DATA HANDLING TOOLS AT DAΦNE

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Abstract

The DAΦNE collider has started operation with experiments since March 1999. A large amount of data is acquired. Several tools for data handling, storage, and presentation to machine operators and users have been developed and are available for online and offline analysis under most common information sharing systems such as WWW, cellular SMS and mailing. The general structure of the system, some examples of online information and users tools are presented.

1 INTRODUCTION

Data in the DAΦNE Control System [1] are stored in the local memories of the 42 front-end VME-CPUs distributed all over the accelerator area. The front-end tasks get commands from the high-level user environment and continually update their own data base with the information from the devices under control. Routines in the user environment are able to get data by a direct memory access to the front-end CPU's memory. The information in the front-end database is structured with different data types tailored to specific machine elements; this means that in order to get data or to correlate different devices specific routines must be implemented.

To be able to create a database for offline and online analysis and to correlate data of different devices, two system tasks have been developed. The offline database is accessible by users, experiments personnel, and operators through a World Wide Web server that takes care also of data consistency and provides information to authorized users via e-mail or via GSM SMS (Short Message Service) cellular phone.

2 SYSTEM TASKS

2.1 "Dumper"

Data distributed in the front-end memory are continuously fetched by a system task, called "Dumper". The procedure contains the specific data type of any device under control in the DAΦNE accelerator and writes data in a uniform database accessible from the high level user interface or other system tasks (see Fig. 1).

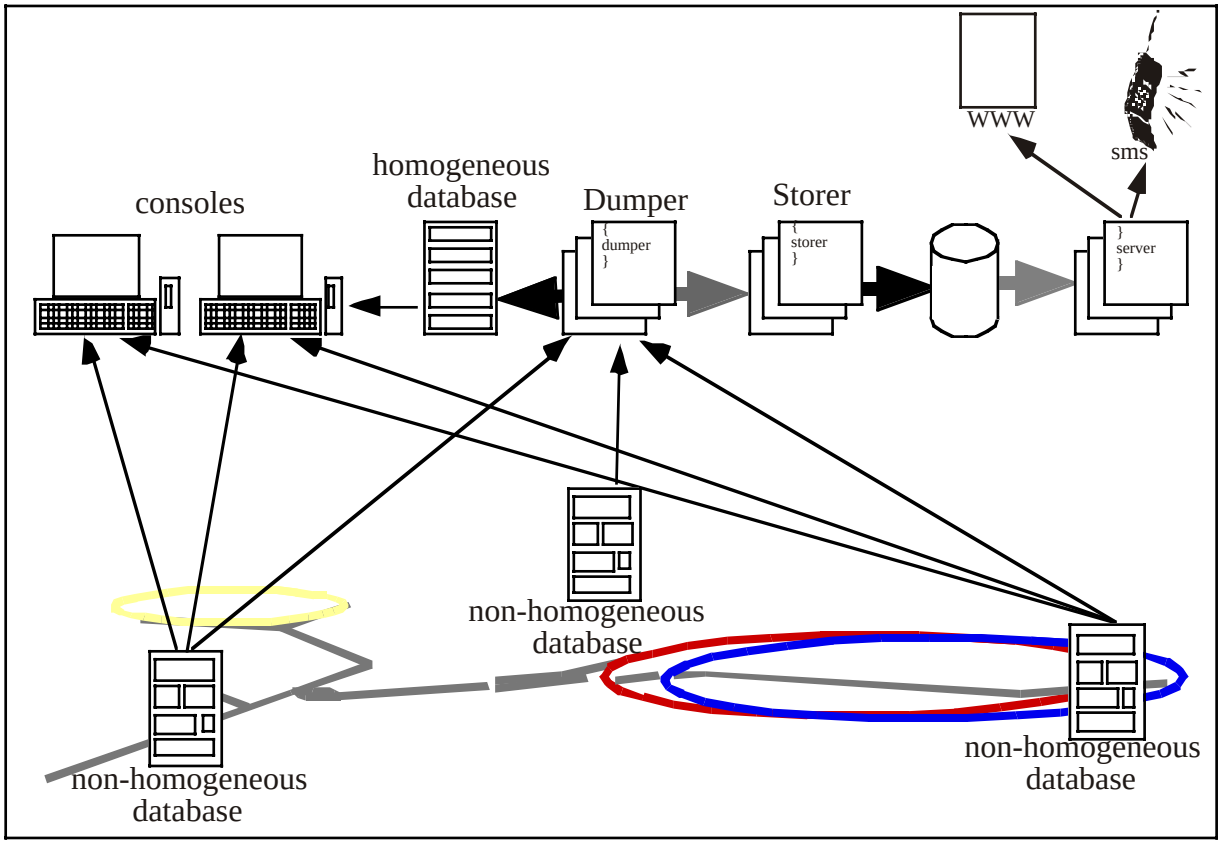

Figure 1: Schematic Layout of the System Tasks.

Some high-level user routines allow correlating a large amount of data. For example the "Hunter Dog" program continuously checks for faulty magnets, vacuum and low level CPUs.

Another program, "The Check Magnet Current Drift", allows to check the current oscillation and drift during operation.

2.2 "Storer"

The storage process of data for offline and slow online analysis is based on the Dumper uniform database. The task reads data from the dumper database, and stores on local disk a subset of the DAΦNE description. The disk is mirrored to an other authorized computer in the laboratory area. No handling is done on data at this level. This allows having full control on data for offline analysis, but requires some routines in order to extract meaningful information

2.3 The Storer Files System

The Storer files system is composed of two status files, with an update time of 5 seconds and 15 seconds each. The first one is used to provide information to satellite machines not belonging to the DAΦNE Control System environment, such as the longitudinal feedback[2], spectrum analyzer and so on. The second one is provided to experiments and is archived in a daily history for offline analysis. Data contain beam current, luminosity, machine status, bunch filling pattern, and some other accessory information.

