GO4 Workshop 2011

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GSI Experiment Electronics

Workshop schedule

Time	Action	Tutors
10:00 – 10:30	**Go4 V4 Overview (presentation)**	Jörn Adamczewski-Musch
10:30- 12:00	**Working with Go4 GUI (practice)**	Sergei Linev, Jörn Adamczewski-Musch
12:00- 13:00	**LUNCH break**	
13:00- 15:00	**Go4 Analysis code (practice)** **Analysis in batch mode**	Jörn Adamczewski-Musch, Sergei Linev
15:00- 15:30	**COFFEE break**	
15:30- 16:00	**Go4 Advanced Features (presentation)**	Sergei Linev
16:00- 17:30	**Go4 Advanced Features (practice)**	Jörn Adamczewski-Musch, Sergei Linev
17:30- 18:00	**Discussion and Questions**	
	CLOSING	

Go4 overview Outline

- Go4 features
- Go4 run modes
- Analysis framework and plug-ins
- GUI elements
- Summary

Go4 key features

Framework for many kinds of experiments (Atomic & Nuclear Physics)

Based on C++, ROOT (CERN) and Qt (Nokia)

Provides services and interfaces for user written analysis

Batch mode (CINT or compiled, online/offline)

Interactive mode (online/offline):

- **A non blocking GUI controls and steers the analysis**
- **GUI interfaces ROOT and Qt graphics**
- **Analysis can update graphics asynchronously: live monitoring**
- **User can create and add specific GUIs (Qt designer)**

Go4 history and status

- **Development start:** **April 1999**
- Go4 v.1.0 May 2002
- Go4 v.2.0 November 2002
- Go4 v.3.0 December 2005
- **Go4 v.4.4.3** **March 2011**

  Full distribution on **Linux, Solaris, Windows XP, W7, MacOS X**

- **Users:**

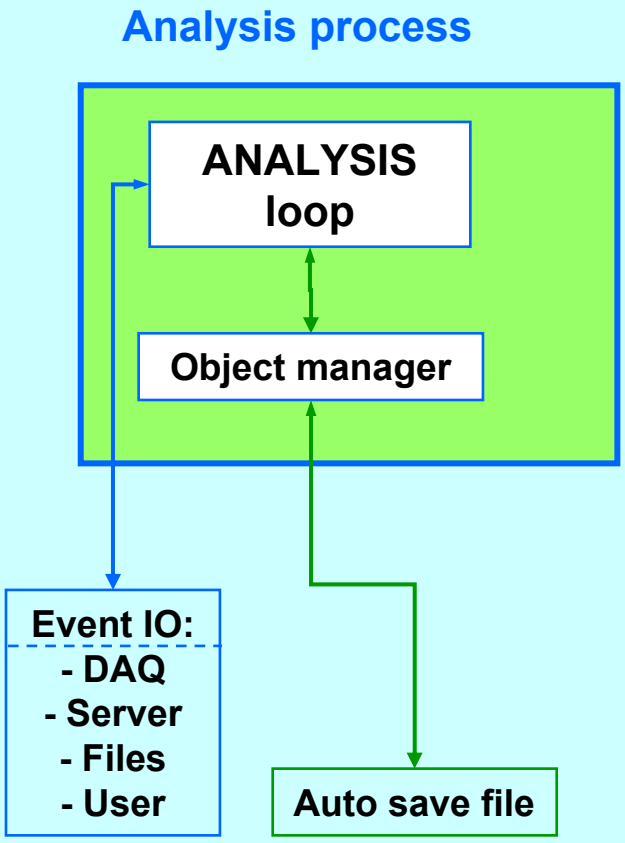
  GSI experiments:

  FRS, SHIP, AP, ESR,

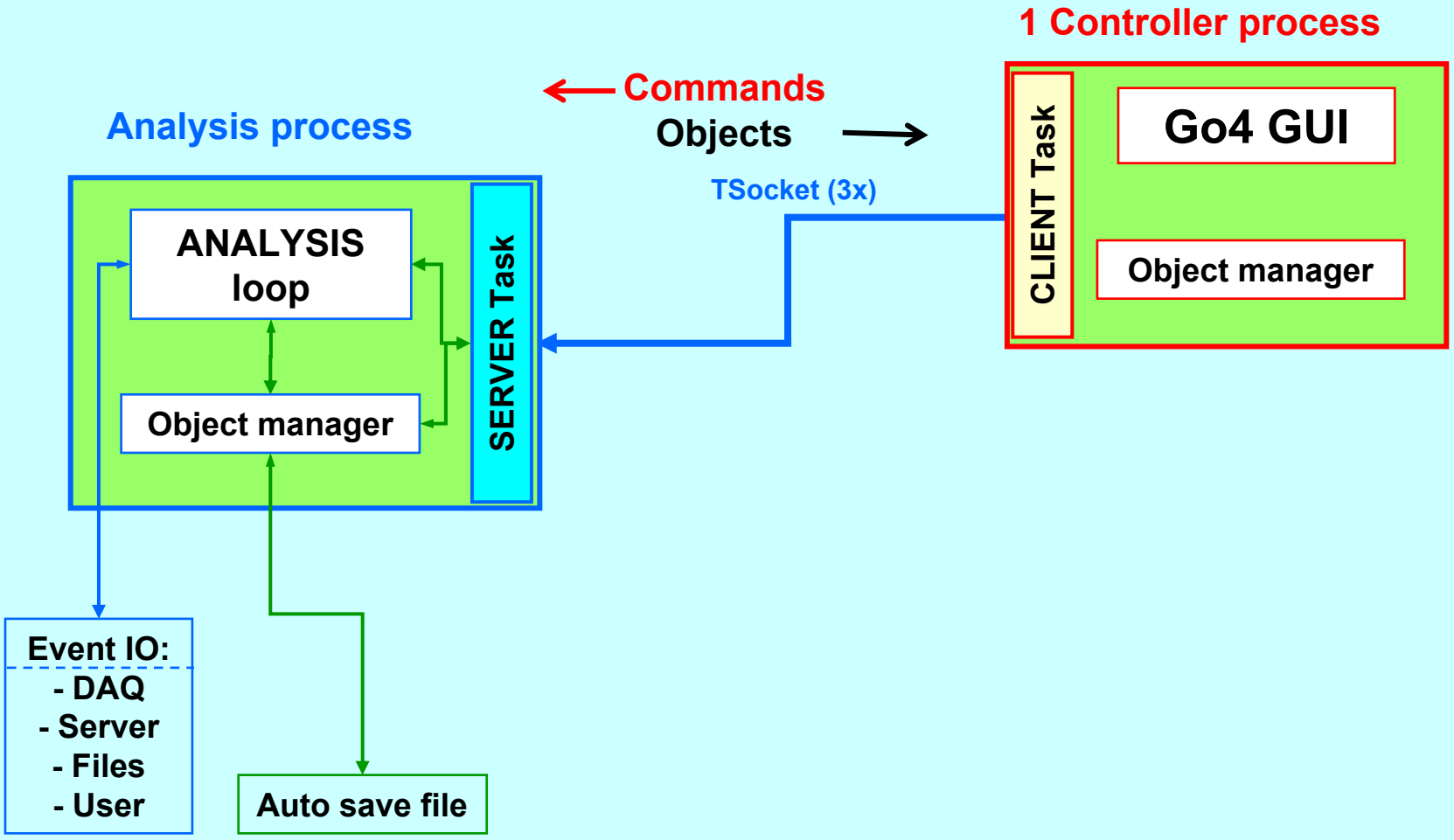
  TASCA, SHIPTrap, CBM testing,..

Analysis batch mode

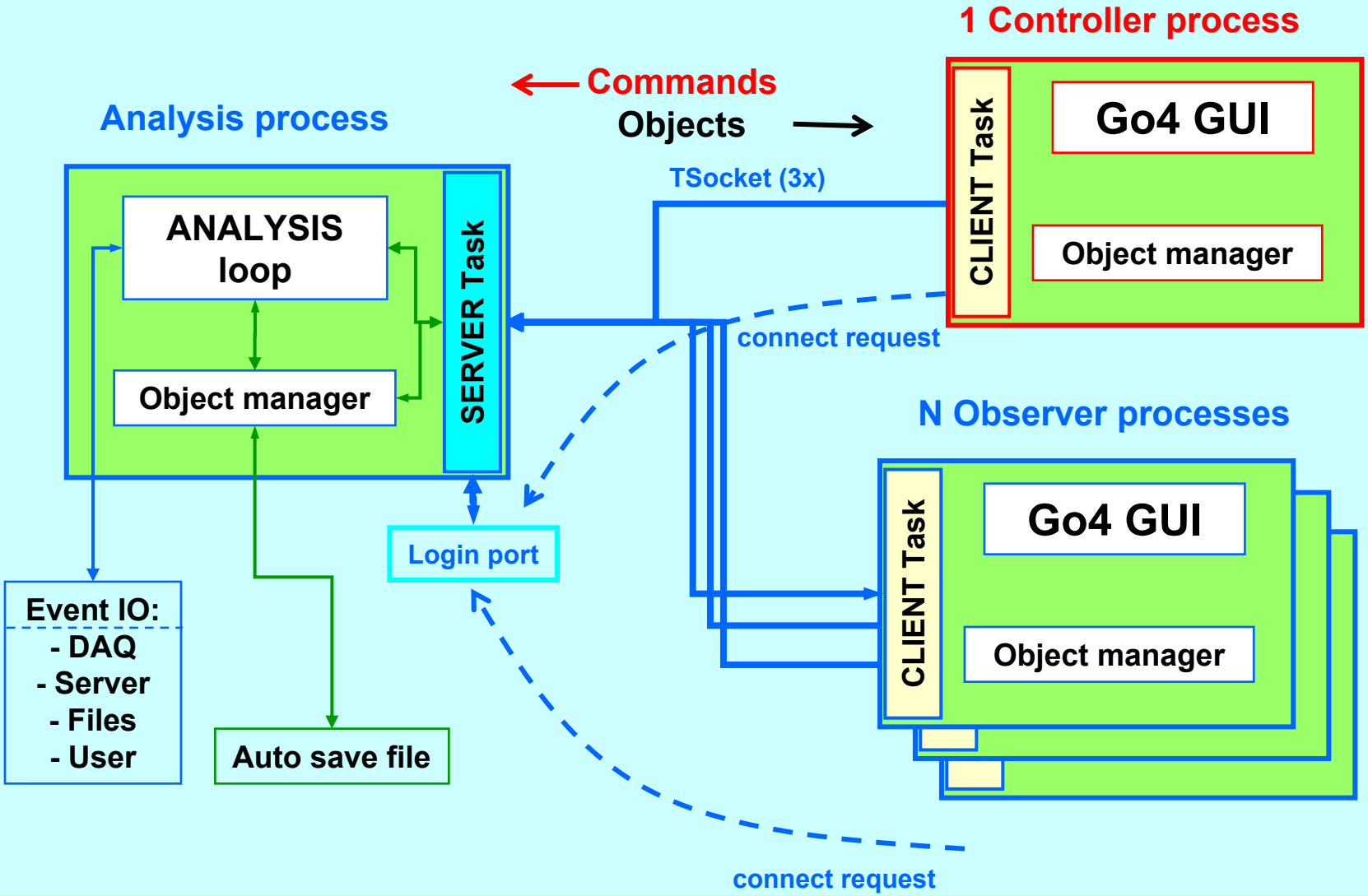
Standard executable go4analysis with user parameters; or CINT



