SMT Examine Progress Report

John Rha

4/5/00

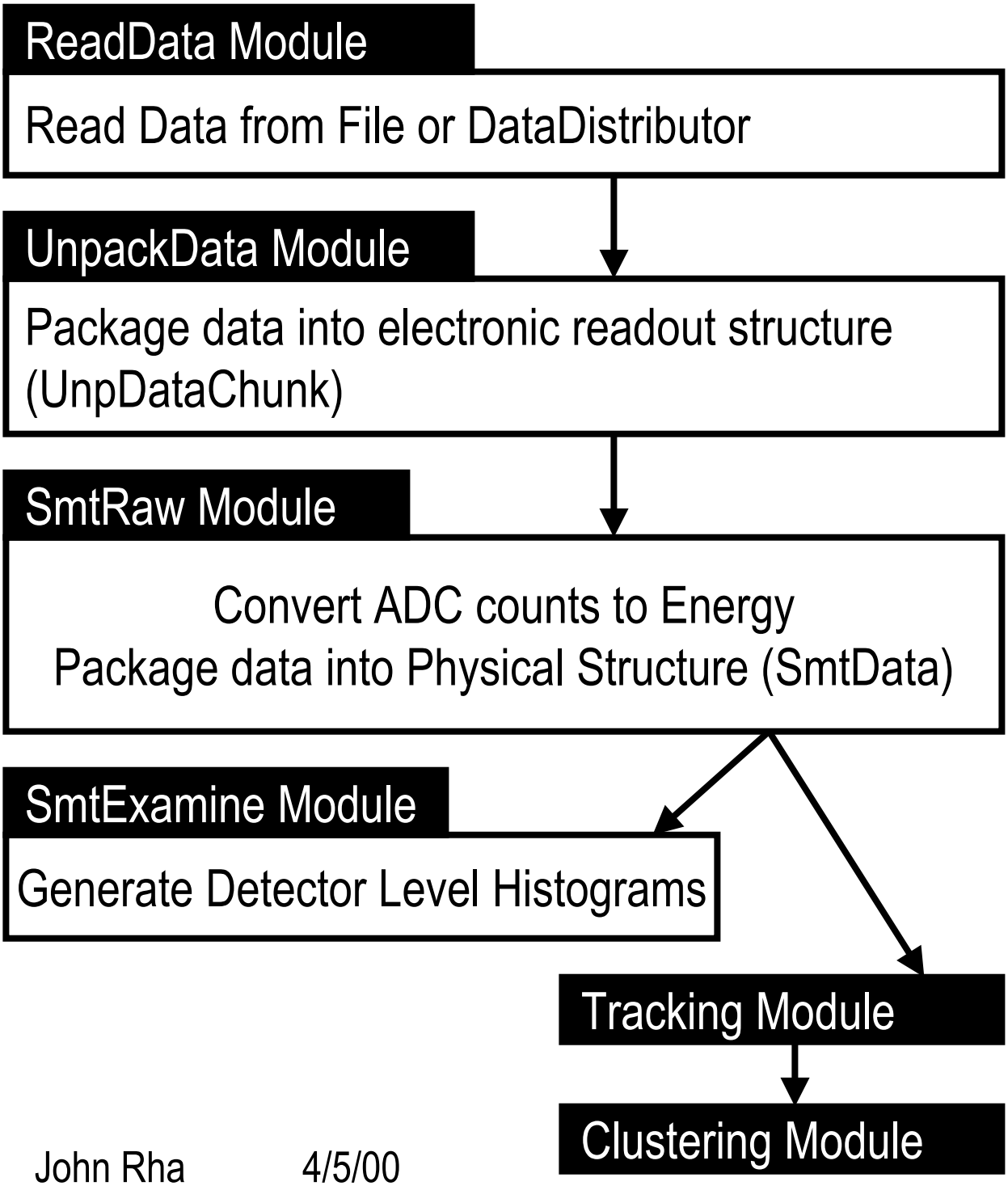
Project Overview

- SMTRaw Module
  - ADC-to-Energy conversion support.
  - Speed Enhancement.
- SMTData Module
  - Speed Enhancement.
- SMTExamine
  - Strip level energy distribution support.
  - User selectable histogram list.
  - NTuples support.

- Binary is built with t00.82.00 parts.

SMTExamine

Program Flow



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Energy Conversion
Implementations

- **STATIC Mode:**
  Fixed Pedestal and Gain for all Strips
  Feature is Implemented

- **DYNAMIC Mode:**
  Derive Pedestals from Event Data
  Feature is Implemented

- **ON_LINE Mode:**
  Look up Pedestal and Gain from the Database (or File)
  Feature is in Progress

Energy Conversion
Background

- Silicon Vertex Detector digitizes energy deposit (8-bit).
- Digitized output contains scale and offset factors.

