

# Testing the CDF Distributed Computing Framework

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## Abstract

A major source of CPU power for CDF (Collider Detector at Fermilab) is the CAF (Central Analysis Farm) [1] at Fermilab. It is mainly used to access datasets which comprise a large amount of files and analyze the data. Up to now the DCache system is used to access the files. (Motivation for a change to SAM) In autumn 2004 some of the important datasets will only be readable with the help of the data handling system SAM (Sequential Access to data via Metadata) [2]. It turns out that the mature systems CAF and SAM have not yet been used in combination. Therefore tests of the systems are necessary to test the interplay of the data handling with the farms, the behaviour of the CAF and the user friendliness of the whole system.

A second goal of CDF is to distribute computing. In 2005 50% of the computing shall be located outside of Fermilab. For this purpose CDF will use the DCAF (Decentralized CDF Analysis Farms) in combination with SAM. To achieve user friendliness the SAM station environment has to be common to all stations and adaptations to the environment have to be made.

## SYSTEM ANALYSIS

The CAF system has about 800 nodes with a total CPU of 1200 GHz, the computing power of the DCAF will of course increase with time. Additional to that the Condor-CAF, a CAF system based on the batch system Condor has a total CPU of 2000 GHz and around 400 nodes. At the moment 25 TBytes per day are read by the CDF community. Most of these data are read at the CAF at Fermilab with the DCache System [3]. The most important data are on disk (XXXTB) and XXXTB are on tape.

Testing the SAM environment therefore means to create the usual user load on the CAF system. In other words to load the CAF with about 50 SAM projects and move around 20 TBytes per day. The SAM projects should be splitted in several segments to run several parts of the jobs in parallel on different CPUs.

The DCAF systems total a CPU of 1000 GHz and a disk space of 35 TBytes. In contrast to the central CAF system the data transfer rates are quite small (depending on the network in the order of 500 GBytes per day), therefore SAM jobs submitted to the DCAF systems need to read the data already transferred to the systems. Testing the DCAF systems should make sure that a unique interface to the user has to be provided. That means environment variables like the name of the SAM station and the project name be set

automatically. In addition the data transfer to the DCAF SAM station has been tested.

## TESTS

In total 600 TBytes have been consumed on the central SAM station at Fermilab. Most of the files were read at the CAF system. At the SAM stations connected to the DCAF systems in total 46 TBytes have been consumed since their installation this winter. The administrators of the DCAF systems have imported datasets interesting for their users. A list of the datasets is published and automatically updated [4].

While submitting jobs with several segments different DCache doors were assigned to the project. A DCache door is a network server which performs user authentication and forwards client requests to the pool managers. The assignment to more than one DCache door had an effect on the end of the projects. Because the signal to stop the project was sent when all files of the segment were read, but this was not necessary equal to the time when all segments have read all files. The problem was solved by assigning only one DCache door to one SAM job.

(Stefans Packet, dass dem Nutzer eine Analyse der Probleme gibt plus einen Recovery Job started.)

## LIMITATIONS

When submitting more than 100 SAM projects at one time problems with the project master have been observed. (Das kann man ausführlicher darstellen.)

SAM projects requesting a dataset with a large number of files (in this example 27000 files) also cause problems. The optimizer had to be improved in order not to check the location of all files when requesting the next file of the dataset or after a network outage. Otherwise the optimizer would be blocked and therefore on all SAM stations the file retrieval would slow down.

During the stress tests the load on the SAM station and the database server has been monitored and was most of the time quite low. So on this site one will not run into problems.

## CONCLUSION

The tests of SAM on the CAF system have shown that SAM can be deployed with physics users this autumn. Some problems have been solved and a recovery program has been developed to analyze failures and recover the

project. The DCAF systems can be used when restricting the user to data which have already been imported to the decentralized SAM stations. The access to the data is quite user friendly.

## **REFERENCES**

- [1] <http://www.cdfcaf.fnal.gov>
- [2] <http://d0db-prd.fnal.gov/sam/>
- [3] <http://dcache.desy.de/>
- [4] [http://hexfm1.rutgers.edu/DATA\\_INFO/sam\\_data/](http://hexfm1.rutgers.edu/DATA_INFO/sam_data/)