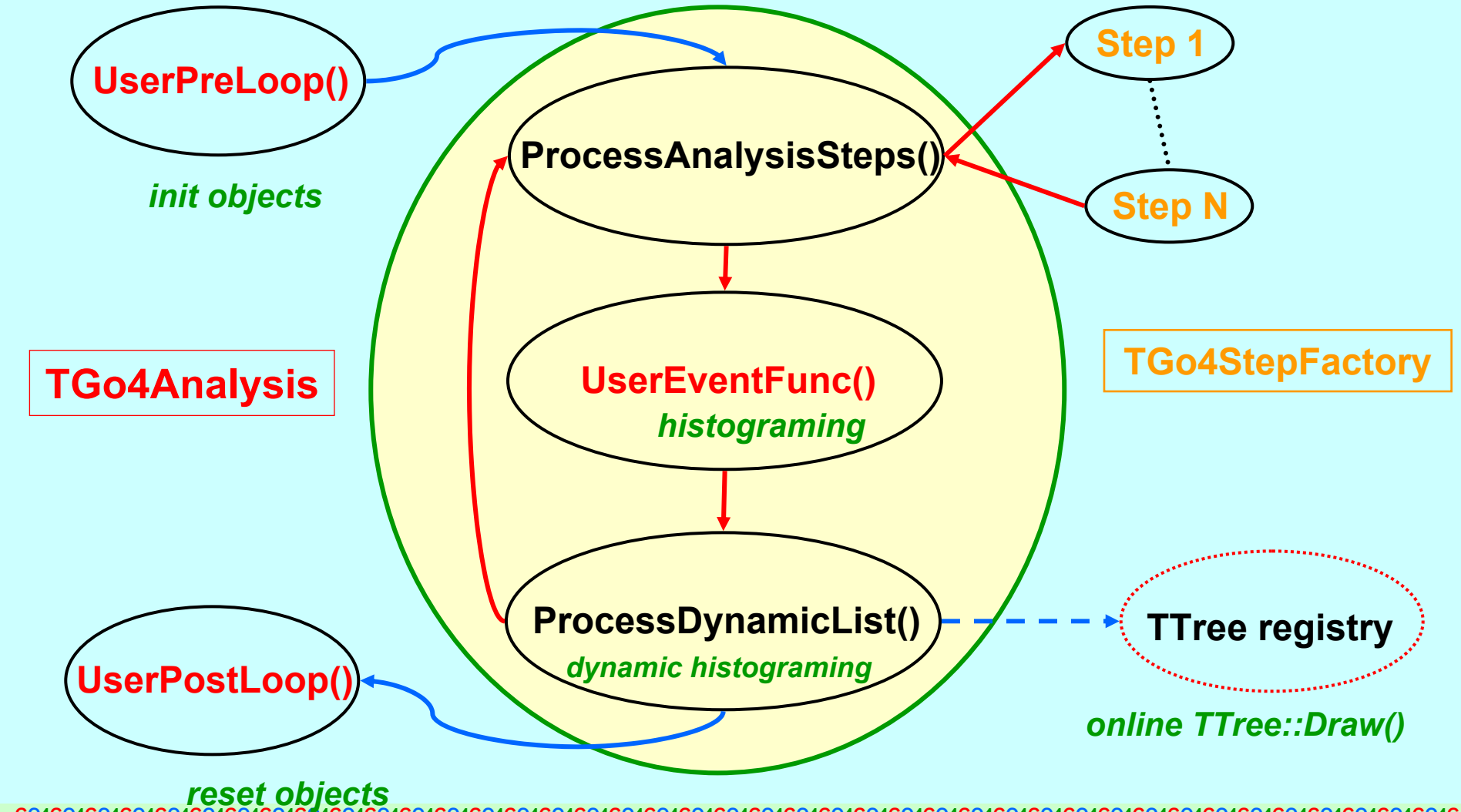
Interactive mode



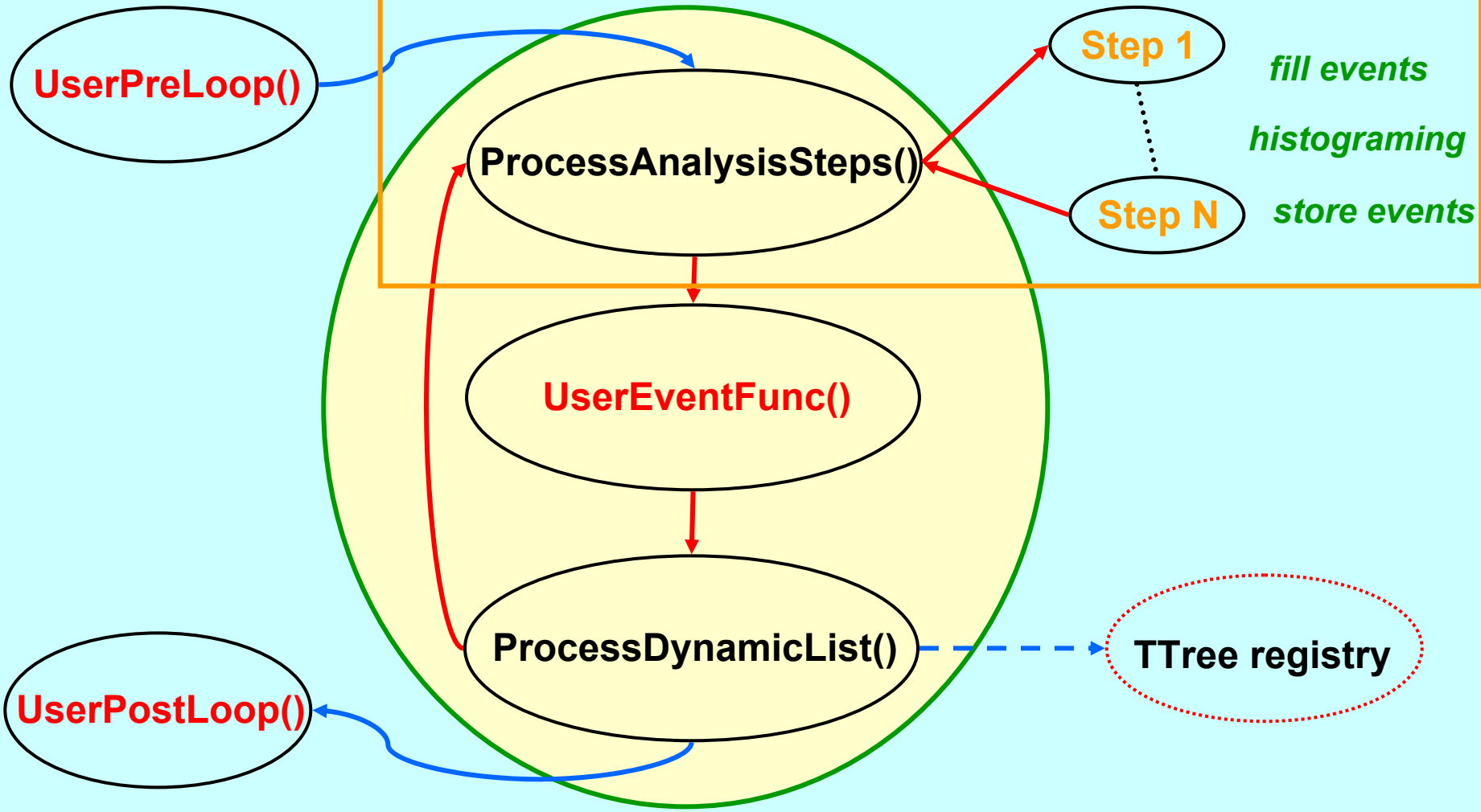
Analysis server mode



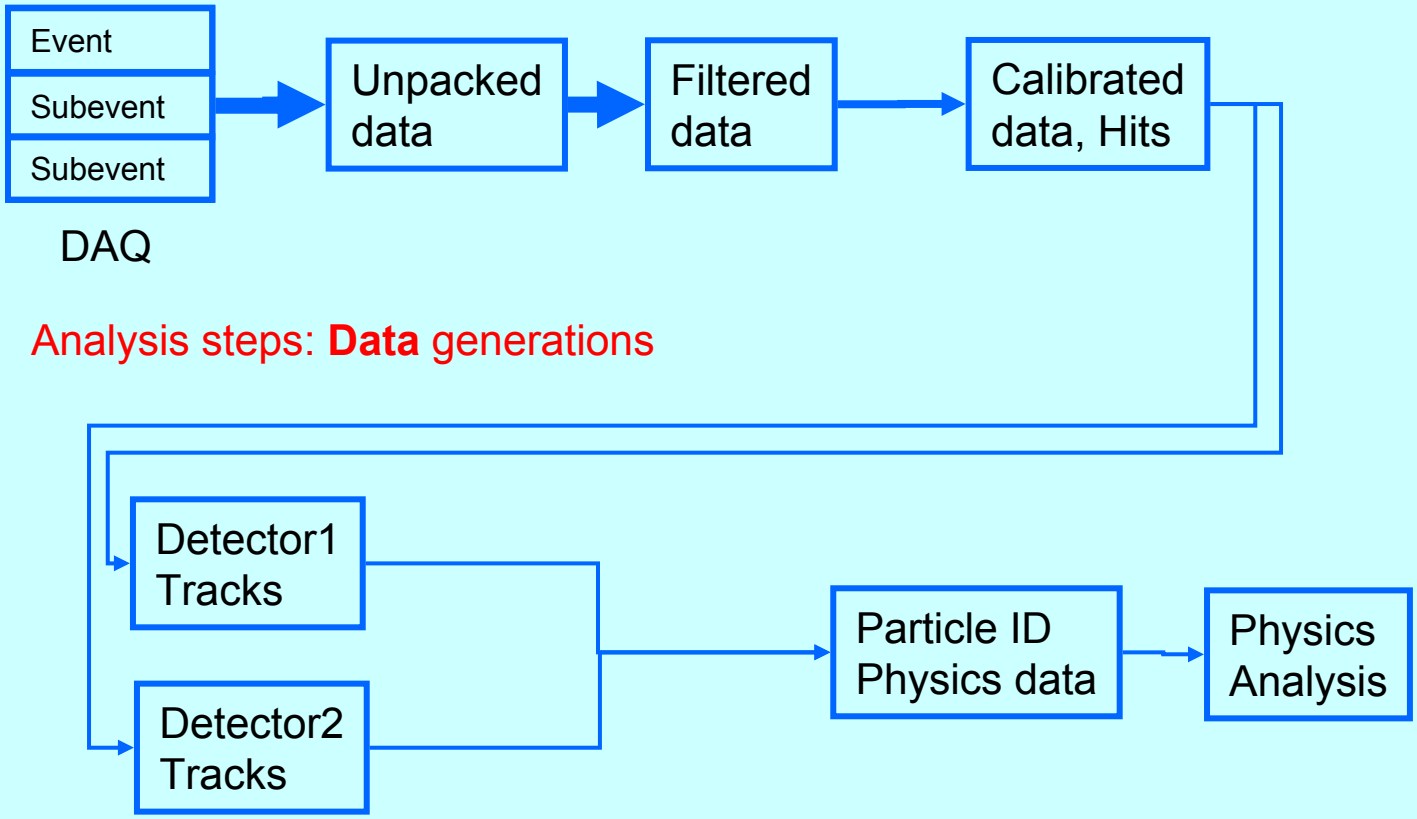
Analysis loop



Analysis loop in steps



Analysis process: Data flow

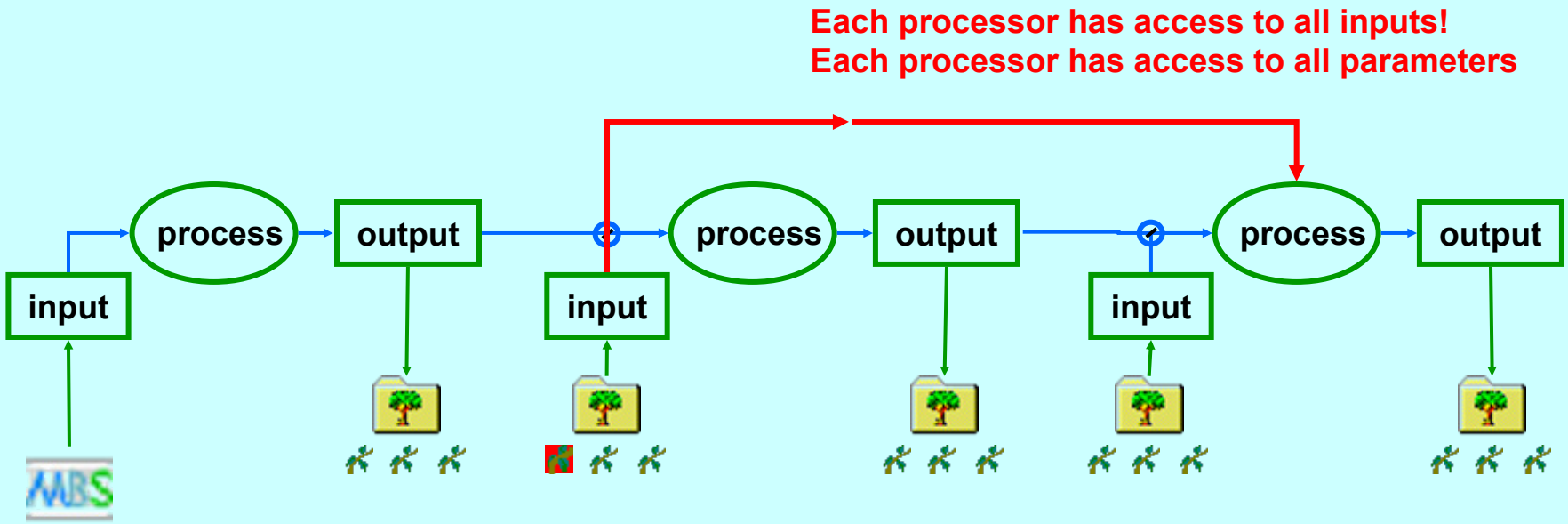


Analysis steps

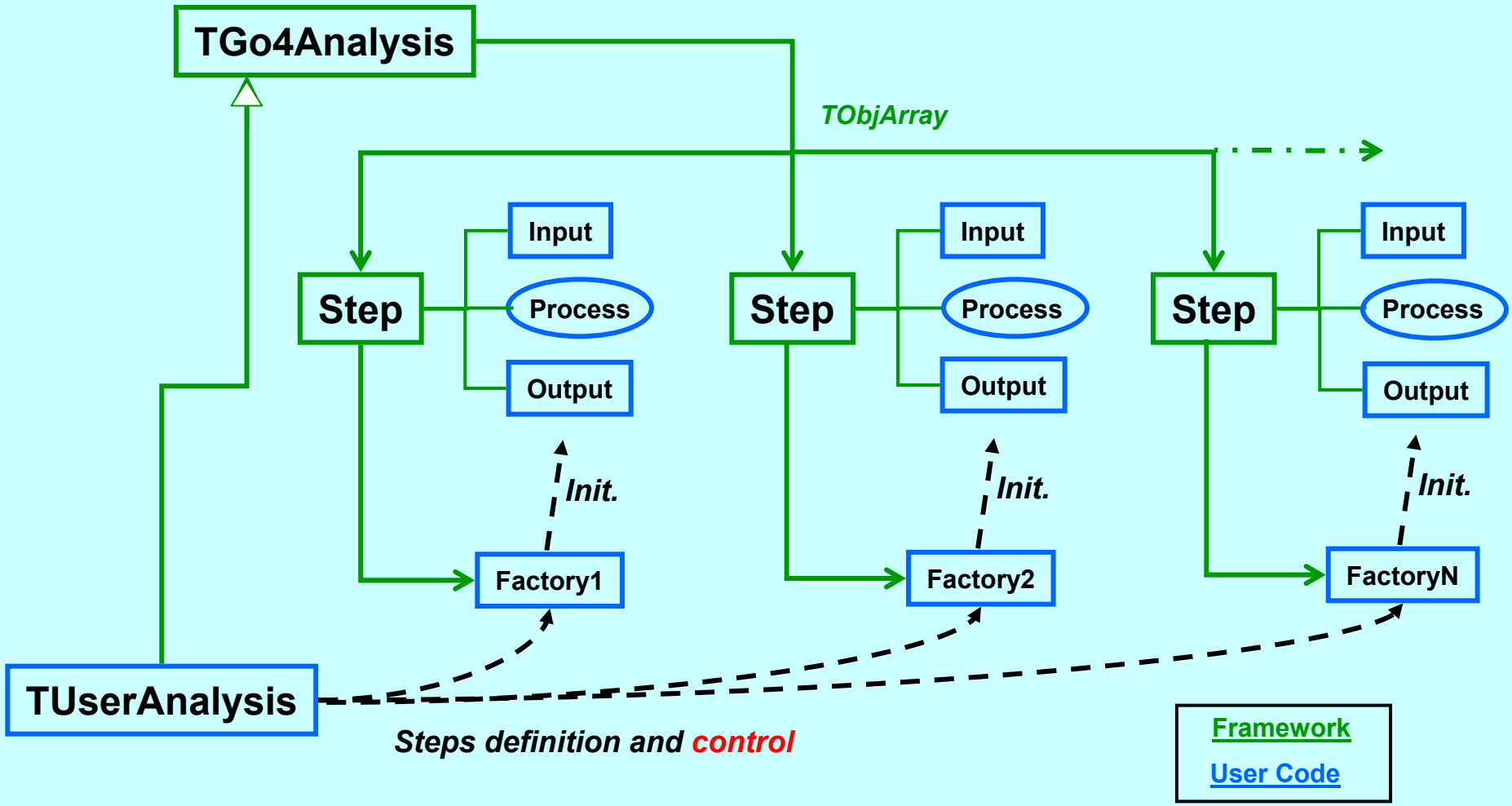
Chain of analysis steps processed sequentially

Each step can be en/disabled (framework)

Input/output can be switched (framework)



Analysis steps



Go4 plug-ins

Framework Services:

- **GSI standard DAQ (Mbs)**
  data formats, data input (*.lmd file and DAQ sockets)
- **Root I/O :**
  event source and store with TTree; object manager TFile i/o

Required user implementations:

- **Event data processing code**
  at least one function *BuildEvent()*

Optional user implementations:

- **Event data structures**
  output event class for ROOT TTree
- **Parameter container (set up, calibration, control)**
- **User event source (input file format, proprietary DAQ connection)**
- **Initialization factories (advanced set-up of event classes)**

Analysis Setup from command line

standard executable go4analysis

- **provided by framework**
- **generic command line arguments for analysis set up**
- **optional arguments passed to user's TGo4Analysis subclass**

examples:

• go4analysis -stream r3g2 -step 0 -store workshop_events.root
-step 1 –store workshop_analyzed.root -asf workshop_auto.root
(setup as from gui: mbs stream server as data source, 1. and 2. step storage files, autosave file specified)

