New development in Go4

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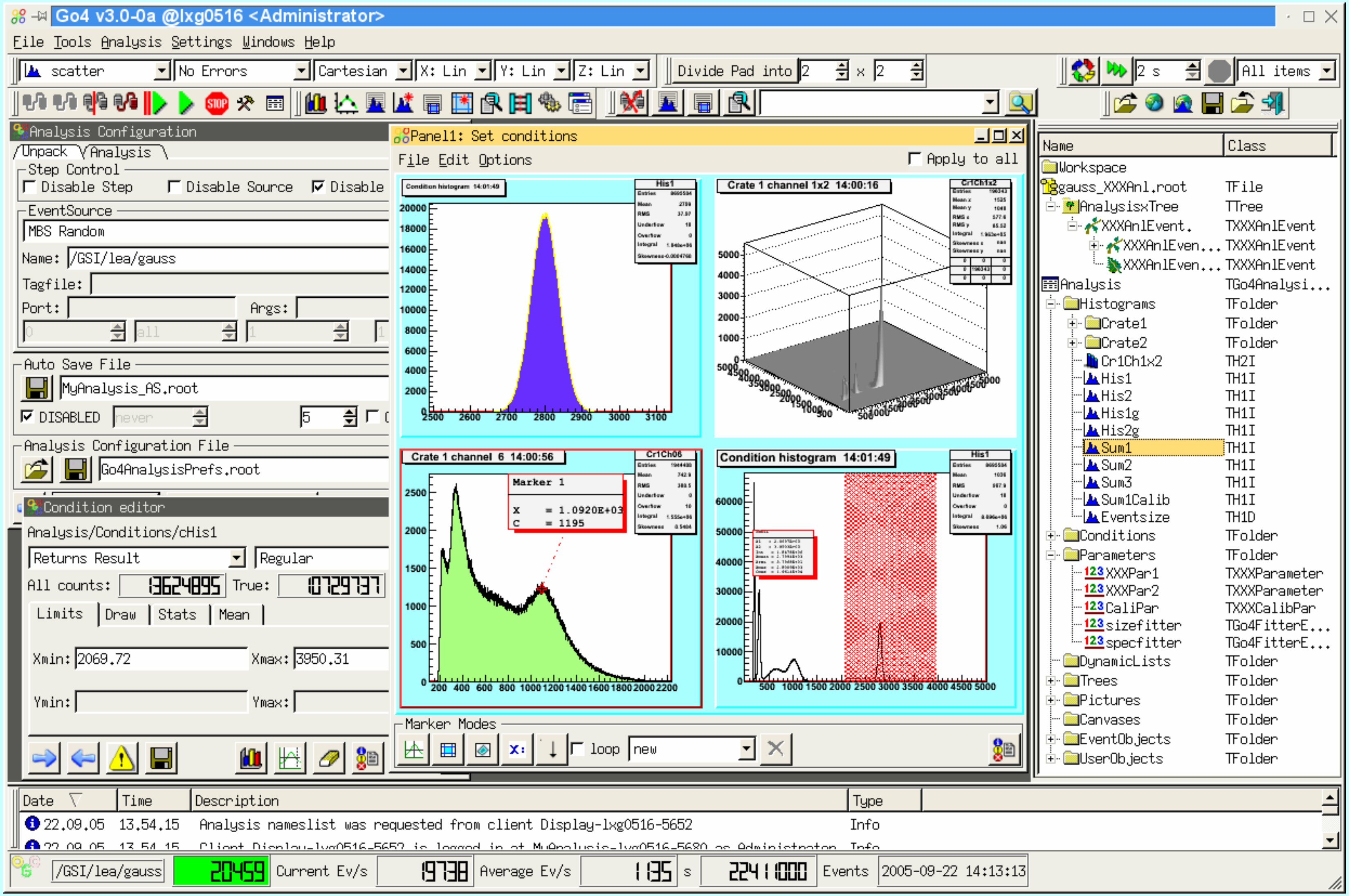
ROOT 2005

