SNAP R&D

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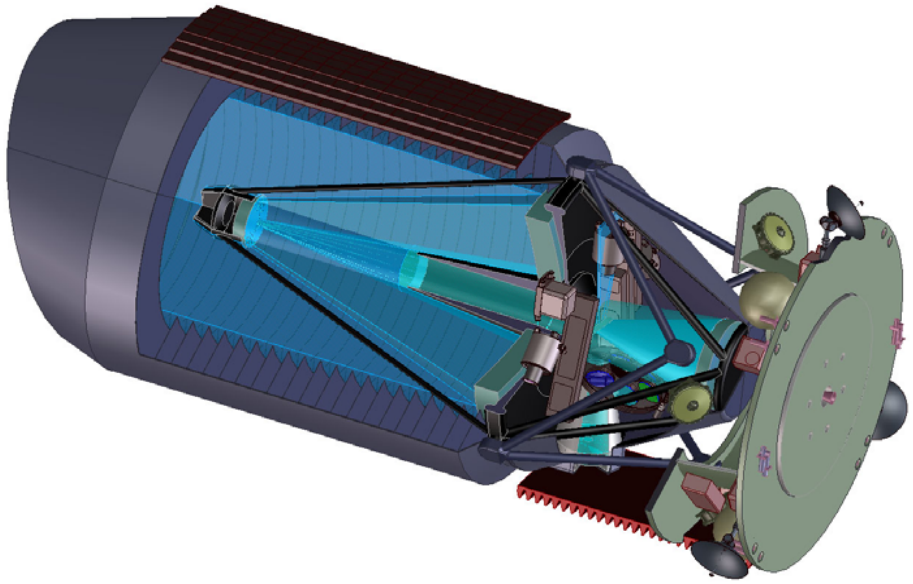
The SNAP Collaboration

- SNAP is the SuperNova Acceleration Probe proposed and led by a group at Lawrence Berkeley National Laboratory.
- Thirteen scientists from FNAL have be admitted to full membership in the collaboration.
- SLAC and many DOE-supported (HEP-funded) universities are also participating in this collaboration.

SNAP Concept

- The SNAP collaboration proposes a satellite-based telescope to measure ~2000 distant type Ia Supernovae to determine the effect of the dark energy on the expansion of the universe.



- A wide-field survey of distant galaxies will offer complementary approaches to measuring the effects of dark energy.

The JDEM

- In response to overwhelming community enthusiasm to address the fundament question "What is the Dark Energy", DOE and NASA have agreed to support a Joint Dark Energy Mission (JDEM), to be realized some time in the next decade.
- A Scientific Definition Team has been formed.
- The SNAP collaboration expects to propose the SNAP concept to meet some or all of the science requirements that will be "defined".

FNAL Participation

- Areas of FNAL Participation
  - Science and Simulations
  - Focal plane cosmic ray shield
  - Calibrations
  - Software Infrastructure
  - Electronics (Mass Memory and Data Handling)
- CD current supports with non-scientific effort
  - Software Infrastructure
  - Electronics

Why should FNAL participate in the R&D?

- Participating building of the instrument is a key part of participating in the science.
- Despite a lack of direct experience with spacecraft, FNAL has abundant experience in the core technologies:
  - High density, high reliability electronics
  - Cryogenics
  - Vacuum
  - Infrastructure
  - Management
- Widens range of contacts and opportunities

Software & Infrastructure

- The Software and Infrastructure effort is supported by the EAG (primarily by Nickolai Kouropatkine).
- The effort is highly regarded ("a treasure") within the SNAP collaboration.
- The level of effort is adequate to support the current scope of activities.

Electronics R&D

- The goal is to study data storage methods and technologies to be used on the SNAP satellite.
  - Memory technology
  - Data compression methodology
  - Data compression computing technology
  - Data storage, retrieval, and management
- The R&D is carried out jointly by PPD and CD
  - PPD has taken the lead in memory technology
  - CD has worked on aspects of data handling

R&D Accomplishments

- FNAL R&D has reversed a long-standing aversion to the use of flash memory (at least within the SNAP collaboration).
- FNAL R&D has shown the value of square-root prescaling as a near-lossless data compression technique.
- FNAL R&D has established the feasibility of using Xilinx FPGA technology for data compression.

Effort in CD

- Currently a small fraction of an FTE (Alan Prosser).
- We requested significantly more support for FY05, but did not press the issue because we understood the demands on CD to support BTeV.
- As a consequence, we have delayed developing the following aspects of the mass storage system.

Expanded CD Effort

- Specification of file system (create, delete, put, get, etc.)
- Conceptual implementation of file system architecture (system state, physical addresses, bad blocks, status & errors, timing & sequencing, deserialization & serialization of data).
- Prototype data compression and error encoding (Prosser already working here).
- Investigation of computing hardware
  - Use of Actel flash memory-type FPGA's
  - Dedicated Rice encoder
- Development of command interface specifications

The Request

- Request an additional 0.5 FTE (mostly engineering) support for the SNAP data management system.
- It would be quite effective if either Gustavo Cancelo and Guilherme Cardoso could lend a significant fraction of time to this effort.
- The level of effort has potential to grow in the future if the circumstances are favorable.

Conclusion

- This is a good time for CD to make a modest increase in the level of effort to the SNAP proposal.
- There is a concrete idea to apply additional manpower to the data storage & management problem.
- It would further the interests of FNAL, the SNAP collaboration, and the DOE long-range plan if support for SNAP R&D could be increased.