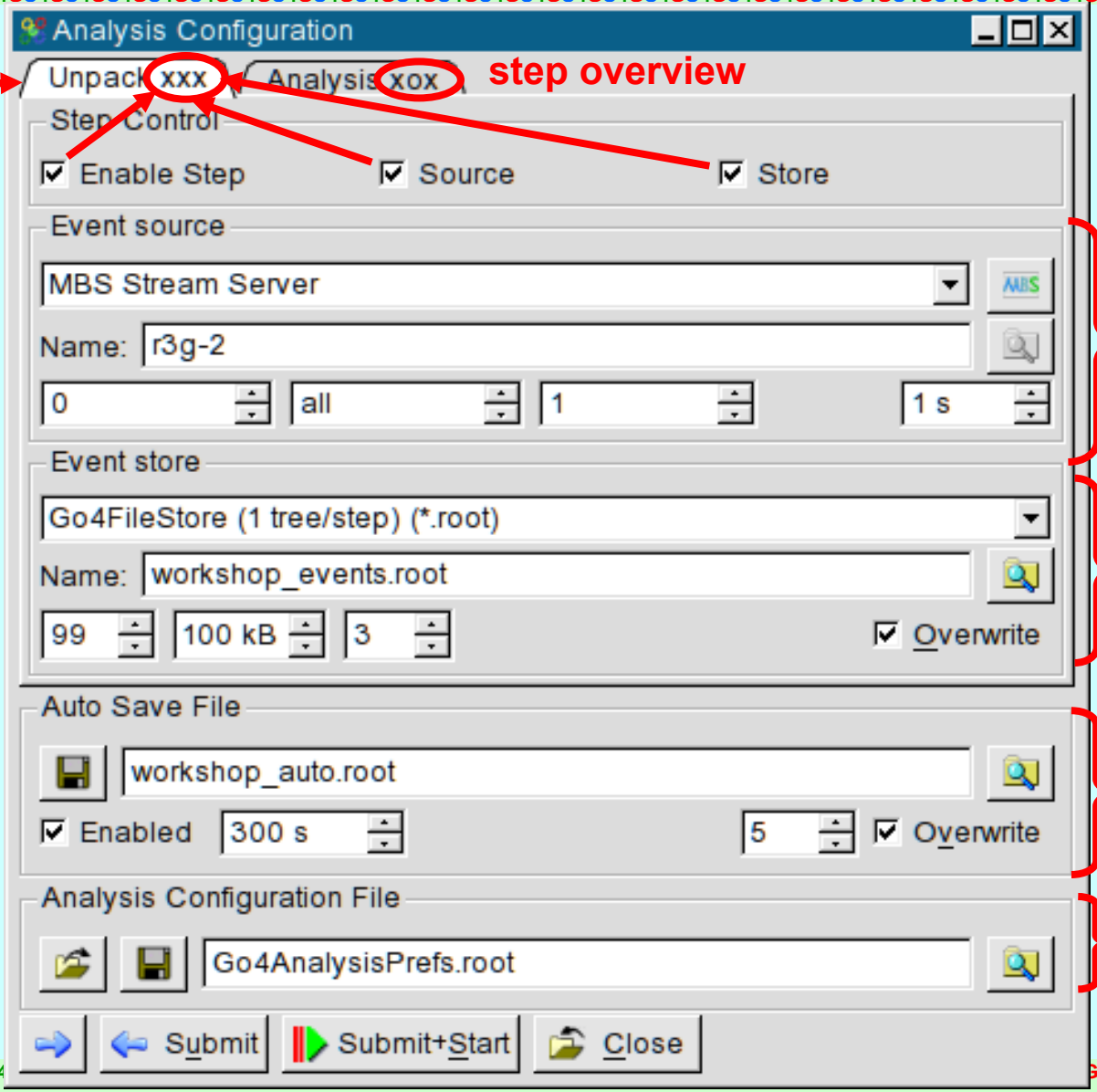
• go4analysis –file gauss.lmd –disable_store
–step Analysis -store analyzed_events.root –number 100000 -disable_asf
(process 100000 events from file gauss.lmd, no store of first step, storage file of step „Analysis", autosave disabled)

• go4analysis –user mydaq.gsi.de -server dataserver –norun –v 2 –log logfile.txt
(start analysis as data server, user defined DAQ event source, do not start processing, log output to file with verbosity 2)

• go4analysis –file gauss.lmd –args result.root 1 5000 7.0 42
(process file and pass user specific arguments to analysis constructor)

• go4analysis –help
(show all options)

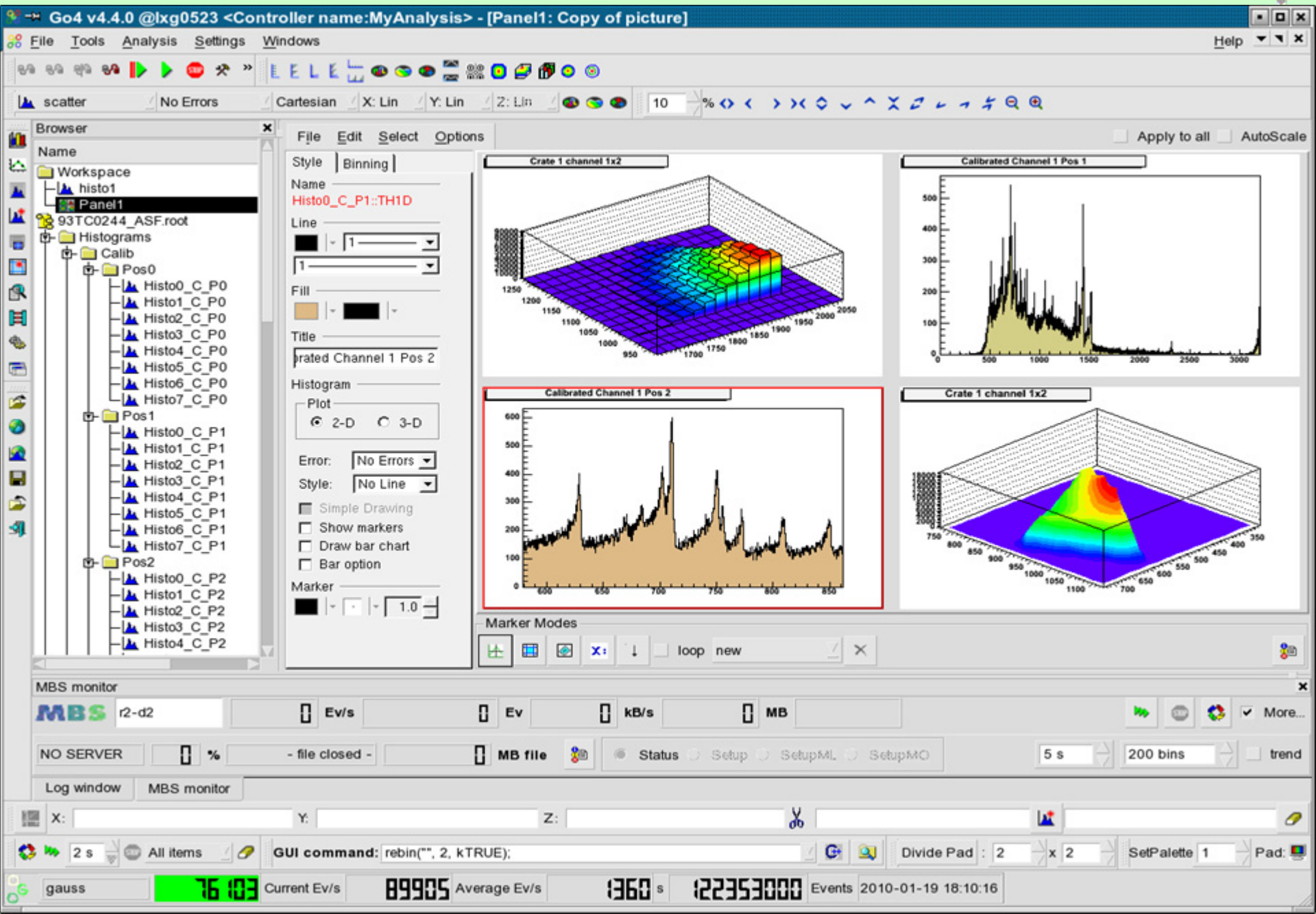
Analysis Setup from GUI



Some Go4 GUI Features

- Control and setup analysis steps (remote analysis)
- Extended browser and tree viewer (local, remote)
- Viewpanel with graphical markers
- Show and edit object properties (local, remote)
- Fit panel for histogram and graphs (local)
- Event data inspection and dump (remote analysis)
- Define „ad hoc“ histograming (remote analysis)
- Macro execution (local, remote analysis)
- Adding User written GUI possible (Qt designer)
- Hot start mechanism to save/restore complete set-up

Screenshot of Go4 v4.4



Go4 browser

Folders for:

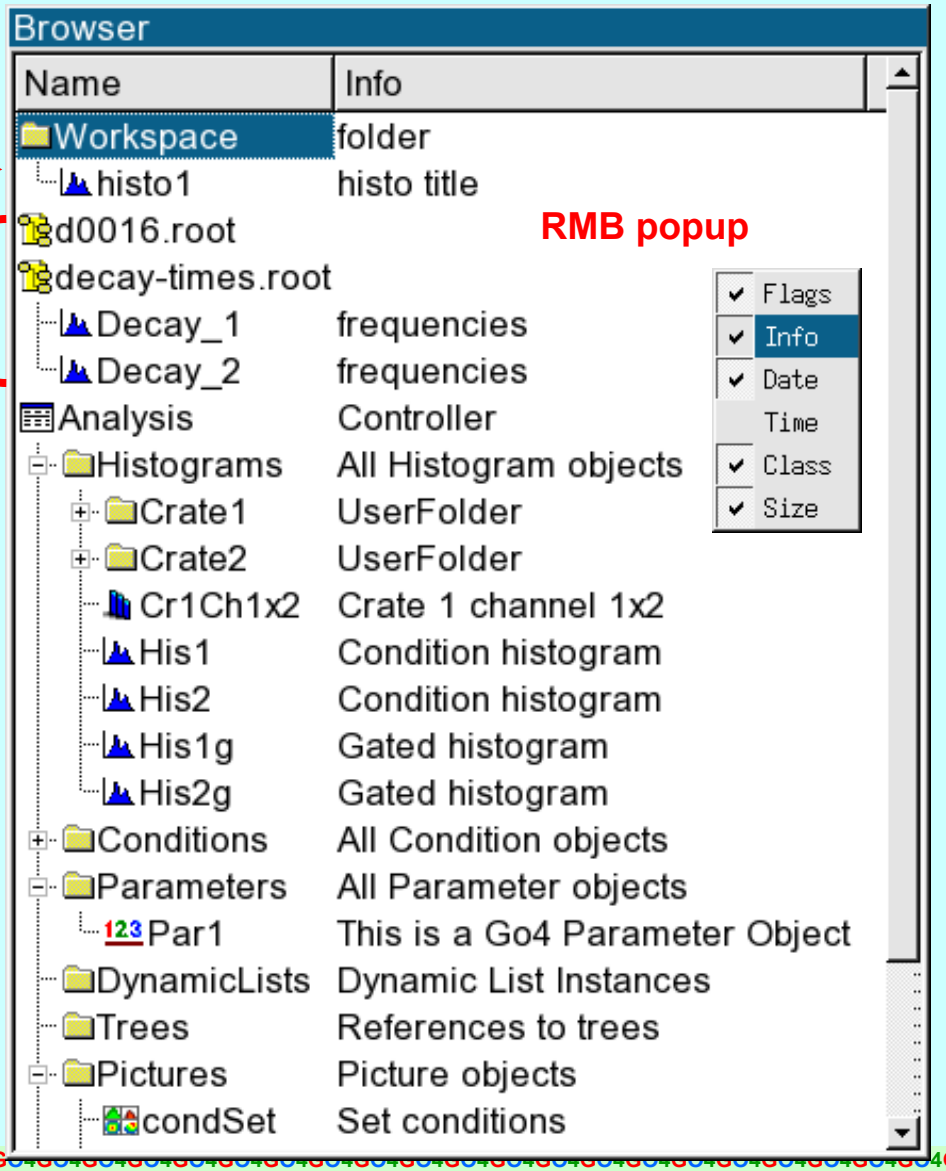
Workspace (GUI memory)

