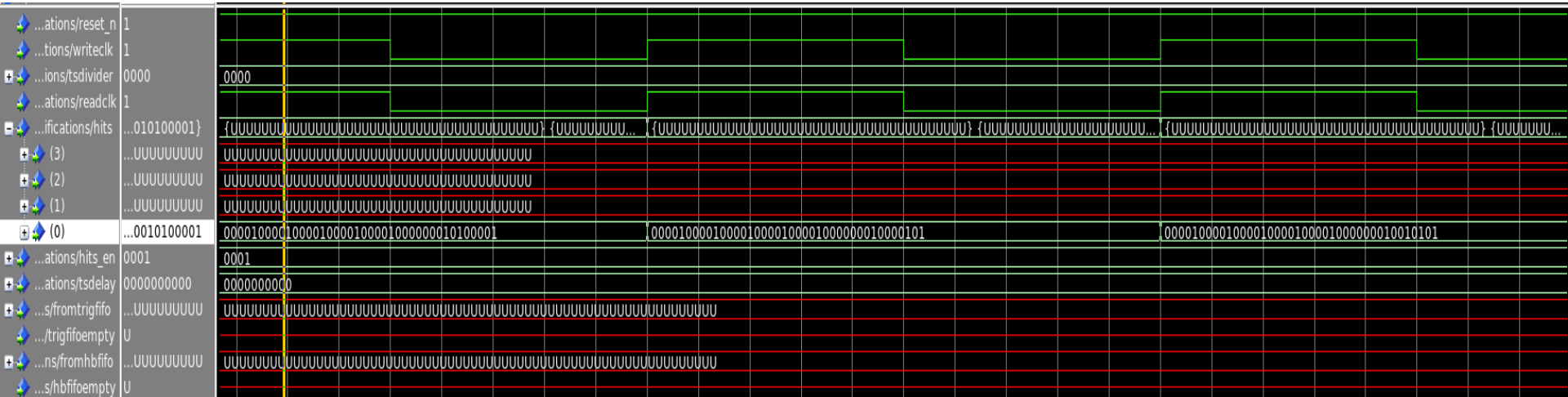
Functionality:

Creates 8 blocks of memory, 4 in “**Writing**” mode and 4 are in “**Reading**” mode

Write to memory and read sorted data



Hitsorter simulations



Input 3 data points :

1- TS = 0010100001

2- TS = 0010000101

3- TS = 0010010101

Hitsorter simulations

..._counter_reg	...0000000000	00000000000000000000000000000000							
...ons/readstate	READING1	READ...	READING2	READING1	READING2	READING1	READING2	FOOTER	IDLE
.../currentblock	001	001							110
...ions/currentts	0010101	0010...	0100001						0000000
...ns/currentts2	0010101	0010...	0100001						0000000
...ns/currentts3	0010101	0010...	0100001						0000000
...ations/nextts	0100001	0100001							
...ns/previous	0000101	0000...	0010101		0100001				
...cations/data2	...0000101001	0000...	00000000111110001000000010000101		00000000111110001000000010010101		00000000111110001000000010100001		
...ons/trigtoggle	0								