Current status of Go4

- **Framework** for many kinds of experiments (Atomic & Nuclear physics)
- The analysis code is written by the user
- **Services and interfaces** for analysis
- A **non blocking GUI** controls and steers the analysis
- Analysis **runs independently** and can **update graphics asynchronously**
- Socket communication between **analysis** and **GUI task**
- **Qt based GUI** with interface to **ROOT graphics**
- **User defined GUI** supported (Qt designer)

Screenshot of Go4 GUI



scatter | No Errors | Cartesian | X: Lin | Y: Lin | Z: Lin | Divide Pad into 2 x 2 | 2 s | All items

EventSource: MBS Random

Name: /GSI/lea/gauss

Tagfile:

Port: Args:

Auto Save File: MyAnalysis_AS.root

☑ DISABLED never 5

Analysis Configuration File: Go4AnalysisPrefs.root

Analysis/Conditions/cHis1

Returns Result | Regular

All counts: 13624895 True: 10729737

Xmin: 2069.72 Xmax: 3950.31

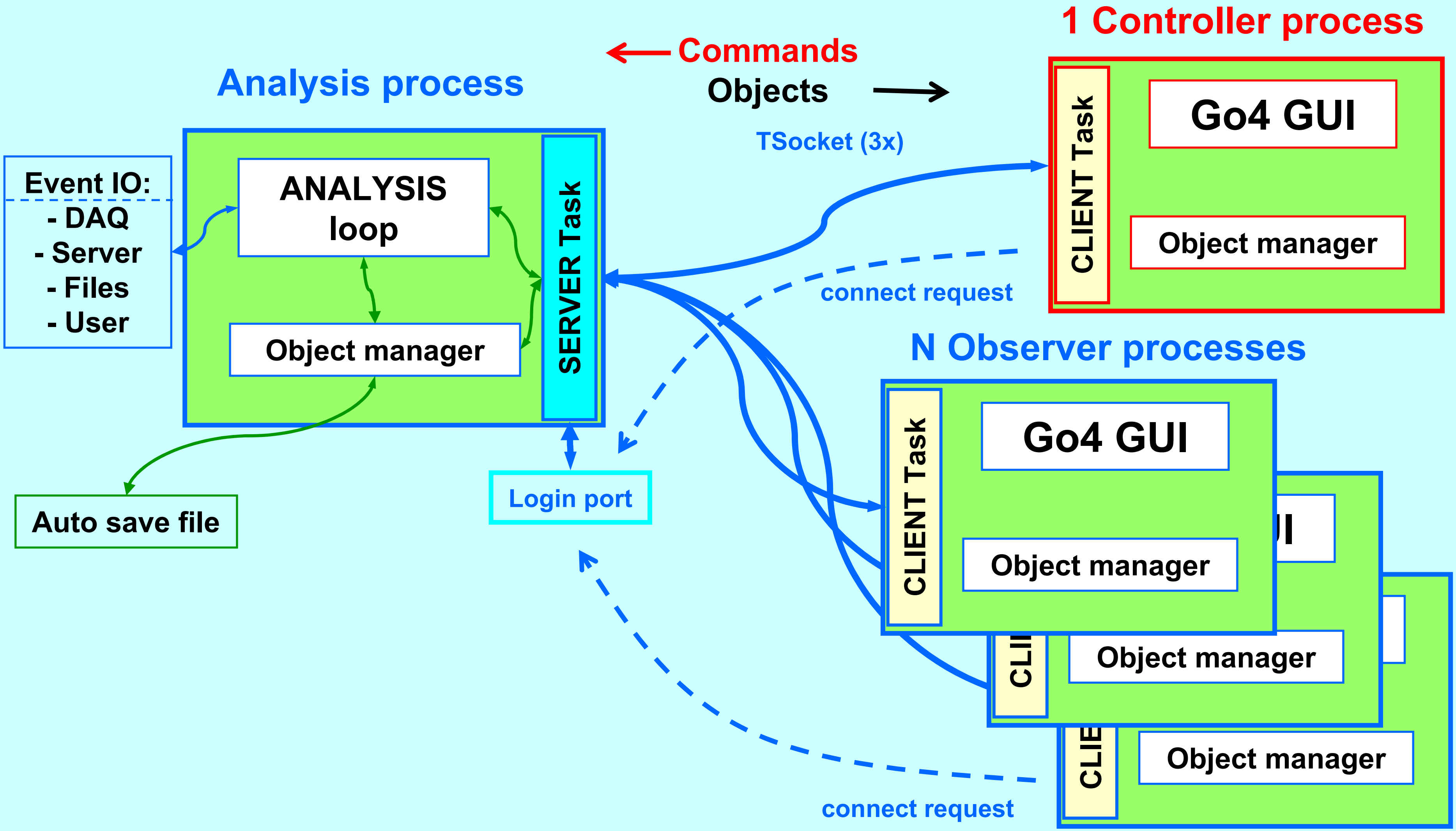
Ymin: Ymax:

