

DØ Run II Online Examine Requirements

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This document lays out various requirements for Run II DØ online Examine package. Since the program is going to run in a real time environment, the program requires efficient communication and multi-threaded asynchronous event handling. This would require support from various packages, such as, DØ ME, Data Distributor, DØ Reco, and others. We discuss the requirements for the Examine package, including the user presentation GUI.

1 Introduction

Online Examine is the program which is used by the shifters or each individual detector group personnel to monitor various sections of the detector as well as the data integrity. Examine provides tools for monitoring the experiment, displaying histograms and automatically analyzing the current data relative to a best known reference set.

Current approach for Examine is to have two separate pieces working hand-in-hand. The two pieces are Examine executable which does reconstruction, calculations, and fill histograms and the GUI which allows the user to interact with the Examine executables and display histograms being filled by the executables. The communication between the two pieces is taken care of by either the DØ Client/Server package or the CORBA compliant TAO/ACE package depending on the choice of the GUI language.

Examine must provide enough freedom for the users to select events by data stream or by trigger or list of triggers with, possibly, appropriate prescale factors. In order to ensure these functionalities in event selection, the Data Distributor (DD) is designed to be aware of the associations between the

selections and each individual Examine (see Ref. [1] for DD design requirements). The user presentation portion, GUI, of the program must be fool-proof and automatic to minimize human manual intervention. All histogram operations - display, reset, update, declare, etc - must be push button controlled.

Since the event data buffering and handling is discussed in detail in Ref. [1], we will only concentrate on the Examine executable and GUI representation portion in this note.

2 Run - I Examines

There will be more than one Examine depending on their responsibilities. In Run-I, there were, at the minimum, five Examines run at all times in the normal shift environment. Table 1 summarizes these different Examine programs and their responsibilities. The responsibilities in table 1 are the

Table 1: Types and responsibilities of Examines in Run -I.

Examine	Responsibility
Detector Examines	
Calorimeter	Monitor CC, EC, and ICD
Muon	Monitor WAMUS and SAMUS systems
Tracker	Monitor CDC and FDC systems
Global Examine	Reconstruct express line events online, fill reconstructed quantities in histograms, and simultaneously provide event displays for shifters.
Trigger Examine	Mostly provide software trigger performances and rates for each bit.

determining factors of the Examine work-horse CPU and memory capacities. The current conceptual design of the Examine work-horse machines is a farm of Linux PC for analysis, histogramming, and reconstruction. On the other hand, the GUI portion of Examine will run on Windows NT.

3 Run - II Examine Configurations

Since the detector has been upgraded from Run-I configuration, there are more parts of the detector to be monitored. This will increase the number of detector monitoring Examines. Table 2 summarizes the types of Examines and their responsibilities that are needed for Run-II.

Table 2: Types and responsibilities of Examines in Run -I.

Examine	Responsibility
Detector Examines	
Calorimeter	Monitor CC, EC, ICD, FPS, CPS systems
Muon	Monitor WAMUS and SAMUS systems
Tracker	Monitor SMT, CFT, Solenoid(?) systems
Beam	Monitor LØand FPD systems
Global Examine	Reconstruct express line events online and fill in reconstructed quantities in histograms and at the same time provide event displays for shifters.
Trigger Examine	Mostly provide software trigger performances and rates for each bit.

4 Examine Executable Requirements

In this section, we will discuss the requirements which are related to Examine executable responsibilities.

- The executable should run on Linux.
- Book standard set of histograms at the start of processing.
- Fill standard set of histograms. The standard set depends strongly on the responsibility of the given Examine.

- Perform appropriate level of reconstruction to fill histograms. The depth of reconstruction also depends on the responsibility of the given Examine. For example, the global Examine will require a full reconstruction while the calorimeter Examine would require the digitized pulse heights only with some reconstructed information at times.
- Allows shifters to access histograms while the histograms are being filled. In other words, the update feature should be permitted.
- Should be able to save histograms into a file. There should be a button for “save histograms” in the GUI that prompts a box with a default name of the file, eg. cal_Examine_run#####.hst.
- Accept requests from client/GUI to :
 - start/stop/finish processing
 - Pause/Resume processing
 - Terminate/Abort processing

via either C/S package or TAO/ACE and take appropriate actions.