ROOT files

Analysis (remote memory)

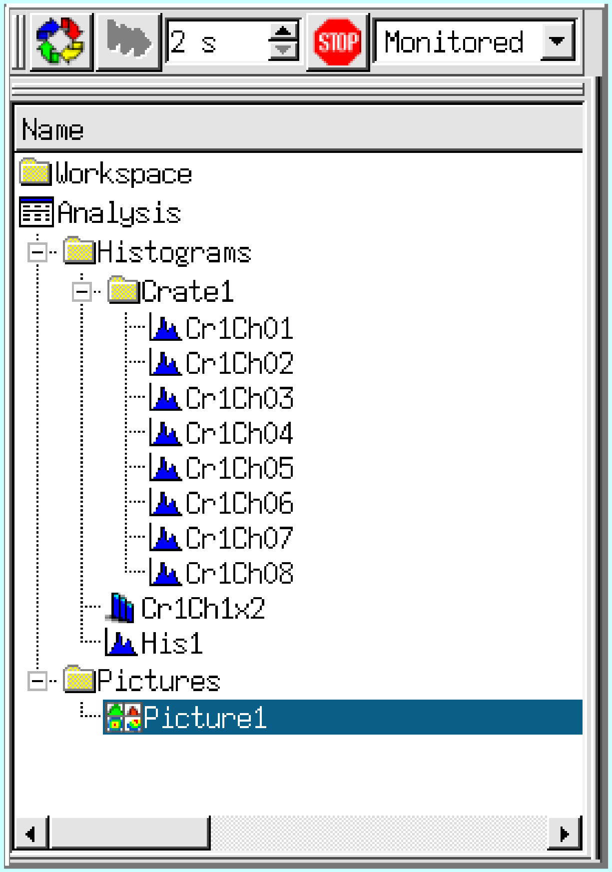
Histogram servers

(Mbs, TNetFile, RFIO)

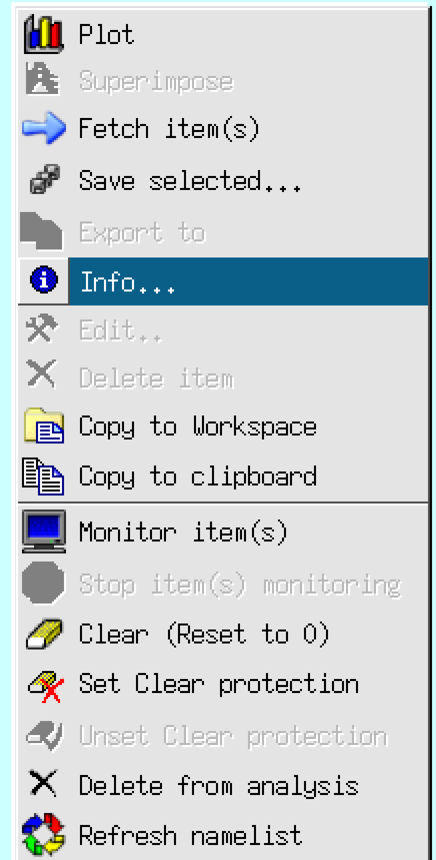


Go4 browser

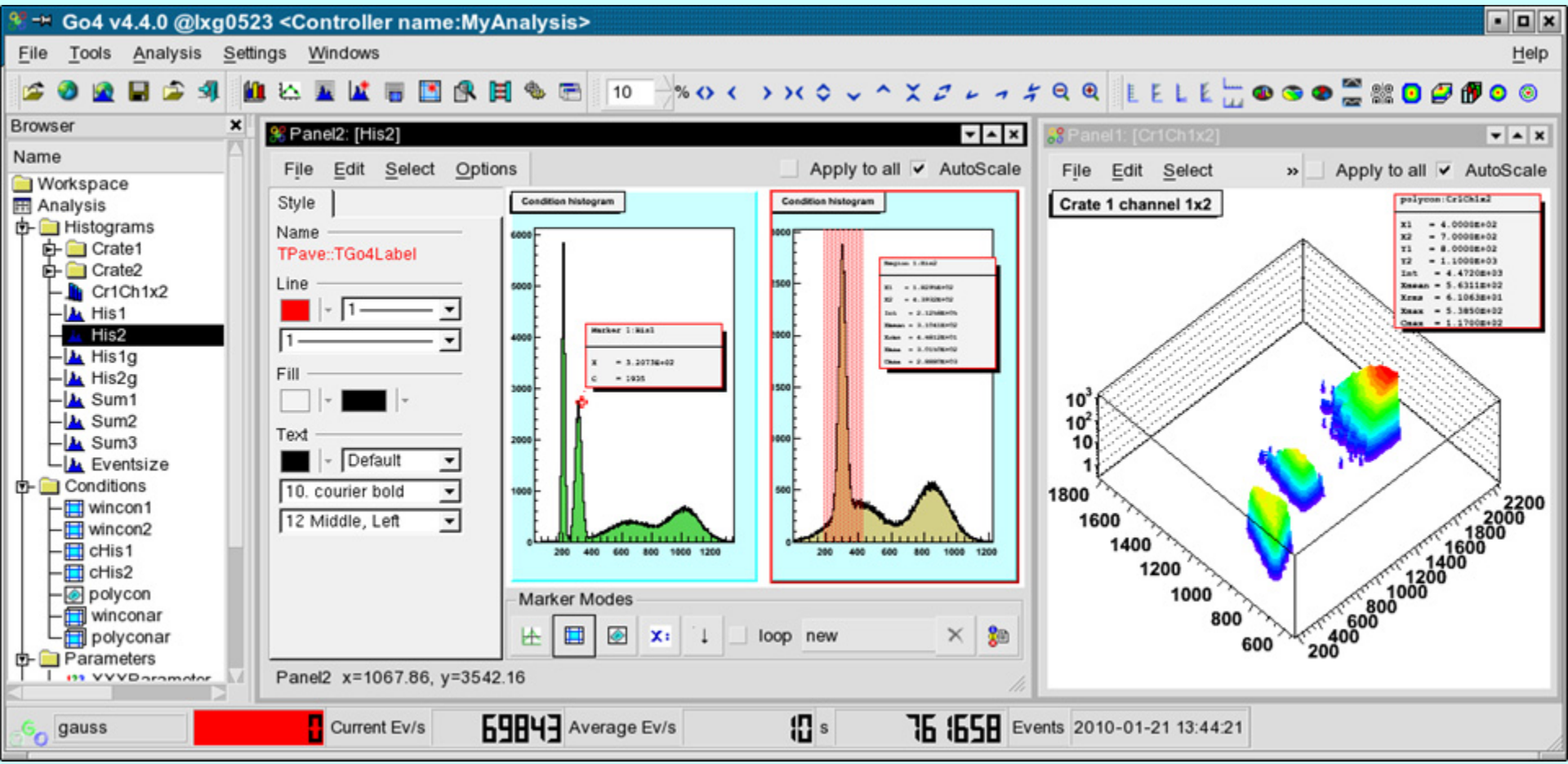
monitor and filter tool



context menu (RMB)