Name	Class
Workspace	
gauss_XXXAnl.root	TFile
AnalysisxTree	TTree
XXXAnlEvent.	TXXXAnlEvent
XXXAnlEven...	TXXXAnlEvent
XXXAnlEven...	TXXXAnlEvent
Analysis	TGo4Analysi...
Histograms	TFolder
Crate1	TFolder
Crate2	TFolder
Cr1Ch1x2	TH2I
His1	TH1I
His2	TH1I
His1g	TH1I
His2g	TH1I
Sum1	TH1I
Sum2	TH1I
Sum3	TH1I
Sum1Calib	TH1I
Eventsize	TH1D
Conditions	TFolder
Parameters	TFolder
XXXPar1	TXXXParameter
XXXPar2	TXXXParameter
CaliPar	TXXXCalibPar
sizefitter	TGo4FitterE...
specfitter	TGo4FitterE...
DynamicLists	TFolder
Trees	TFolder
Pictures	TFolder
Canvases	TFolder
EventObjects	TFolder
UserObjects	TFolder

Date	Time	Description	Type
22.09.05	13.54.15	Analysis nameslist was requested from client Display-lxg0516-5652	Info
22.09.05	13.54.15	Client Display-lxg0516-5652 is logged in at MyAnalysis-lxg0516-5680 as Administrator	Info

/GSI/lea/gauss | 20459 | Current Ev/s | 19738 | Average Ev/s | 1135 | s | 22411000 | Events | 2005-09-22 14:13:13

Improved communication mechanism



New concept for objects organization

Requirements:

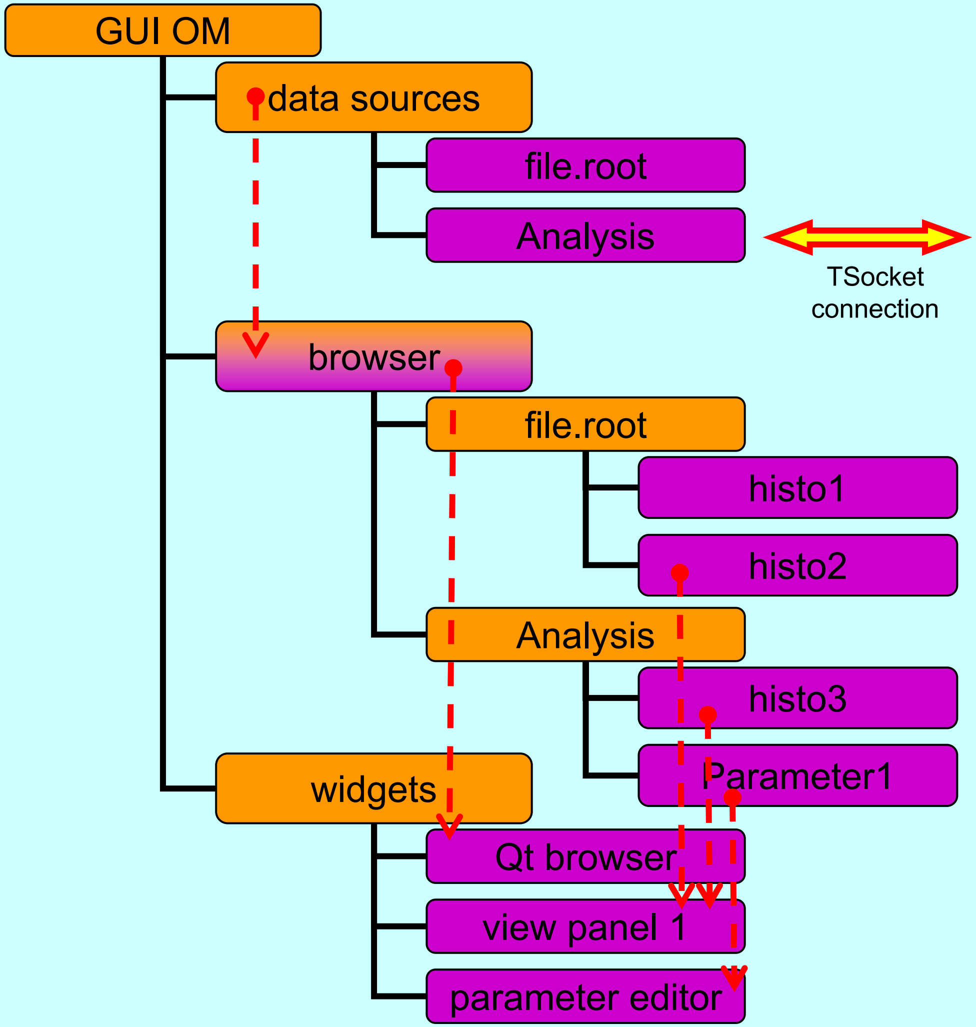
- central registry for all data
- naming like “Analysis/Histograms/His1”
- common API to browse and access data from different sources like TFolder, TDirectory, remote analysis and so on
- decouple functionality and graphical surface
- possibility of interactive interface