- Read in reference set of histograms and compare normalized or un-normalized histograms. The reference histogram filename should be either transferred from the GUI or read in from RCP, yet it should be overloadable during the processing to compare with another histogram file.
- Perform analyses on histograms within the current run and against the reference set, and alarm the shifters accordingly.
- Read in Run Control Parameters (RCP) which includes the name of the event selection file. The selection file can either have a list of triggers by the L3 filter names, L3 bit numbers, or stream name along with some prescale parameters if necessary. *The RCP must have, at the minimum:*
 - *Reference histogram filename*
 - *Filename for event selection conditions*

- *Choice of event selection (stream/trigger)*
 - *etc.*
- Pass the requested selection conditions to the Data Distributor for buffer registration and allocation.
- Attach itself to the assigned buffer or queue for event reception from the DD.
- Reconnect automatically if the connection to DD is lost. Retry connecting to DD for a given period and prompt the user of the connection problem. The prompt also should give choices to the user whether to terminate and re-establish connection or keep retrying.
- Receive messages on run transition from the DD and pass the messages to GUI, ie., to the user for the transition and take appropriate action (close and save histogram, print out the standard set of histograms, disconnect itself from the DD, etc).
- Be aware of the connection status to the GUI and accept reconnection request from the GUI.
- Allow many connections for histogram retrieval, but keep the shifter GUI as the only controller of the histogram reset, delete, and declare manipulation.
- Should be able to accept a data filename as an input and perform analyses using the file.

5 Examine GUI Requirements

In this section, we will list the requirements for Examine GUI representations. Figure 1 shows a conceptual design of an Examine GUI window.

- Must run on NT (or less likely Linux).
- Must have an input selection drop-down menu with **DAQ** or **File** as the entries. Then the **DAQ** must have sublevel of drop-down menu which lists all available Examine processes currently in progress. Highlighting

