TrackBase & HitPattern redesign

30/06/2014

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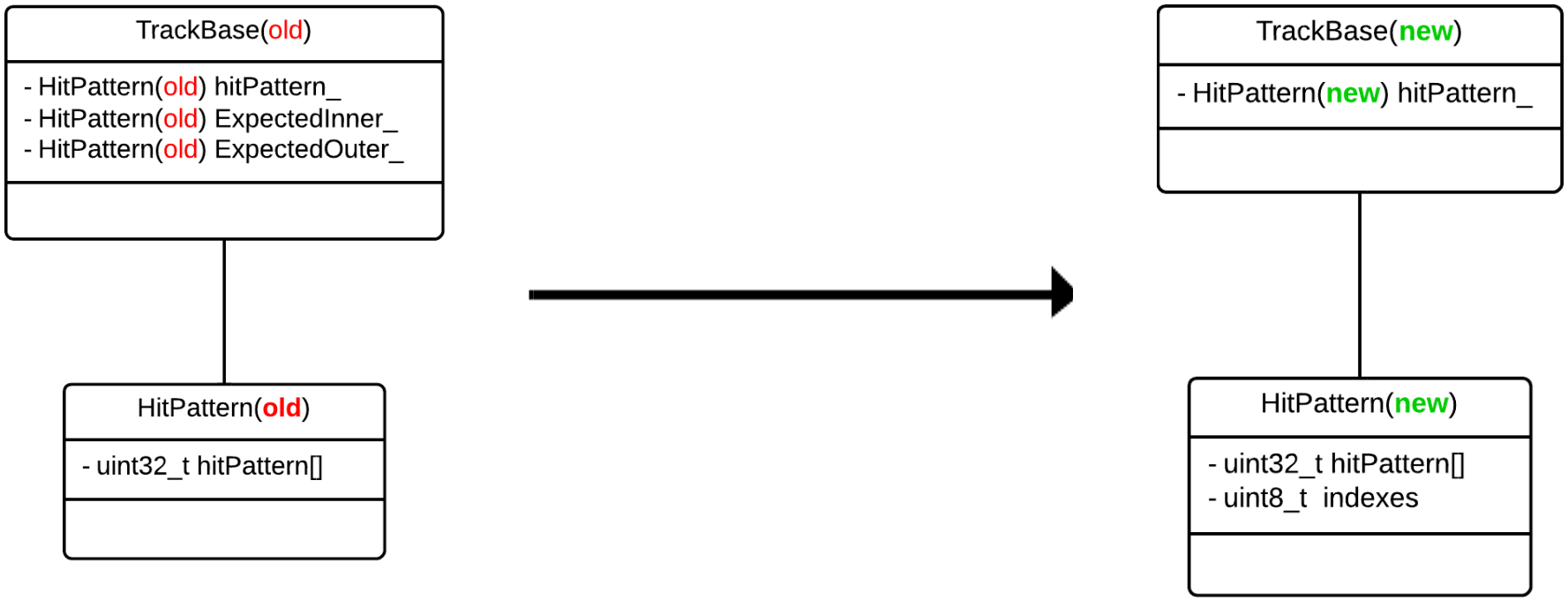
Objective

- Reduce memory used by TrackBase.
  - Current TrackBase has three HitPattern objects.
    - HitPattern_[ ]: stores track hits.
    - TrackerExpectedHitsInner_[ ]: stores missing inner hits.
    - TrackerExpectedHitsOuter_[ ]: stores missing outer hits.
  - A hit belongs to only one of those three categories.
    - HitPattern storage is static → Unused space.

Solution

- Merge the three into one.
- Add boundary indexes.
- Implement a ROOT IOrule so that previous ROOT files can be read.



Memory footprint

- Data from WF 25202.0, 100 samples [1]
  - Old:
    - Runtime size: 11535228 bytes (~11M).
    - Disk size: 549912 bytes (~0.52M).
  - New:
    - Runtime size: 4123110 bytes (~3.93M).
    - Disk size: 552927 bytes (~0.53M).
  - Ratio (new/old):
    - Runtime size: 0.36 (reduced by 64%).
    - Disk size: 1,005 (~ no change).

Interface changes

- TrackBase has three accessors:
  - track.hitPattern().someMethod();
  - track.trackerExpectedHitsInner().someMethod();
  - track.trackerExpectedHitsOuter().someMethod();
- This would change to:
  - track.hitPattern().someMethod(TRACK_HITS);
  - track.hitPattern().someMethod(EXPECTED_INNER_HITS);
  - track.hitPattern().someMethod(EXPECTED_OUTER_HITS);

- All changes required are percolated (PR #4455) [2].

References

- [1] https://twiki.cern.ch/twiki/bin/viewauth/CMS/TrackingHitPatternRedesign
- [2] https://github.com/cms-sw/cmssw/pull/4455