Proxy approach

Instead of direct objects hierarchy (like TFolder) mediator proxies are used. Proxy functionality:

- Holds object pointer (with or without ownership)
- Provides iterator over object structure
- Provides metainformation about contained data
- Via the names gives an access to object data
- Correctly store/restore object to file
- Delivers messages, when object is inserted, modified or deleted

GUI object manager

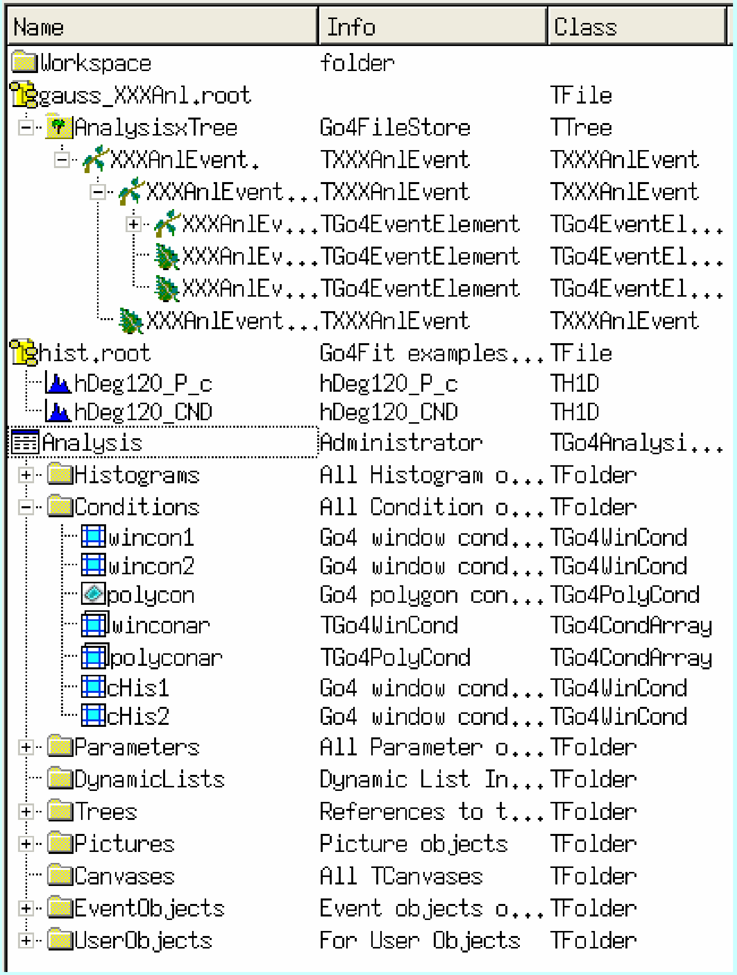


- hierarchical structure of **containers**
- special **proxies** for different data sources
- single **iterator** for looping over complete structure
- **message** passing between different branches for notification purposes
- ROOT **cleanup** mechanism