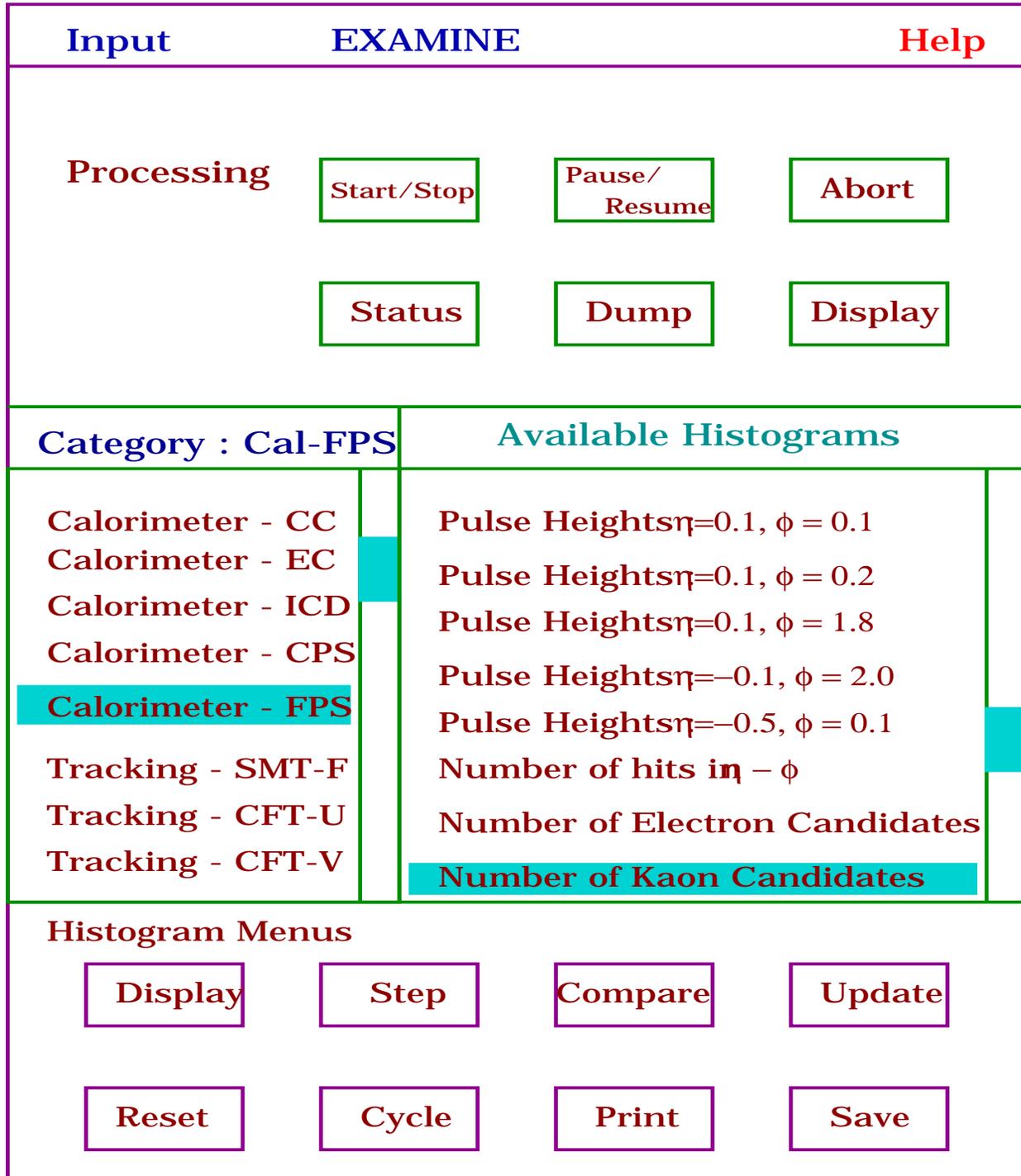


Figure 1: A conceptual Examine GUI window.

one of the processes in the drop-down menu should send the message requesting the connection to the Examine process.

Highlighting the **File** should pop open a dialogue box to the user to provide a filename. When the filename is entered, the GUI should :

1. Start an Examine executable process.
 2. Send the filename to the Examine process.
- Must have a drop-down menu with various Examine executable choices. Since there will be more than one Examine, the GUI should permit choosing one of the executables depending on the shifter's responsibility.
 - List of available histograms from the given Examine process should be given in some dialogue box and the desired histogram should be highlighted. The highlighted ones will be the ones to be displayed, updated, etc...
 - Must provide sufficient online help for the operation of GUI and Examines.
 - Must have a toggle button to start/stop/finish processing.
 - Must have a toggle button to pause/resume processing.
 - Must have a toggle button to terminate/abort processing.
 - Must have a button for status check.
 - Must provide the buttons for the following actions, executing proper PAT commands:
 - Display
 - Update
 - Reset
 - Delete
 - Declare
 - Compare (normalize/unnormalize)

- Cycle through all the histograms
- Save to a file. A GUI dialogue box with the default filename in it before saving so that the user can change the name of the file, if he chooses to.
- Print. This functionality should be permitted to one or more sets of histograms.
- Capture PAT display canvas.
- Must be able to pop up message windows upon the reception of special messages from the corresponding Examine executable. The special messages are :
 - Processing status (begin, paused, etc). In principle, the toggle buttons should indicate this status.
 - Examine connection to DD lost
 - GUI Connection to Examine executable lost.
 - Run transition status
 - Forced histogram saving into a non-default filename.
 - etc.

References

- [1] S.Fuess *et. al*, Online Group, “DØ Online Data Distributor Requirements,” DØ Note #3540 (1998)