2-D clustering algorithm verification

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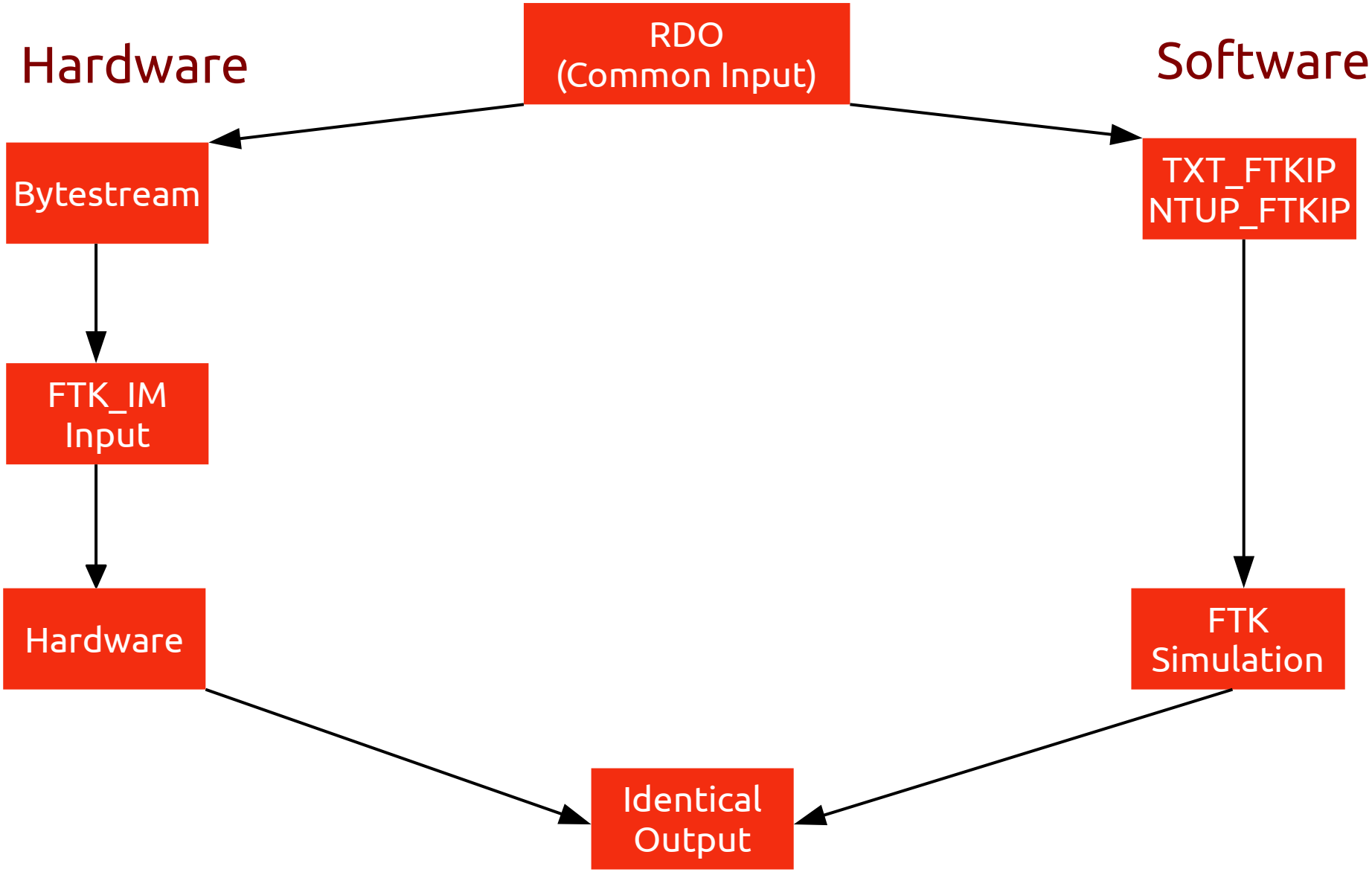
Introduction

Goal: Starting from some input file, process a list of events through firmware and software separately and have an identical result

- Code at TrigFTKSim
- Design follows firmware with three separate parts mimicking each module
- Comparisons have been made after each module to assure 100% accurate flow

Overview


Hardware
RDO
(Common Input)
Software
Bytestream
TXT_FTKIP
NTUP_FTKIP
FTK_IM
Input
Hardware
FTK
Simulation
Identical
Output

Hardware Chain

- Start with RDO, run transformation
  - Output is a Bytestream File
- Run script on Bytestream
  - Script selects specific RDO from Bytestream
  - Extracts hits from it
  - Sorts the hits for Pixel Detector, for IBL hits are prer-sorted
  - Hit sorting done by FE chip, double column, row
  - Output is 32bit wordlist suitable for FTK_IM input
- Run on the Hardware
  - Get output as “readable” 32bit words

