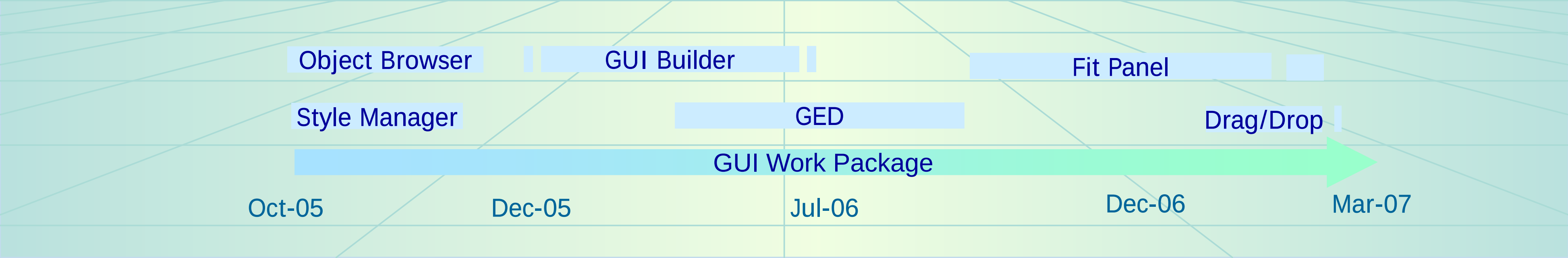
GUI Status and Development

Ilka Antcheva, Bertrand Bellenot,
David Gonzalez Maline[*], Valeriy Onuchin[**]

CERN, Geneva, Switzerland
[*] Summer Student, Spain
[**] IHEP, Protvino, Russia

Overview

- Status
- GUI Classes
- Object Browser
- Graphics Editor
- New Fit Panel
- Future Plans