View panel

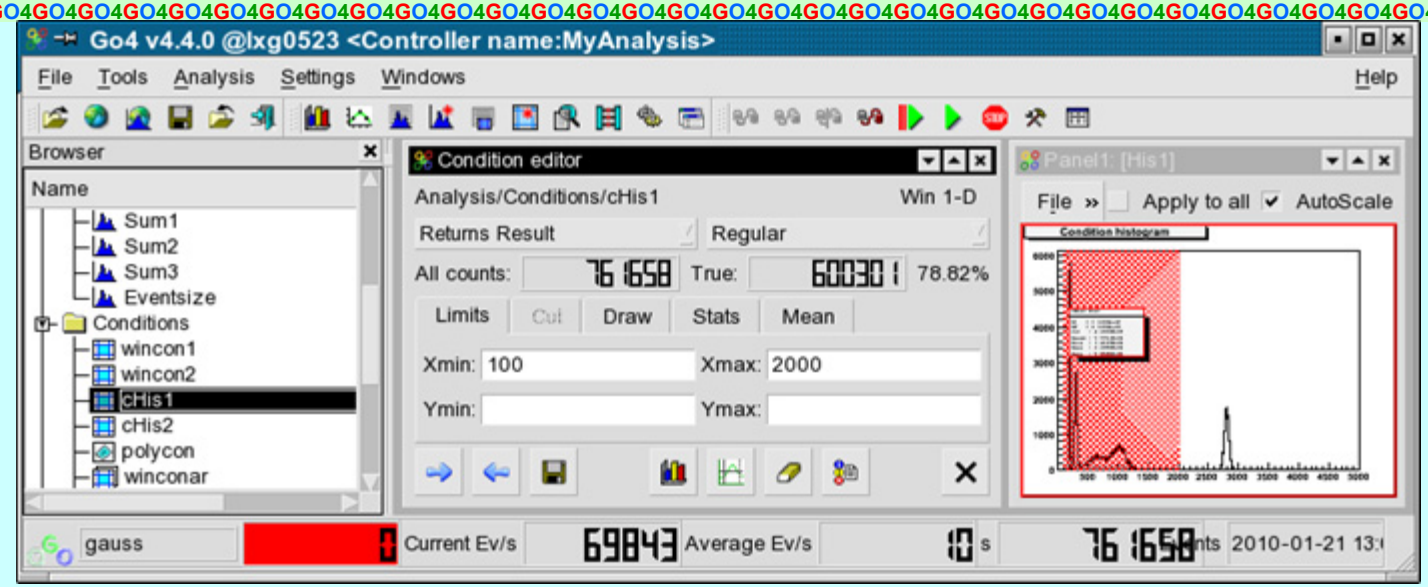


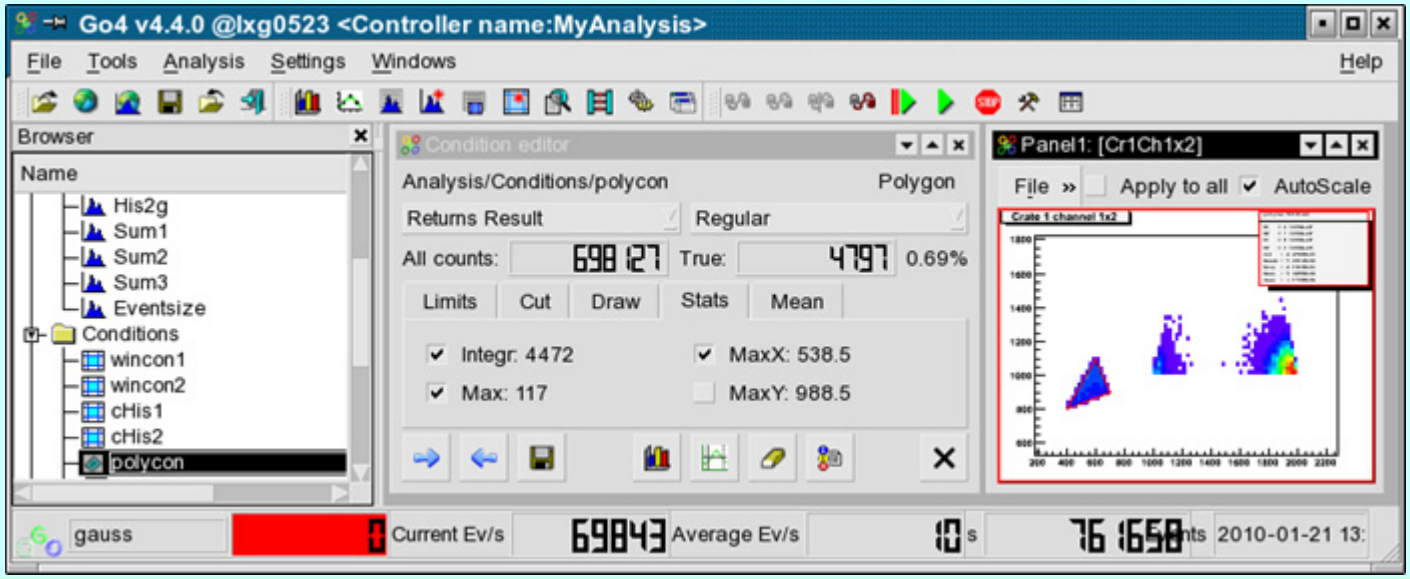
- Graphical ROOT editor
- Show same histogram in different views (ranges, line and fill colors)
- Improved marker editor, may also edit conditions
- Info on time/date and full object path

Go4 special objects

- **Condition**
  - **window condition: check 1 (2) value(s) against 2 limits (pairs of limits)**
  - **polygon condition: check if point (x,y) is inside/outside polygon**
  - **interactive control (GUI editor)**
- **Parameter**
  - **User class (plug-in) keeping parameter variables**
  - **supports atomic data types and Go4 fit objects**
  - **interactive control (generic GUI editor)**
- **Picture**
  - **Display definition for histograms, conditions, any ROOT objects...**
  - **Keeps Pad division and graphical attributes (ranges, colors, styles,...)**
  - **Predefined in analysis code or saved interactively from GUI**