Simulation Chain

- Start with RDO, run transformation
  - Output is either an TXT_FTKIP or an NTUP_FTKIP
- Find corresponding RDO from cable map, insert it at source code of FTK Simulation
- Run TrigFTKSim
  - Get output as “readable” 32bit words

FW – SW comparison

- Hit Decoder comparison
  - diff for missing words
- Cluster comparison
  - Script creates a data structure for FW, one for SW and detects potential differences
- Centroid Module comparison
  - Same as cluster

Results identical for all tests for Pixel detector

Current Status

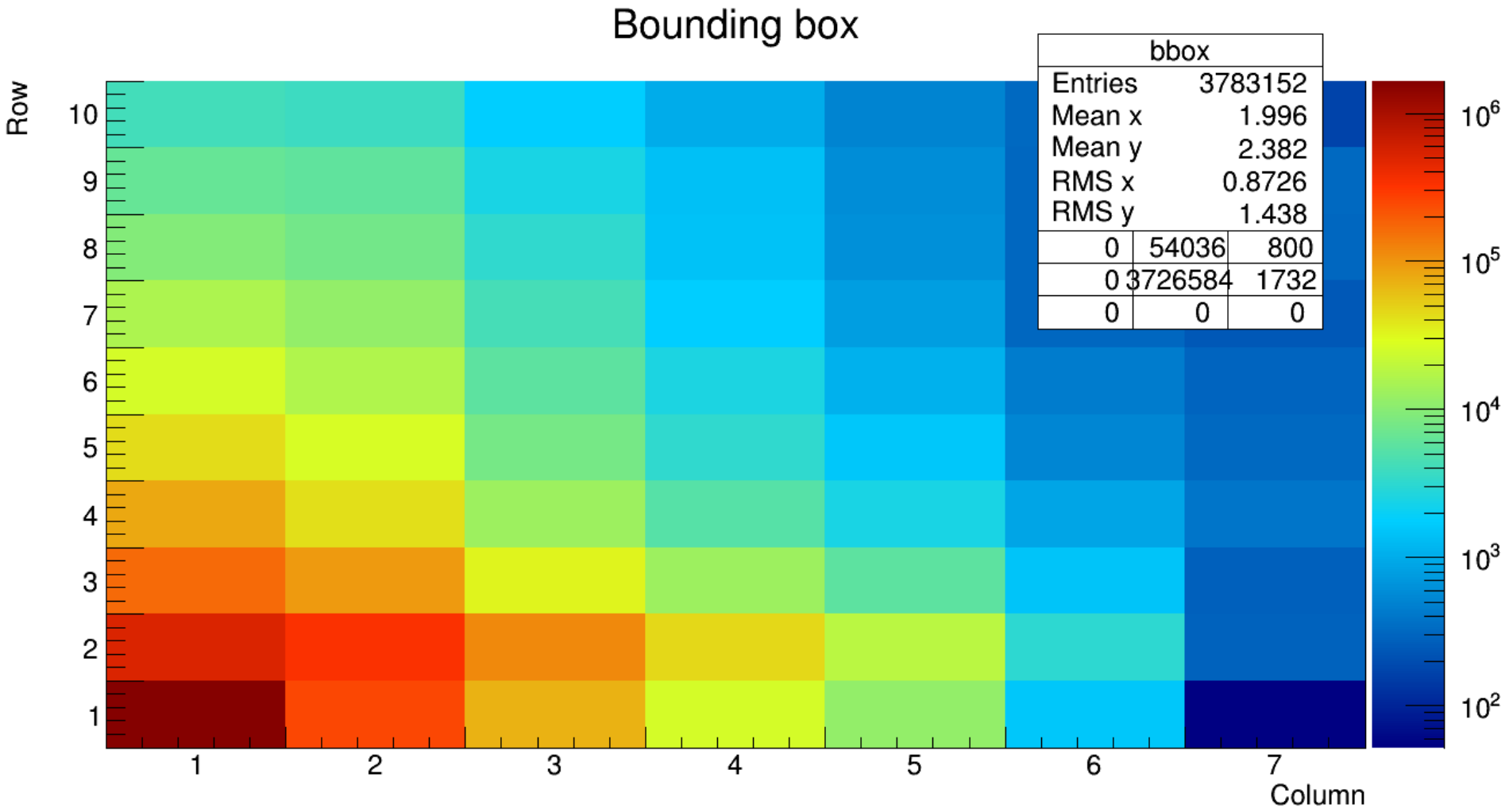
- Pixel: Ready ☺
- IBL: In progress
  - Hit Decoder Implemented, Debugging Pending
  - Clustering Module Implemented, Debugging Pending
  - Centroid Calculation Module Implementation & Debugging Pending

Current Status – Resolution

Comparison between the previous (ideal) centroid calculation and current (realistic) centroid calculation shows that there is a bug somewhere in the code

- Efficiency for single muons
  - With ideal clustering: 0.9114
  - With realistic clustering: 0.0007

Bounding Box Size



Thank you for listening