Supported data sources:

- TFolder
- TDirectory (TFile)
- TTree
- TCanvas
- Remote Go4 analysis
- GSI histogram server

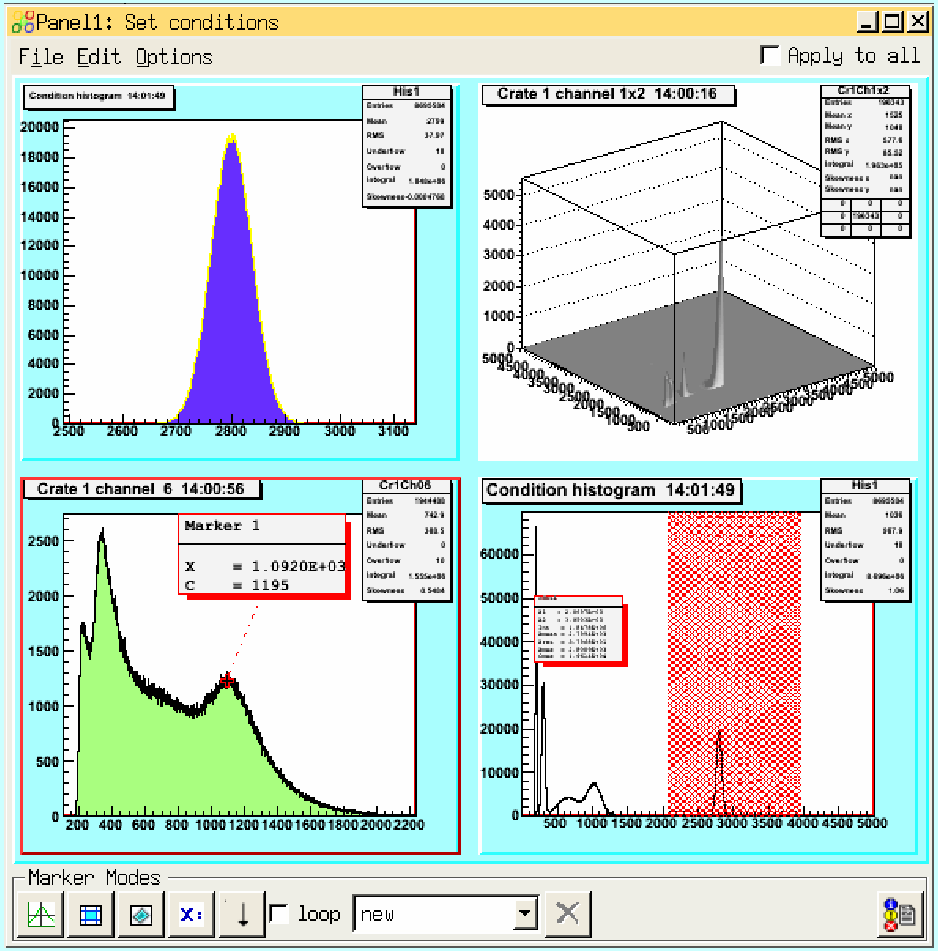
Go4 browser



Name	Info	Class
Workspace	folder	
gauss_XXXAnl.root		TFile
AnalysisxTree	Go4FileStore	TTree
XXXAnlEvent.	TXXXAnlEvent	TXXXAnlEvent
XXXAnlEvent...	TXXXAnlEvent	TXXXAnlEvent
XXXAnlEv...	TGo4EventElement	TGo4EventEl...
XXXAnlEv...	TGo4EventElement	TGo4EventEl...
XXXAnlEv...	TGo4EventElement	TGo4EventEl...
XXXAnlEvent...	TXXXAnlEvent	TXXXAnlEvent
hist.root	Go4Fit examples...	TFile
hDeg120_P_c	hDeg120_P_c	TH1D
hDeg120_CND	hDeg120_CND	TH1D
Analysis	Administrator	TGo4Analysi...
Histograms	All Histogram o...	TFolder
Conditions	All Condition o...	TFolder
wincon1	Go4 window cond...	TGo4WinCond
wincon2	Go4 window cond...	TGo4WinCond
polycon	Go4 polygon con...	TGo4PolyCond
winconar	TGo4WinCond	TGo4CondArray
polyconar	TGo4PolyCond	TGo4CondArray
cHis1	Go4 window cond...	TGo4WinCond
cHis2	Go4 window cond...	TGo4WinCond
Parameters	All Parameter o...	TFolder
DynamicLists	Dynamic List In...	TFolder
Trees	References to t...	TFolder
Pictures	Picture objects	TFolder
Canvases	All TCanvases	TFolder
EventObjects	Event objects o...	TFolder
UserObjects	For User Objects	TFolder