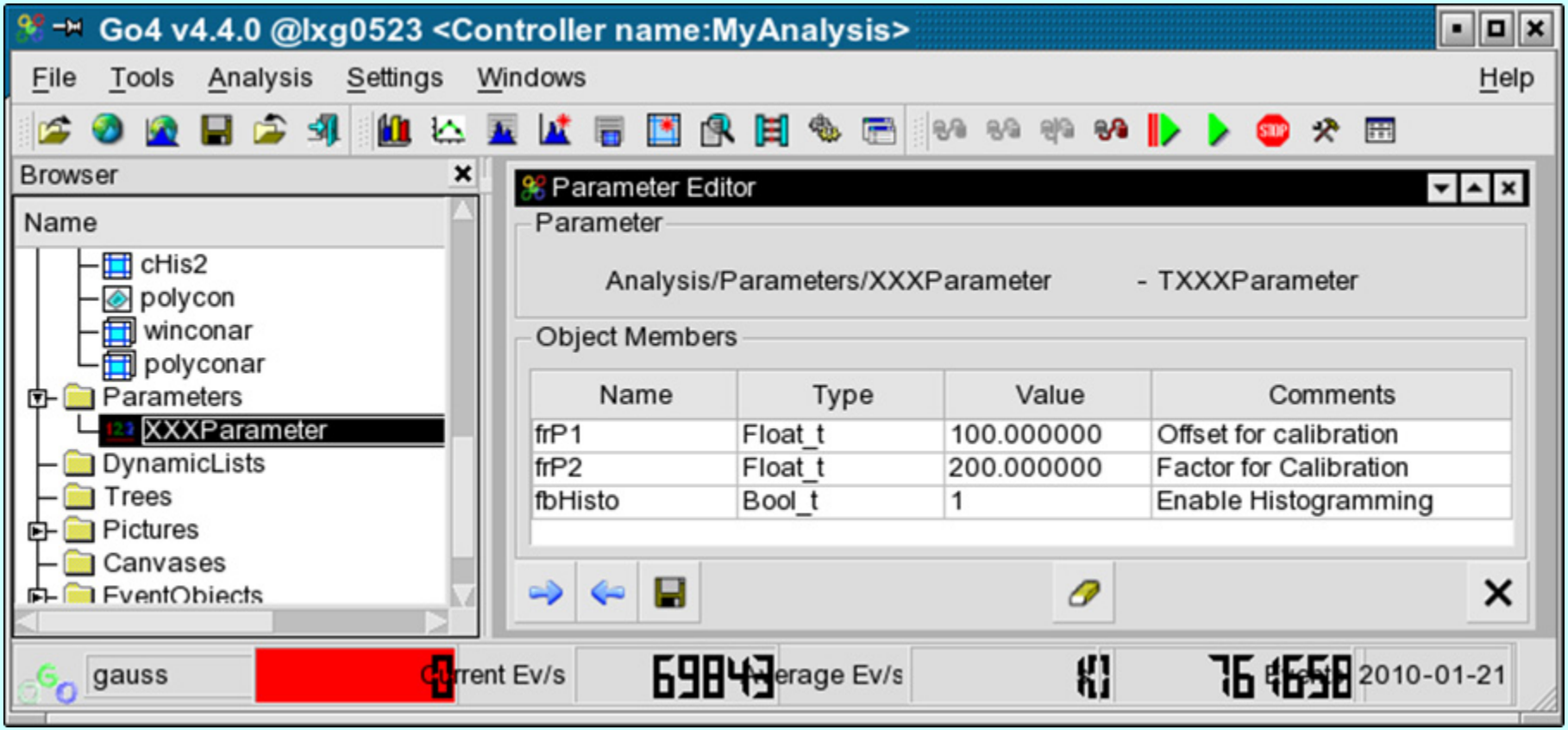
Condition editor



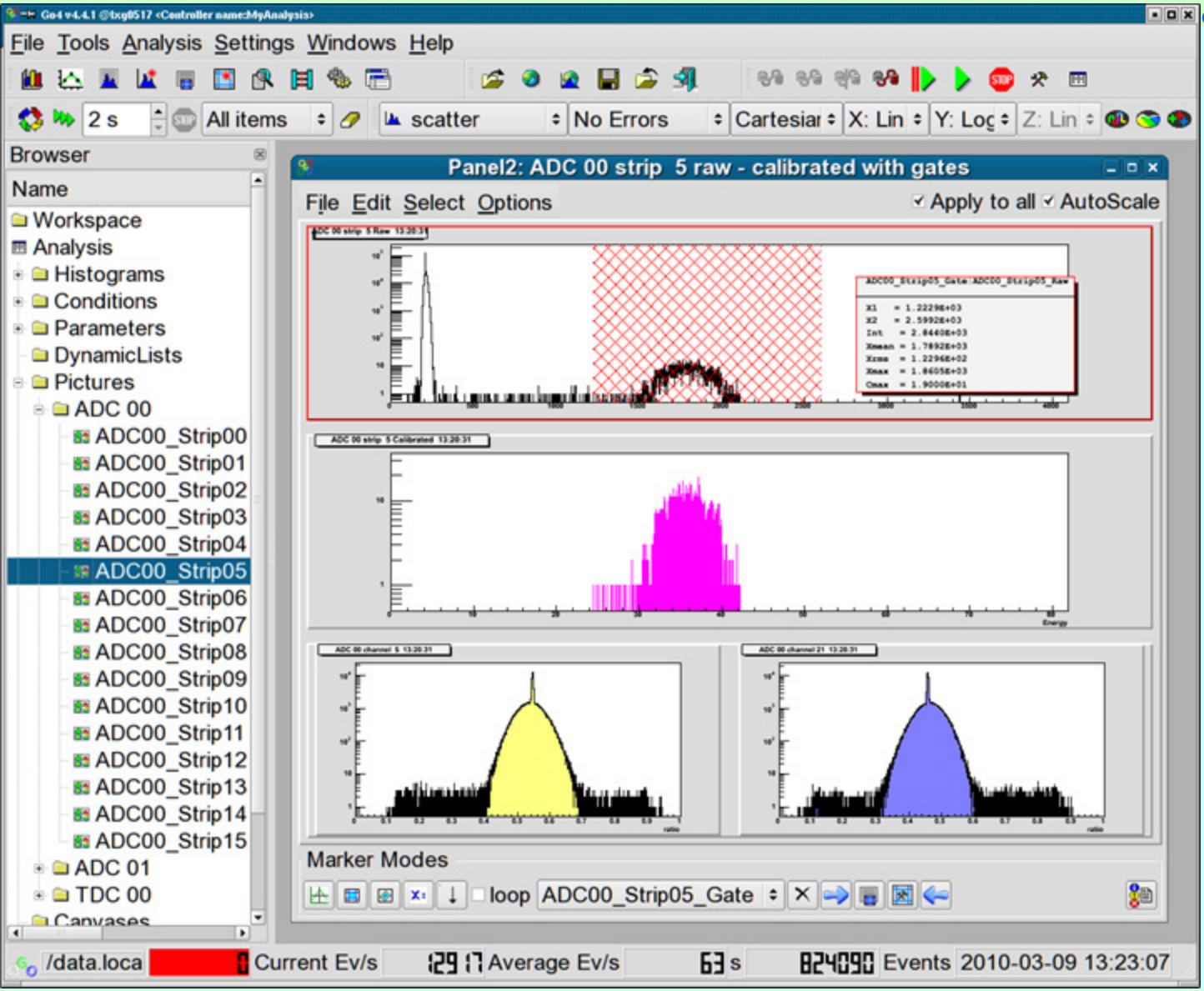


Parameter editor

Remote editing of object (data structure) contents



Picture view



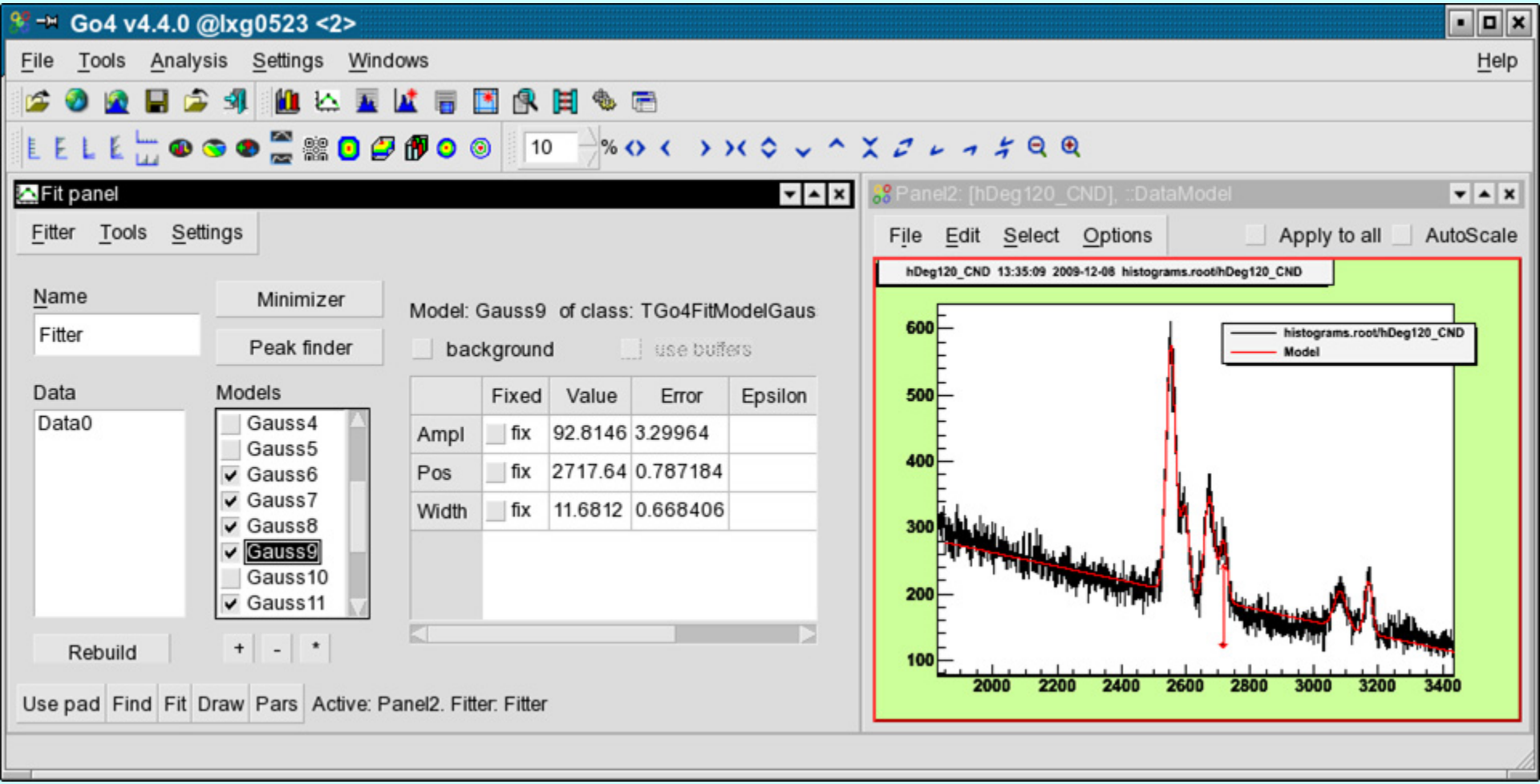
Set up a view of corresponding histograms, conditions,..

Go4 fit package and fit panel

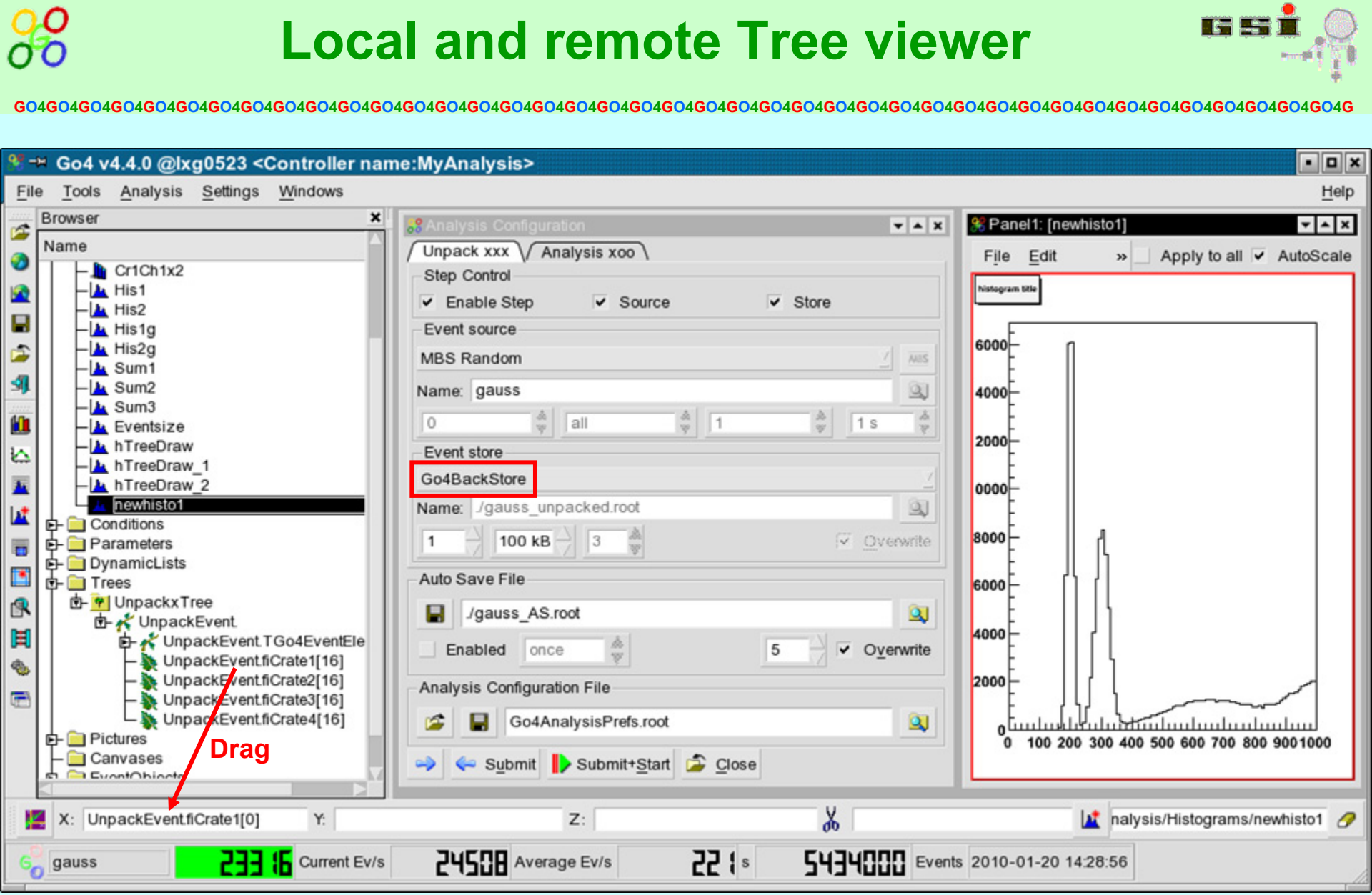
- Fitting of histograms / graphs for any kind of model
- Peak finder
- Interactive set up of model and fit parameters
- Fit panel modes:
  - simple (quick fit)
  - wizard (usual)
  - expert (full control of TGo4Fitter class)
- Different display modes
  (model components, parameter output, etc.)
- Different minimization functions
  (Chi square, ML Poisson, ...)
- Store fitter object in ROOT file for re-use

