iTOP Raw Data

April 24, 2014

Computing Group Request

Computing group requested update on raw data from each subdetector:

- What are the status and prospects of the raw data definition of your detector?
- How does the raw data compare with the digits format created by the simulation in terms of size and content?
- What are the status and plans for a converter from raw data to digits (unpacker)?
- What are the status and plans for a converter from digits to raw data (packer)?
- Can packer and unpacker be implemented as modules or is another scheme needed/wanted?

TOPCAF framework dev will start up again with new BASF2 release

Update will be presented at computing group workshop May 5-9

Raw Data Status

iTOP raw data currently digitized waveform packets ~640 bytes per hit (4 window readout)

Word	High bytes		Low bytes		Description
	31:25	24:16	15:8	7:0	
2	0x77617665				"wave" in ASCII
3	0x00	source SCROD revision(7:0)	source SCROD ID(15:0)		source designates which SCROD sent the packet
4	0x0000		0000000 & reference ASIC window(8:0)		identifies analog storage window to be used as reference time for waveforms in this packet. This corresponds to the last window in analog memory sampled, so all timing is a "look-back" from this window.
5	event number				32-bit event number
6	# waveform segments this packet				
7	0x0000		segment ASIC window(15:0)		identifies ASIC_COL(15:14), ASIC_ROW(13:12), ASIC_CH(11:9), analog storage WINDOW(8:0) of waveform segment
8	# of points this segment				
9	segment data 1		segment data 0		waveform ADC values
10	segment data 3		segment data 2		
...	...		...		...
	repeat for further segments				

Format does not yet include RF clock information or equivalent method to

Raw Data Plans

- iTOP feature extraction development in progress, tested over next few months
- Things to include in data output (most to least important):
  - Ch. identifiers, pulse time, height, RF clock sync. info (mandatory)
  - Pulse width
  - CFD threshold sample # on rising edge
  - CFD threshold samples on rising edge
  - CFD threshold "" on falling edge

This information is all that's needed to rederive pulse time

Total Data Size Estimate

Computing group also requested an estimate of total storage needed for iTOP data

- Belle II TDR claims ~360 billion events recorded 48 ab^{-1}
- Can assume 2.5% occupancy in data rate calculations (~205 hits per event)
- Some fraction of hits should be output as both feature extracted data and waveform (10% ?)