- Implemented as special proxy
- Replicates structure of data sources
- Keeps pointers on fetched objects
- Objects copy & paste
- Monitoring (periodical update) of specified objects
- Completely independent from graphical surface
- Simple Qt widget to display structure of browser

Go4 view panel



- Uses QtROOT interface (by D.Bertini)
- List of drawn objects is kept in special branch of OM
- Via special widget proxy view panel notified, when object is modified or deleted
- Possibility to draw same histogram with different ranges, line and fill colors

Remote dispatching of ROOT macro

- Use regular ROOT session
- Init script to loads Go4 libraries and starts up analysis server task

  ```
  [root] .x go4Init.C
  ```

- All methods of TGo4Analysis::Instance() available in CINT via

  `go4->...(),`

- Register Root objects in CINT / analysis script:

  `go4RegisterAll()` (all histograms in root memory), or

  `go4->AddHistogram(TH1*), go4->AddObject(TNamed*),...`

- Optional run control methods for macro:

  `go4->WaitForStart()` – suspend macro until start button pressed

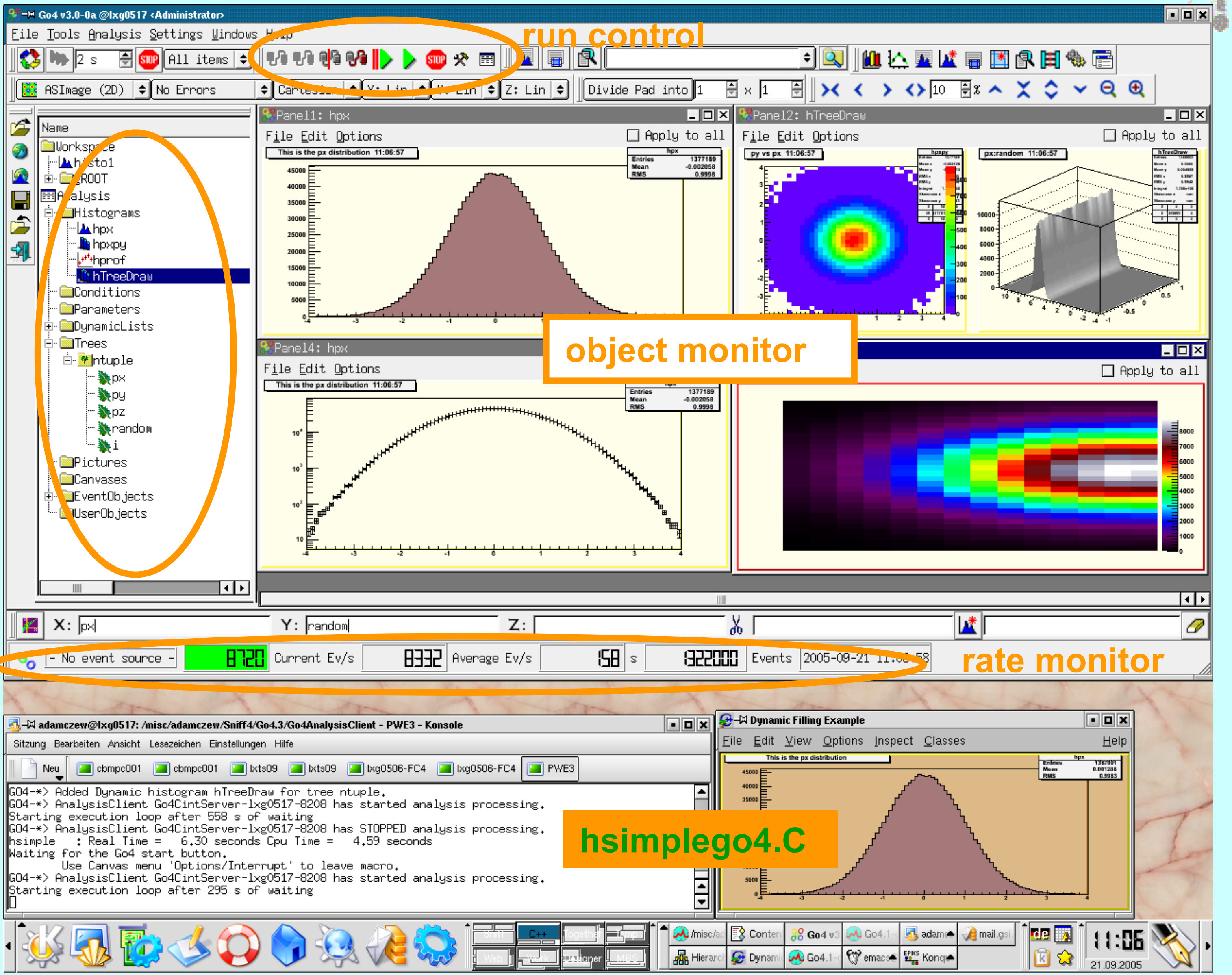
  `go4->Process()` – break eventloop when stop button pressed