A daily history file, recorded every 5 minutes, is also produced for elements with slow readout such as vacuum, magnet faults, etc. In this file the same information as in the fast status are also logged each minute file for easy data correlation. The mass storage is exported to machine for their own analysis and to the DAΦNE supervisor and WWW server for data presentation and pre-analysis.

3 DAΦNE SERVER

2.1 Online data handling

Data are stored without any handling. In order to provide users and experiments with useful information a task running on the DAΦNE server processes raw data and writes a new status and daily history file. According to the timing status, currents and luminosity a global machine status is obtained: **standby**, **injection e-**, **injection e+**, **stored e-**, **stored e+**, **filled**, **colliding**. Whenever the machine **filled** condition is reached a progressive number is incremented.

An important parameter for users is the beam lifetime estimation. A simple adaptive routine is applied on the current data when any of the **stored, filled** or **colliding** general condition is reached. As soon as the current data decays by a quantity greater than 10 times the noise of the current measurements, the lifetime is evaluated under linear approximation. This allows having a fast and quite accurate estimation of the beam lifetime.

The DAΦNE server takes care to produce files containing a subset of useful information easily accessible under control system or via Web. Figure 2 shows an example of correlation plot between KLOE luminosity and DAΦNE currents data. Some important parameters (luminosity per bunch, beam-beam tune shift) are estimated on line.

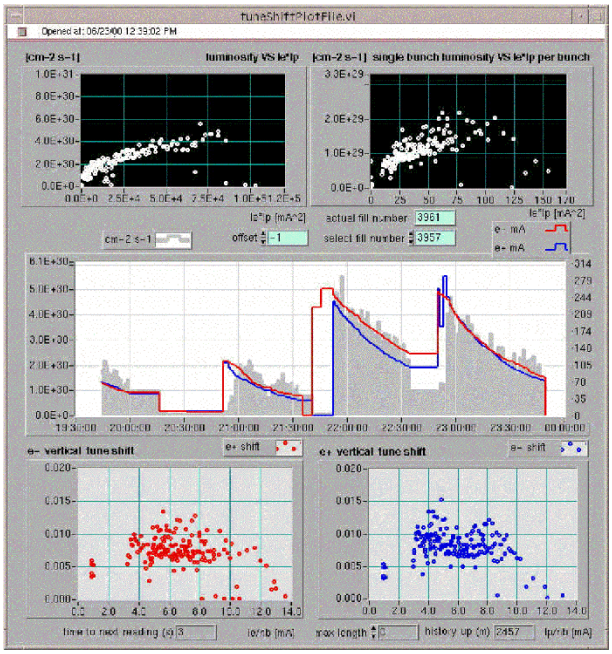

Figure 2: example of data correlation tools based on KLOE experiment data, and machine data.

2.2 The web and e-mail server

The DAΦNE server has been equipped with a Web server powered by Apache software. A set of CGIs (Common Gateway Interface) allows users to access online the DAΦNE and KLOE data. Statistics on run performance and daily information have been very useful in machine optimization.

Dedicated software written in the LabVIEW® environment has been developed for plots and histograms presentation.

A banner refreshed every 10 seconds continuously reports the status of the DAΦNE accelerator and of the main experiment KLOE (see Fig. 3).

A download area has been set for offline analysis, where not only stored data are accessible, but also machine settings and useful operating file can be obtained.

For safety the server is accessible only from the Laboratory domain on the other hand, a subset of most significant information are reported each minute in the Laboratory Web server.

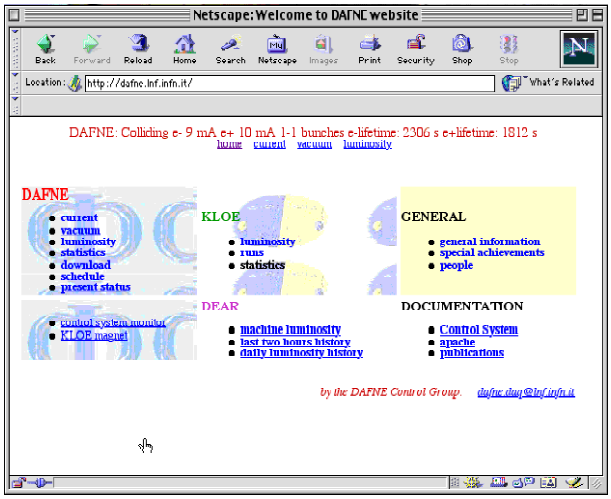

Figure 3: Welcome page of DAΦNE Website.

Authorized users can also download via e-mail most of the information available on the Web pages. The same routines elaborating data with CGIs return plain text information that can be received on demand or at scheduled time. A subset of information can be also sent via GSM SMS. A simple SMS query message can be sent by users to receive information on the DAΦNE-KLOE status. Midnight broadcast messages give a synthesis of the today's run performance.

2.3 Supervisor tools

A set of procedures running on the server continuously monitors the status of data acquisition and of the Control System. On line statistics of front-end tasks is available. Supervisor routines keep checking the data validity, and the health of the system task procedure. When some fault occurs in the Control System or in data acquisition system, specialized personnel are alerted via e-mail and GSM SMS.

4 CONCLUSION

A powerful system for DAΦNE machine data and KLOE experiment data as been implemented. During last year of operation the data handling tools have demonstrated useful for online data exchange, offline data analysis and machine optimization.

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