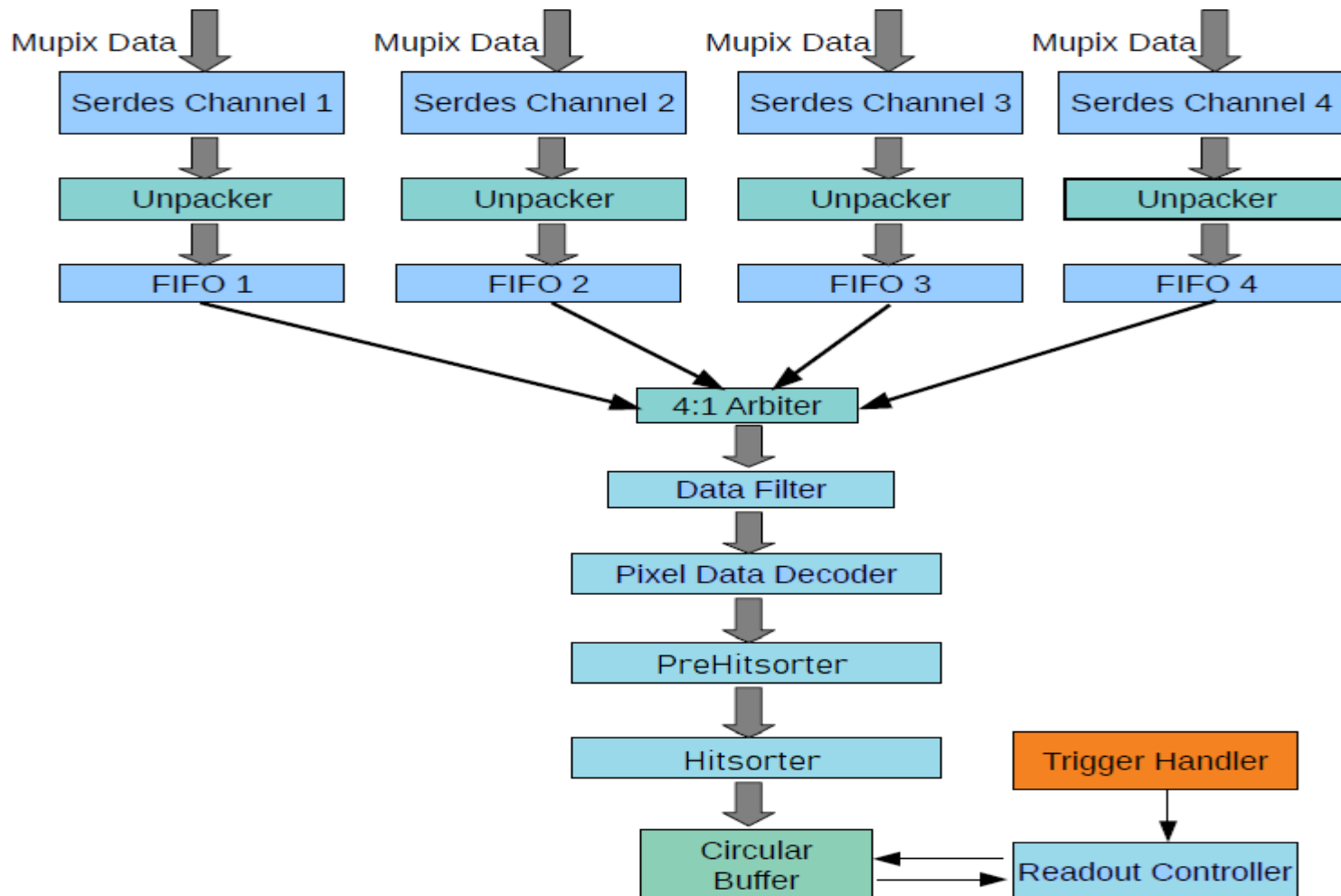
Output:

1- TS = 0010000101

2- TS = 0010010101

3- TS = 0010100001

Updated Data path



Outlook

- Upcoming:
 1. Uploading and installing the upgraded Data Path code to the TRB board
 2. Testing it with inserting injection
 3. Sorting by sensors for the next beam time

More Problems to be fixed:

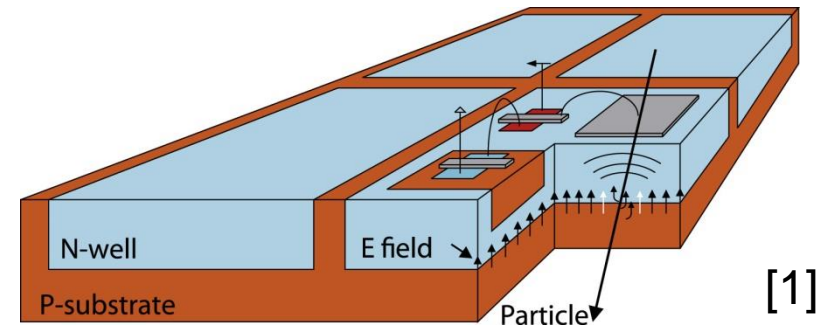
1. Working on SODAnet in order to synchronize LMD DAQ with other subdetectors DAQ

Thank you for attention

BACK UP

Mupix 8

- HV-MAPS (High voltage monolithic active pixel sensors).
- Based on HV-CMOS technology.[1,2]
- 50 μm thin.[3]
- 200x128 pixels ($80 \times 81 \mu\text{m}^2$).[3]
- Voltage bias = - 60 V \rightarrow \approx 10 μm depletion zone. [3]
- Fast charge collection (1 ns).[3]
- Amplification. [3]
- S/N \geq 20.[1]
- 99.7% efficiency.[4]
- Good time resolution.[3]



Updated Datapath with sensor position information