Fit panel

Interactive peak finding and fitting. Save fitter for use in macros



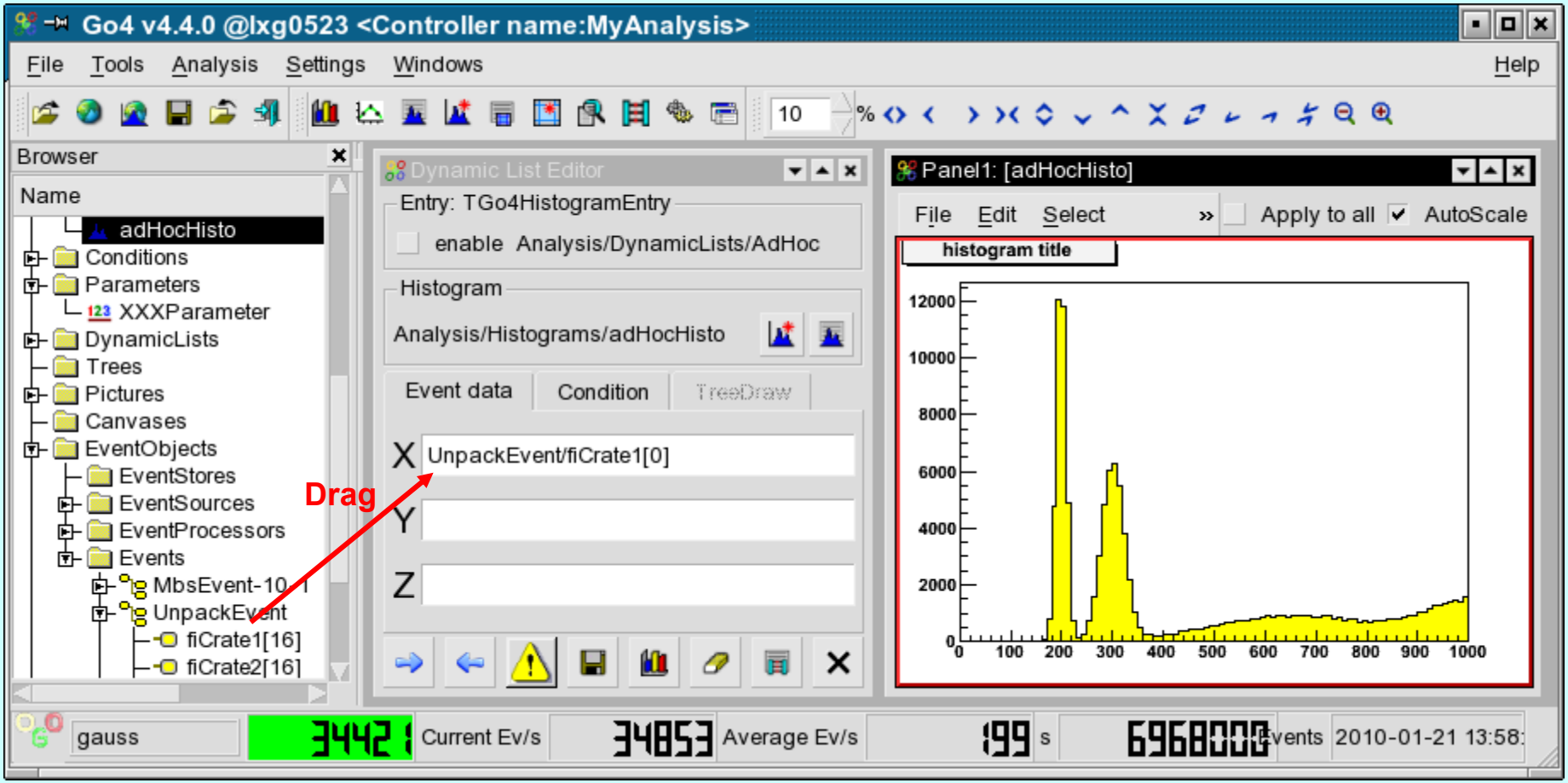
Local and remote Tree viewer



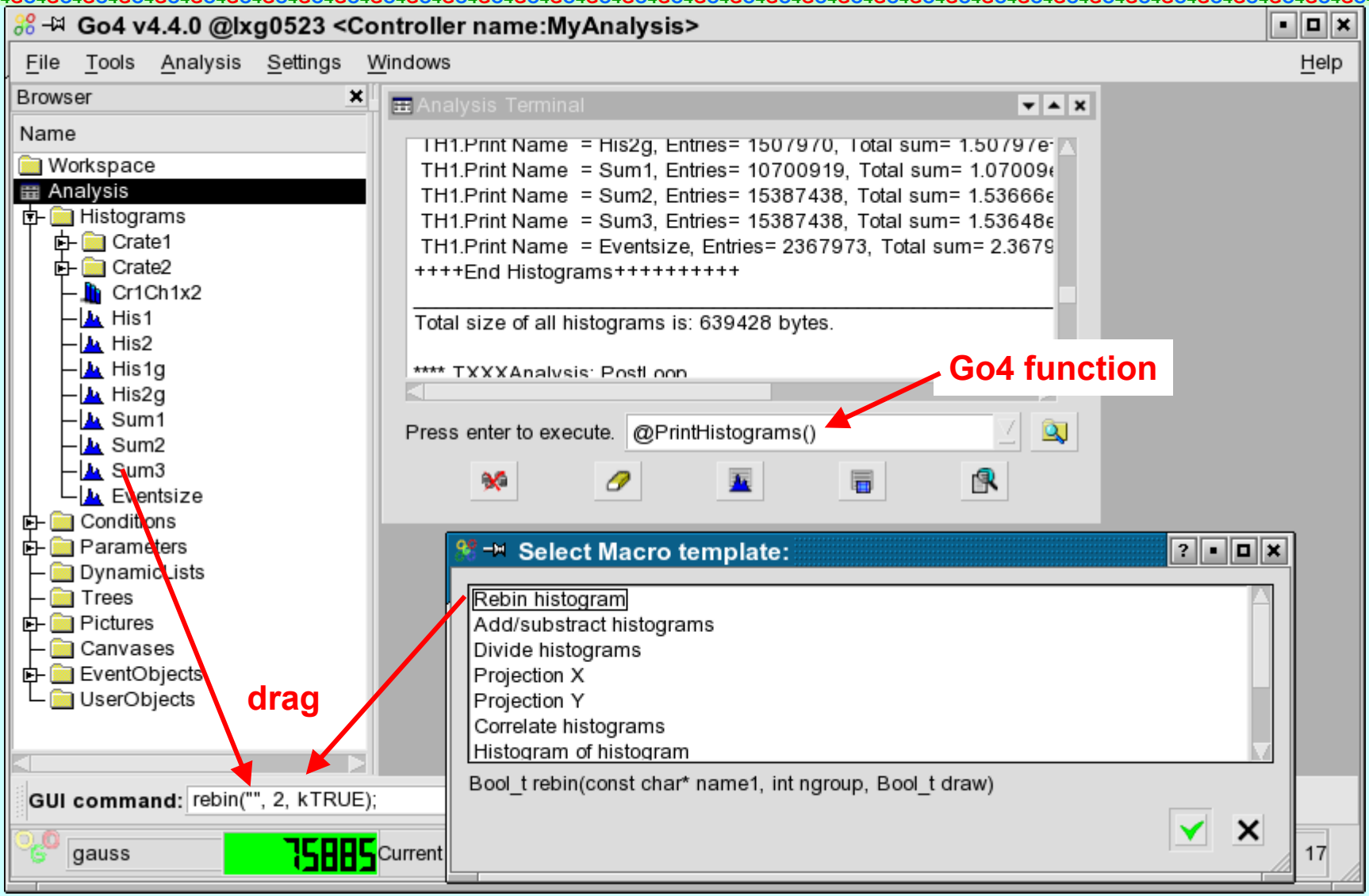
Histograming "ad hoc" from remote analysis TTree

Dynamic list editor

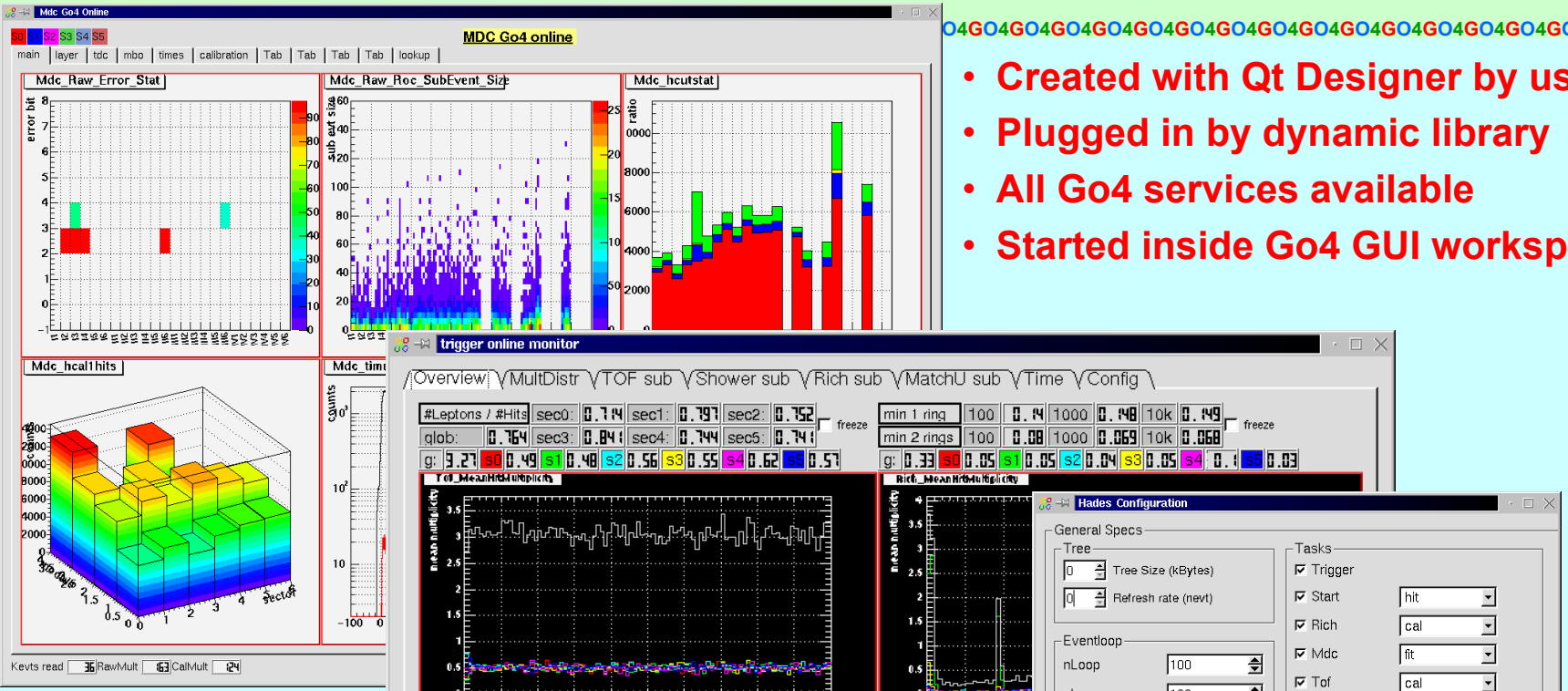
Histograming “ad hoc” from event data



Macro execution



User GUI (Qt)



- Created with Qt Designer by user
- Plugged in by dynamic library
- All Go4 services available
- Started inside Go4 GUI workspace

HADES
on-line monitoring

Courtesy HADES coll.

Go4 summary

A flexible framework for online monitoring and analysis

Used in production since 2002

Runtime environments: batch, or with asynchronous GUI(s)

User code: Go4 plug-ins, or unlimited ROOT

Applications: atomic and nuclear physics, detector testing

Go4 v4.4 free available under GPL at http://go4.gsi.de