Preparation of data Analysis in SDU

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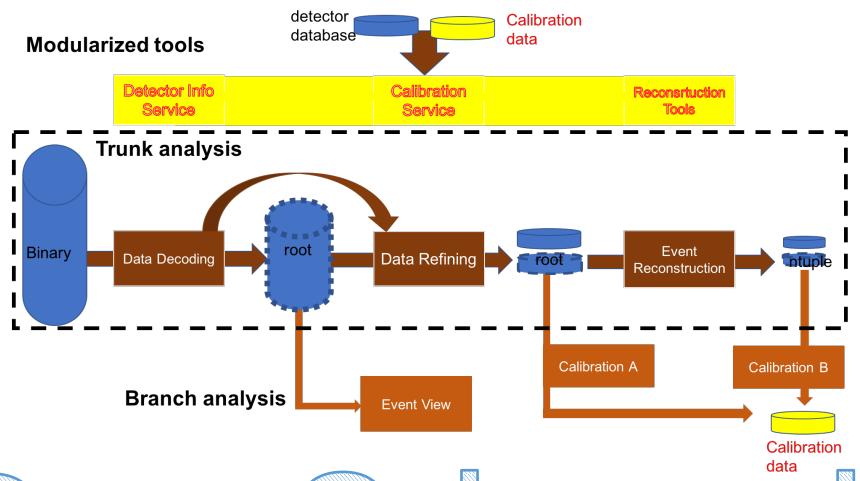
Motivation

- Cooperation internally for an efficient physics analysis.
  - SDU group: 8 faculties + 5 Ph.D.s
    - More than 1 person means cooperation possible when 1+1>2
    - Yantai University, Shandong Agriculture University involved
    - Extend usage to more groups who is interested
  - . Need ramping up, will speed up
- Advantage to start from SDU:
  - Software frame "LordStar” designed by SDU:
    - crucial to adopt the frame work which interact between computing and user.
    - easy to start up with face to face help from experts.
  - PMT and ED test at SDU:
    - starting point to construct a full chain of data correction/calibration, analysis

- Prepare for an efficient data analysis structure:
  - ease sharing: code modularization, a few lines to include tools/services code, package version control, ease switching between different version or different packages(same functionality)
  - improved confidence on result: maintained by expert, used by all. reasonable result of others using the packages,
  - extended validation: debugs by all users from many more points of views.
  - ease understanding data: hard to compare results between totally different code.
  - efficient: not always to analyze full dataset, aim at a run within tens of minutes. Do analysis any time anywhere.
  - quick start up for young scientists: build analysis chain with blocks (as if black box), understand the code step by step when necessary.