> Let ***E***=physical energy deposit.
> ***C***=Digitized energy measurement.
>
> Then,
> $E = s \cdot (C - C_0)$, where
> ***s*** is the scale factor (GeV/count).
> C_0 is the offset (a.k.a. Pedestal).

- The offset factor C_0 is time dependent.
- $\sigma(C_0)$=1~2 digitized counts.

Energy Conversion
Dynamic Calibration

What does it do?

- Computes Pedestal C_0 for every event from the event data themselves.
- A statistical calculation.

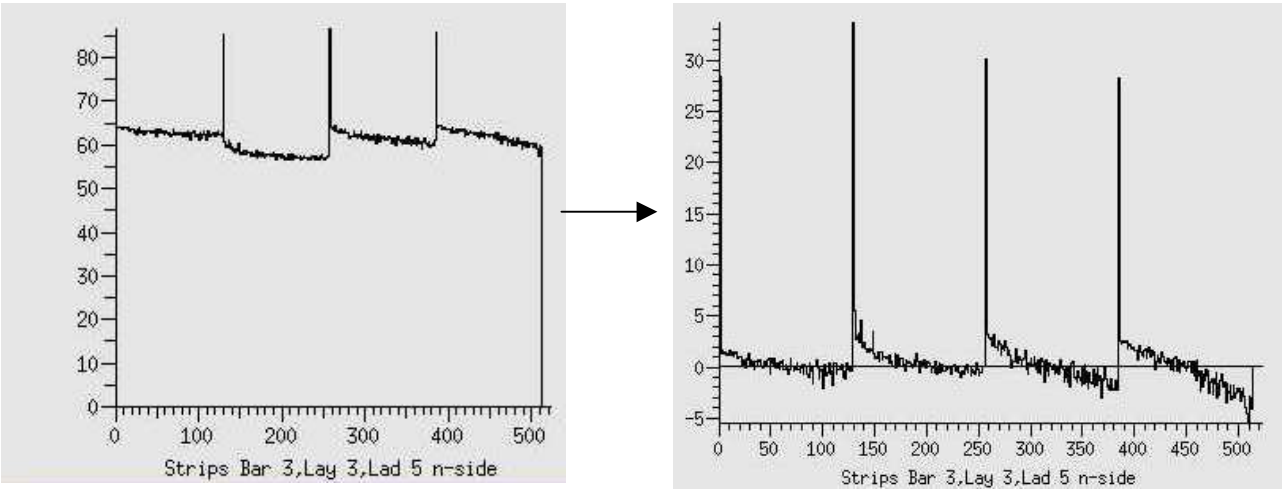
Why do we need it?

- Takes place of the on-line calibration infrastructure (until it is completed).
- Permits testing of tracking packages with cosmic ray data now.
- Relieves schedule coupling between tracking software and energy calibration infrastructure.

Dynamic Calibration

Theory

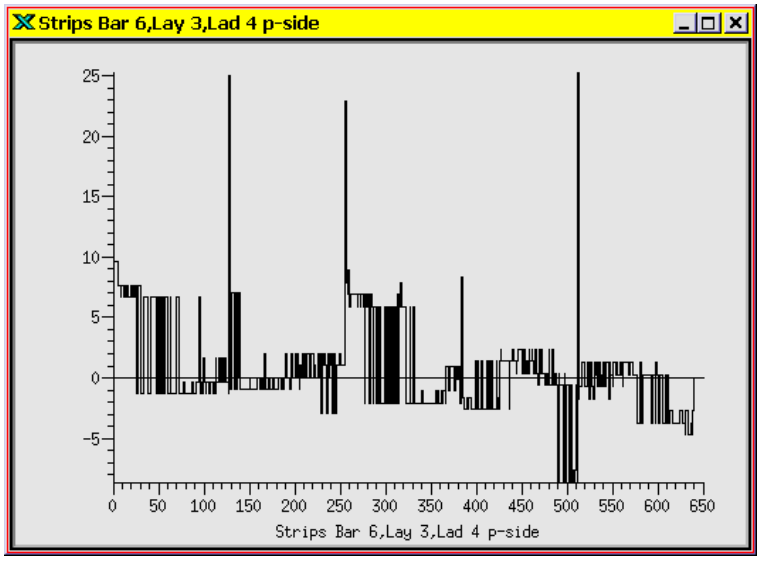
- Single SVX chip digitizes 128 channels.
- All channels in one SVX chip share the same offset.



Dynamic Calibration

Implementation

- The chip-wide offset is taken as the mean ADC's of 20 strips with amplitude closest to the mode.
- The offset is stored in a class structure mirroring SMT electronic readout structure.