Remote dispatching of ROOT macro

browser

Go4 GUI

ROOT



run control

object monitor

rate monitor

hsimplego4.C

```
G04-*> Added Dynamic histogram hTreeDraw for tree ntuple.
G04-*> AnalysisClient Go4CintServer-lxg0517-8208 has started analysis processing.
Starting execution loop after 558 s of waiting
G04-*> AnalysisClient Go4CintServer-lxg0517-8208 has STOPPED analysis processing.
hsimple   : Real Time =   6.30 seconds Cpu Time =   4.59 seconds
Waiting for the Go4 start button.
        Use Canvas menu 'Options/Interrupt' to leave macro.
G04-*> AnalysisClient Go4CintServer-lxg0517-8208 has started analysis processing.
Starting execution loop after 295 s of waiting
```

Plain ROOT for analysis control

- Use regular ROOT session
- Instantiate TGo4Interface instance

```
[root] TGo4Interface::Instance()
```

- Connect to running analysis

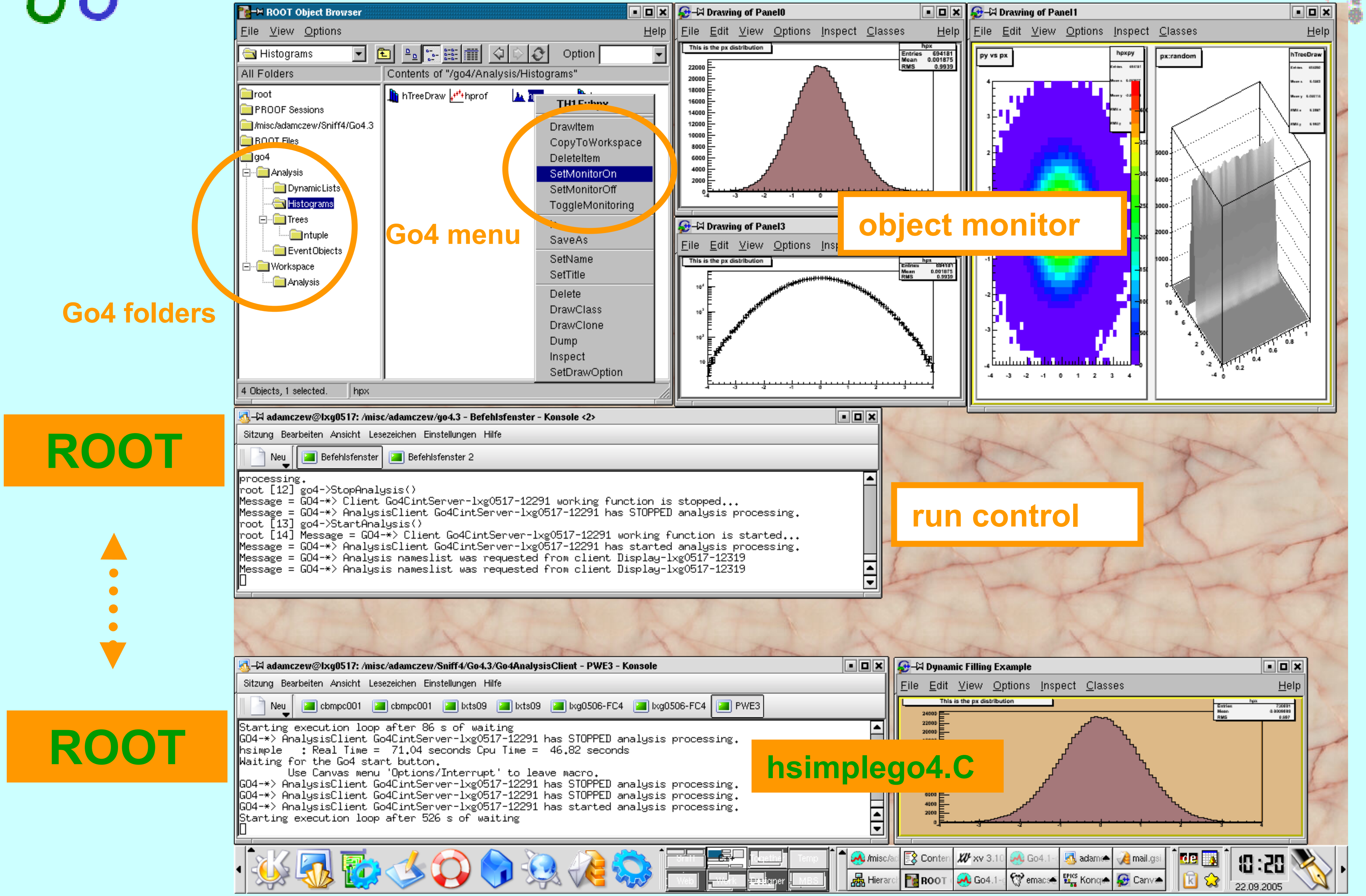
```
[root] go4->ConnectAnalysis("host.domain", 5000, 2);
```

- Create TBrowser instance:

```
[root] new TBrowser
```

- ROOT browser will contain “go4” folder, where all objects in analysis will be displayed

Using TBrowser for macro control



```
processing.
root [12] go4->StopAnalysis()
Message = G04-*> Client Go4CintServer-lxg0517-12291 working function is stopped...
Message = G04-*> AnalysisClient Go4CintServer-lxg0517-12291 has STOPPED analysis processing.