Based on LordStar
CMT style packages
Run on farm



Data Oriented

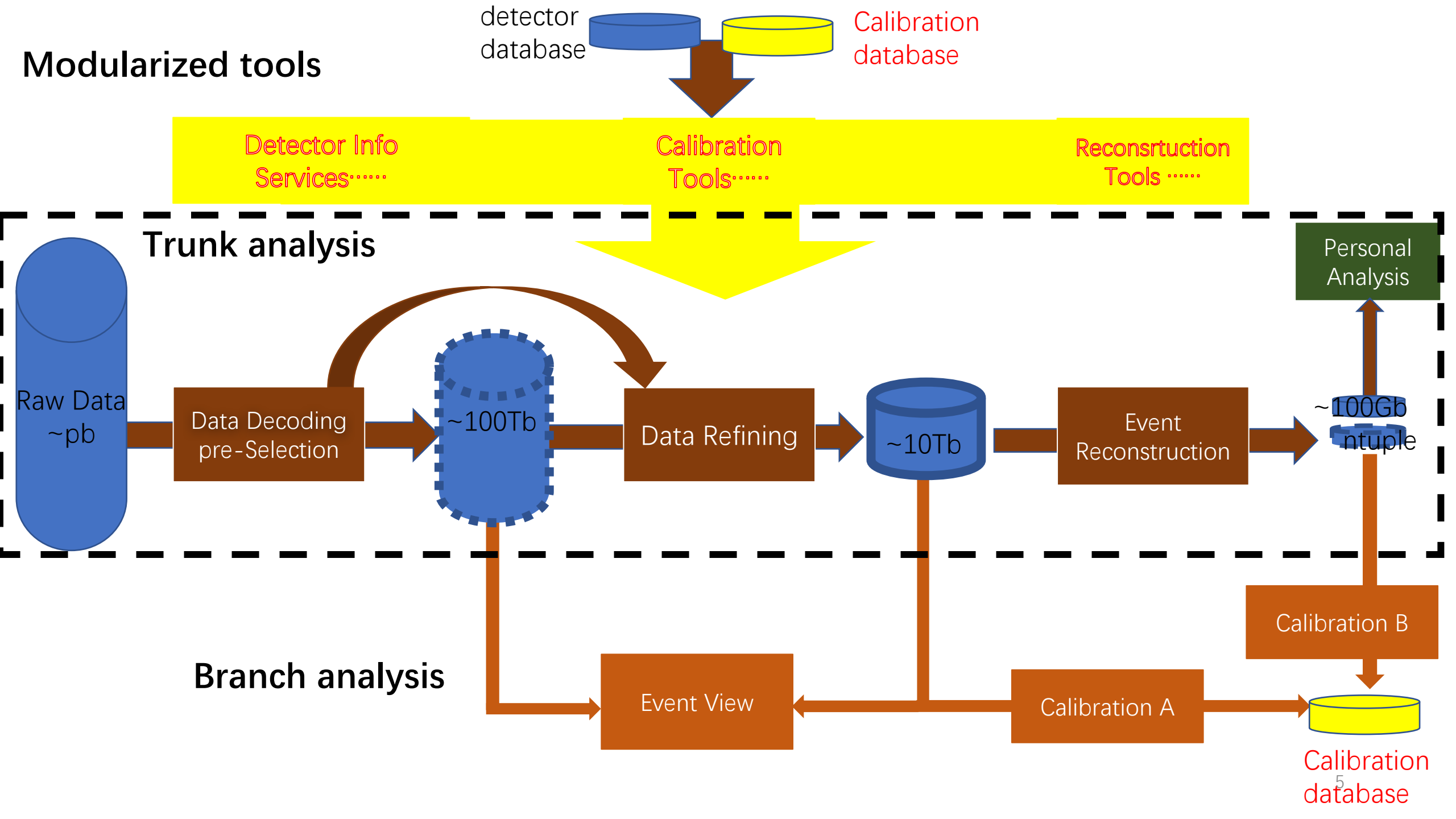
Standardized
Modularized
Easy sharing

Analysis Oriented coding
ROOTCORE style packages
Run on farm or laptop

User Oriented

Fast, fast, fast

Modularized tools



Algorithms: easy to be plugin

DataDecoding

- Decode binary data
- Drop unused data
- preliminary event reconstruction
- Drop unused event
- Input:
  - ED binary file
  - MD binary file
  - … binary file
- Output: [LHAASO event]

DataRefining

- **iDataRefining base class**
- **EDDataRefining**
- **MDDataRefining**
- **…Refining**
- Input: LHAASO Raw Event
- Output: LHAASO event (corrected, selected, slimmed)

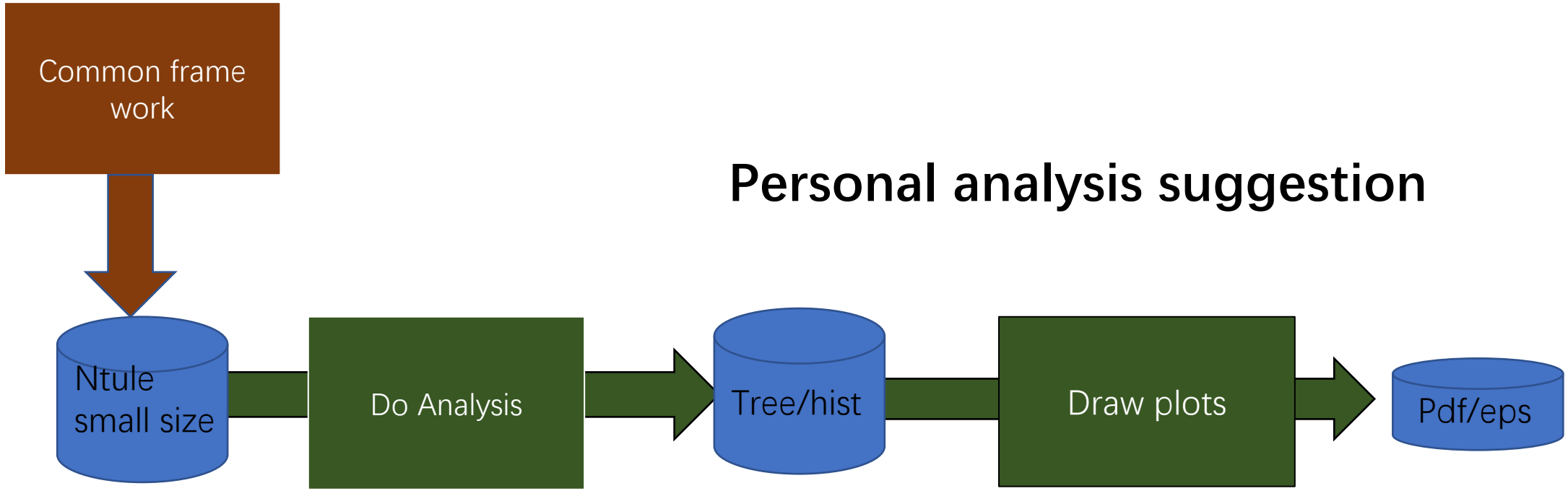
EventReconstruction

- **KM2AEventReconstruction**
- **WCDAEventReconstruction**
- **MultiDetectorEventReconstruction**
- Input: LHAASO Raw Event
- Output:
  - [LHAASO Reco Event]
  - [Simple ntuple]

Calibration tasks:

- The following calibration run though part of analysis chain, but using different event selections
  - Single particle charge v.s. time after HV/temp correction. Calib A
  - Single particle time delay v.s. time after delay correction, Calib B
  - ED A/D ratio per detector per run/file. Calib A
  - ED linear-limit : from EDs around the target ED, the expected number of hits are calculated and compared to the response of the target ED. If the response stop at some point, it is the linear space upper limit. Calib B
  - ED scales calibration: a proportion relation between response and number of hits are assumed. Using the method above, the proportion can be tested and the uncertainty are concluded. Calib B

Personal analysis suggestion



Thanks