SmtRaw

New Parameters

- **float AdcToEnergy**
  GeV per ADC count.
- **float GlobalPedestal**
  System-wide pedestal in STATIC calibration mode.
- **string CalibrationMode**
  =STATIC for fixed Pedestal.
  =DYNAMIC for dynamic calibration.
  =ON_LINE for database look-up.
- **bool PrintPedestal**
  string PedestalFileName
  Dumps pedestal of each SVX chips into a file for each event in DYNAMIC calibration mode.

SmtRaw
Pedestal Output Format

```
CollisionID: Run number: 0, Event Number: 415
 Crate: 3 VRB: 8 HDI: 2 Chip: 0 Pedestal: 36.96 Spread: 0.196092 EnergyPerADC: 1
 Crate: 3 VRB: 8 HDI: 2 Chip: 1 Pedestal: 37.84 Spread: 0.366605 EnergyPerADC: 1
 Crate: 3 VRB: 8 HDI: 2 Chip: 2 Pedestal: 37 Spread: 0 EnergyPerADC: 1
 Crate: 3 VRB: 8 HDI: 2 Chip: 3 Pedestal: 44.52 Spread: 0.499634 EnergyPerADC: 1
 Crate: 3 VRB: 8 HDI: 2 Chip: 4 Pedestal: 34.36 Spread: 0.479944 EnergyPerADC: 1
 Crate: 3 VRB: 8 HDI: 2 Chip: 5 Pedestal: 44.88 Spread: 0.32476 EnergyPerADC: 1
 Crate: 3 VRB: 8 HDI: 2 Chip: 6 Pedestal: 37 Spread: 0 EnergyPerADC: 1
 Crate: 3 VRB: 8 HDI: 2 Chip: 7 Pedestal: 44 Spread: 0 EnergyPerADC: 1
 Crate: 3 VRB: 8 HDI: 2 Chip: 8 Pedestal: 44.16 Spread: 0.366605 EnergyPerADC: 1

CollisionID: Run number: 0, Event Number: 416
 Crate: 3 VRB: 8 HDI: 2 Chip: 0 Pedestal: 44.88 Spread: 0.32476 EnergyPerADC: 1
 Crate: 3 VRB: 8 HDI: 2 Chip: 1 Pedestal: 37.96 Spread: 1.94896 EnergyPerADC: 1
 Crate: 3 VRB: 8 HDI: 2 Chip: 2 Pedestal: 45 Spread: 0 EnergyPerADC: 1
 Crate: 3 VRB: 8 HDI: 2 Chip: 3 Pedestal: 43 Spread: 0 EnergyPerADC: 1
 Crate: 3 VRB: 8 HDI: 2 Chip: 4 Pedestal: 37 Spread: 0 EnergyPerADC: 1
 Crate: 3 VRB: 8 HDI: 2 Chip: 5 Pedestal: 46 Spread: 0 EnergyPerADC: 1
 Crate: 3 VRB: 8 HDI: 2 Chip: 6 Pedestal: 36 Spread: 0 EnergyPerADC: 1
 Crate: 3 VRB: 8 HDI: 2 Chip: 7 Pedestal: 45.32 Spread: 0.466662 EnergyPerADC: 1
 Crate: 3 VRB: 8 HDI: 2 Chip: 8 Pedestal: 45.96 Spread: 0.196403 EnergyPerADC: 1
```

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New Objects

- CSMT_DZERO_Readout
  - Sets up general purpose data structure mirroring DZERO electronic readout.
  - Inherits from CSMT_Readoout.
  - Contains CSMT_Crate, CSMT_VRB, CSMT_HDI, and CSMT_Chip.

- CSMTCal_FEModule
  - Performs pedestal subtraction on a VRB's worth of SVXChannel objects.
  - Contains CSMTCAL_SVXChip
    - Single chip pedestal subtraction.

SmtRaw

Calibration Object

- Applies to calibration to ADC counts and converts them into energies.
- Accepts a vectors of strips belonging to a single VRB unit in SVXChannel format.
- Packages strips into SmtStrips object and dumps them into SmtData structure.
- **CSMT_CalServer_Base** derives **CSMT_CalServer_Static**, **CSMT_CalServer_Dynamic**, **CSMT_CalServer_OnLine.**

SmtExamine

Work in progress

Completed tasks

- Repair histogram array overruns.
- Support instantaneous event output (as supposed to accumulated pulse heights).
- Support network data feed.

Tasks in Progress – ECD 4/11/00.

- Support per-strip ADC distribution plots.
- Support user-specifiable histogram list.
- Maintain histogram list in a class hierarchy mirroring physical SMT structure.