root [13] go4->StartAnalysis()
root [14] Message = G04-*> Client Go4CintServer-lxg0517-12291 working function is started...
Message = G04-*> AnalysisClient Go4CintServer-lxg0517-12291 has started analysis processing.
Message = G04-*> Analysis nameslist was requested from client Display-lxg0517-12319
Message = G04-*> Analysis nameslist was requested from client Display-lxg0517-12319
```

```
Starting execution loop after 86 s of waiting
G04-*> AnalysisClient Go4CintServer-lxg0517-12291 has STOPPED analysis processing.
hsimple   : Real Time =  71.04 seconds Cpu Time =  46.82 seconds
Waiting for the Go4 start button.
         Use Canvas menu 'Options/Interrupt' to leave macro.
G04-*> AnalysisClient Go4CintServer-lxg0517-12291 has STOPPED analysis processing.
G04-*> AnalysisClient Go4CintServer-lxg0517-12291 has STOPPED analysis processing.
G04-*> AnalysisClient Go4CintServer-lxg0517-12291 has started analysis processing.
Starting execution loop after 526 s of waiting
```

Conclusion

- Communication mechanism was improved to enable multiple viewers of running analysis
- Go4 GUI was enhanced and its main functionality was separated from graphical surface
- Running on other node ROOT macro can be observed and controlled from the Go4 GUI or from the normal ROOT TBrowser
- Go4 v3 beta release is available. Production release will be in the next few weeks