

# Using SAM datahandling in processing large data volumes

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## Abstract

SAM is the new, grid enabled datahandling system of the CDF experiment at Fermilab. Its core capabilities are storing metadata and locations for data files and transferring the files to the nodes to process them. The system is known to work for physics analysis jobs. To accommodate the compute needs for physics analysis jobs, CDF introduced the CAF batch farm system. Now SAM and CAF are used together to allow the reprocessing of large dataset on big compute farms. The problems faced during the transition and their solutions will be discussed.

## 1 Introduction

The CDF [1] detector is an elementary particle detector at the Fermi National Accelerator Laboratory (FNAL) [2]. This detector produces large amounts of raw physics data<sup>1</sup> during normal operations. To be useful for physics analysis, the raw data has to be processed on large compute farms to produce so called reprocessed data<sup>2</sup>. These data will then be read by physics analysis programs which produce the results used in scientific publications.

So far all data of the CDF experiment were simply stored on tape and nearly all metadata about the content of the file where kept in the file name. Now CDF is introducing a new datahandling infrastructure. Its main component is the metadata system SAM [3].

To analyze the large amount of data from the detector CDF introduced the farm batch system suite CAF. It is based on “fbsng”, a Fermilab farm batch system, and includes sandbox handling, Kerberos and Ganglia monitoring. In the future “fb-

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<sup>1</sup>also called first level data

<sup>2</sup>also called second level data

sng” will be replaced by Condor.

## 2 SAM metadata storage

The SAM system stores metadata about the physics content and the physics properties of files including their locations around the world. This information can be used to group files to named entities. In addition the SAM system is able to move files to participating machines upon request. To use this system the user can specify the files he wants to analyze by its physics content and the SAM system will deliver all files to the user. SAM also keeps track of all deliveries and their successful processing.

Since the SAM system knows about all the raw files of the CDF detector this system can also be used to deliver data to the compute farms which process the “raw data” to “reprocessed data”.

## 3 Reprocessing

Analyzing reprocessed data is typically done with small amounts of data ( $\sim 1$  TB) on a small amount of processors ( $\sim 10$ ), or in a short time ( $\sim$  days). But reprocessing raw data means processing large amounts of data ( $> 10$  TB) on many CPUs (several hundreds) for a long time ( $\sim$  month).

The aim of our project is to enable the

system composed out of a farm batch system (CAF [4]) and a data handling system (SAM) to reliably reprocess the largest raw data stream of the CDF experiment.

The first step is to define parts of the full dataset we want to process as input datasets for our reprocessing step. These partial dataset will then be processed on a CAF system file by file. The output of this step is then stored on a local CAF disk server and the file metadata and its location is declared to SAM. Due to tape storage limitation we than have to concatenate these intermediate files to files which are  $\sim 1$ GB in size. These files will than be stored to the tape system and their locations and metadata will be declared to the SAM system. Due to file lineage considerations the metadata of the intermediate files will be kept, but their locations will be deleted.

## References

- [1] CDF home page  
<http://www-cdf.fnal.gov/>
- [2] FNAL home page  
<http://www.fnal.gov/>
- [3] SAM home page at CDF  
<http://cdfdb.fnal.gov/sam/>
- [4] CAF home page  
<http://cdfcaf.fnal.gov/>