CDMS Note DRAFT

A Proposed Trace Acquisition Subsystem for CDMS

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`http://fnphyx-www.fnal.gov/experiments/cdms/software/daq`.

1 What

This work plan specifies the performance of the trace acquisition portion of the Data Acquisition system (DAQ). Figure 1 illustrates schematically how this piece fits into the overall DAQ system.

The trace acquisition subsystem receives signals from the RTF board and from a not-yet-specified trigger. It delivers data to the not-yet-specified event builder. We plan to specify an interface (API) for both the trigger and the event builder to the trace acquisition subsystem, to be used in developement. This interface will be revised as specifications are developed for the other subsystems.

Familiarity with most of the components in the system and similar performance from other systems gives us confidence that we can achieve the specs outlined here.

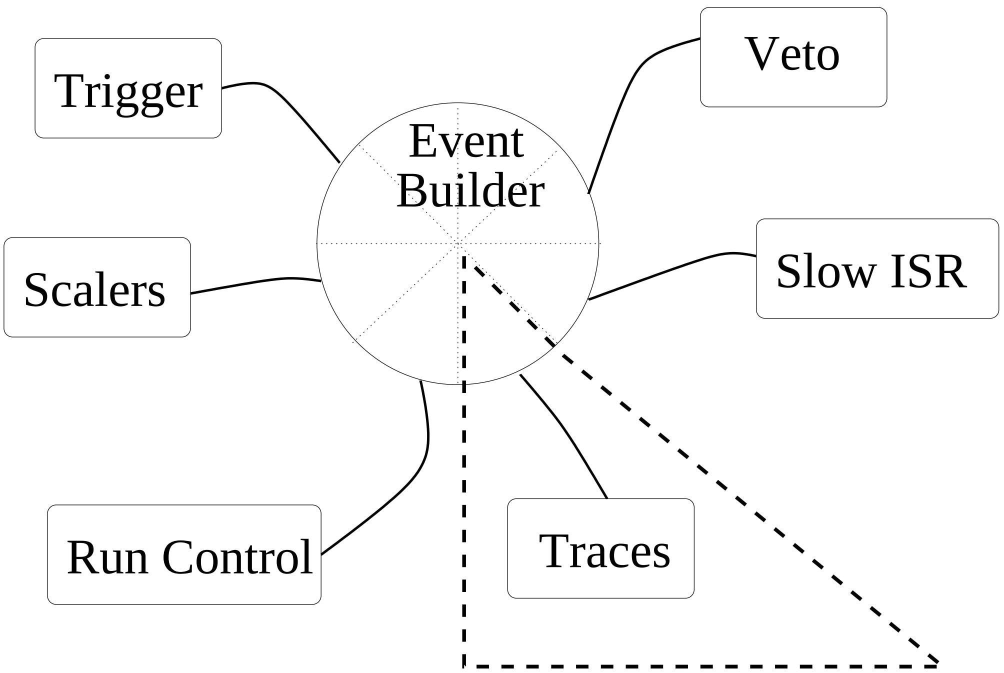

Figure 1: *An overall diagram of the DAQ. The large dotted triangle shows the scope of this piece of the project.*

FEATURES

Number/Type of Detectors
Up to 42 ZIP or BLIP detectors.

Sampling Rate
Up to 10 MHz sampling rate. For high sampling rates, the data out of the system will contain 20% of the sampled data (the rising edge at high sampling rate, the remainder at 1MHz).

Dead Time per event
40 ms. at a data rate of 1 Hz reading all detectors.
40 ms. at a data rate of 10 Hz reading a single detector from each tower.

Integrated Dead Time
Less than 5% at a data rate of 1 Hz reading all detectors, or 10 Hz reading a single detector from each tower.

10 bits of resolution
The data will be digitized to 12 bits, of which at least 10 will be "true".

Logical rather than physical detector mapping
This allows flexible configuration of slots and use of modules with missing channels.

Granularity of readout
Readout performed on a per-detector basis. (You can't read out only a fraction of a detector).

Remote Control
All functionality, including reboot, program control, updating programs and configuration, *etc.*, available via Internet.

Documentation
Detailed description of the interface to the trigger and the event builder (API) will be distributed for review *before* implementation.
A final html and postscript description of the entire trace acquisition system will be delivered upon completion of the product.

Code Management
Development code will be stored in a repository, allowing versioning. Old working copies can be reinstalled quickly and easily.

2 Why

We propose to build the trace acquisition for use in CDMS run 20 and in CDMS II.

3 Who

The authors will lead the project, and do most of the work. The Fermilab computing division can be counted on for advice and tools, and probably people if we are in a bind.

4 Where

We will build the system at Fermilab. The first installation will be at the Stanford Underground Facility upon completion. We will build an additional copy for the Soudan Mine.

5 When

A working prototype for a single tower of ZIPs can be delivered by October, 1999.

Table 1 shows a breakdown of the work, the effort and the projected completion date of each part. The completion dates are based on the 2 authors directing about 1/4 of their time toward the trace acquisition.

N	Item	Effort (man-wk)	Completed
1	Linux in Crate Controller	1	5/15/99
2	Digitizer Procurement	.1	5/15/99
3	Minimal Software to run digitizer	1	6/10/99
4	Electrical Testing	1	6/15/99
5	API Specifications delivered	1	7/1/99
6	Event Layout and Transfer	4	10/1/99
7	Performance Measurements	2	10/1/99
8	Decimation Code	.1	10/1/99
9	Documentation Delivery	1	10/15/99

Table 1: Timetable for completion of subprojects. The estimates based on the authors contributing about 1/4 of their time. Some parts will be done in parallel.

6 How

The items in the "How" section may change in the actual implantation. This reflects our current idea of how to achieve the specifications in the section 1.

6.1 Hardware

Digitizers
Joerger VT1012A.

In-Crate Processor
Motorola MVME 162 or MVME 167.

Operating System
Linux, on both the in-crate single board computer and the event builder. We will provide and maintain an intel-based Linux workstation to perform the initial event building for the Trace acquisition subsystem.

Architecture
The digitizers and crate processor will use a VME 6U crate.

6.2 Software Management

Programming Language
C/C++.

Revision Control
Fermilab Standard code and configuration management tools, CVS, UPS, *etc.*.

Documentation
Embedded comments in the code, translatable to html and postscript documentation (*e.g.* `doxygen`).