Object Browser

GUI Builder

Fit Panel

Style Manager

GED

Drag/Drop

GUI Work Package

Oct-05

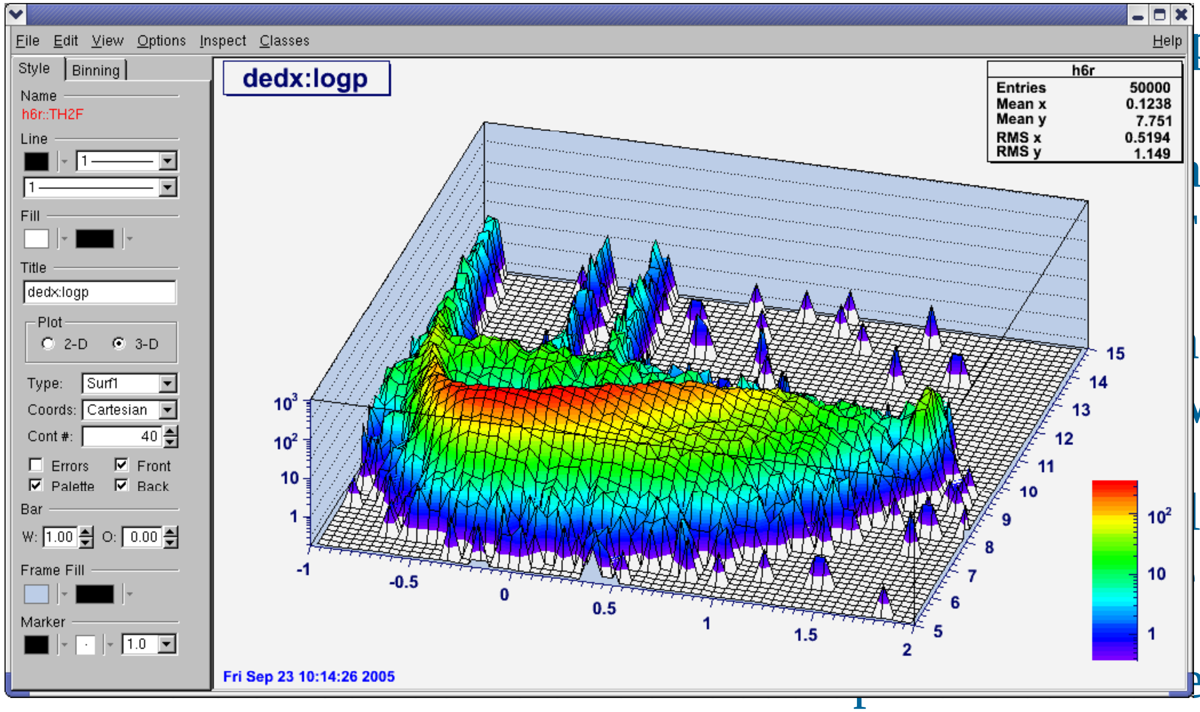
Dec-05

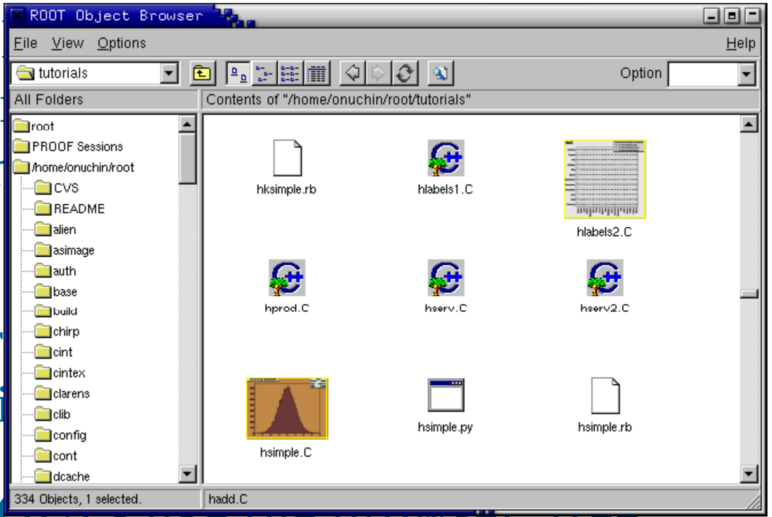
Jul-06

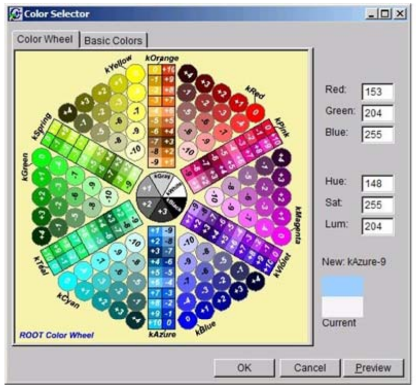
Dec-06

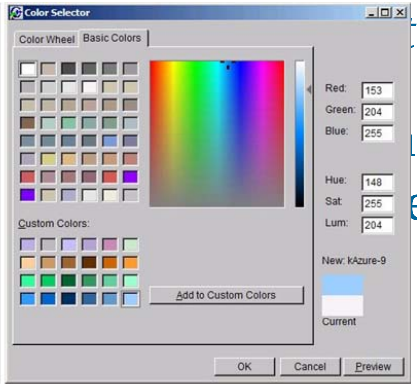
Mar-07

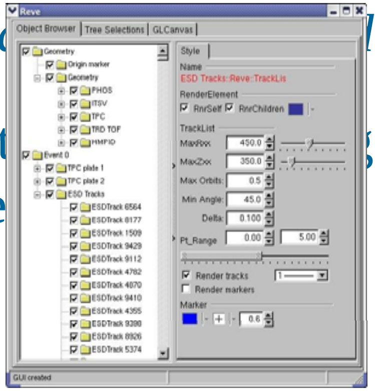
Status ❶

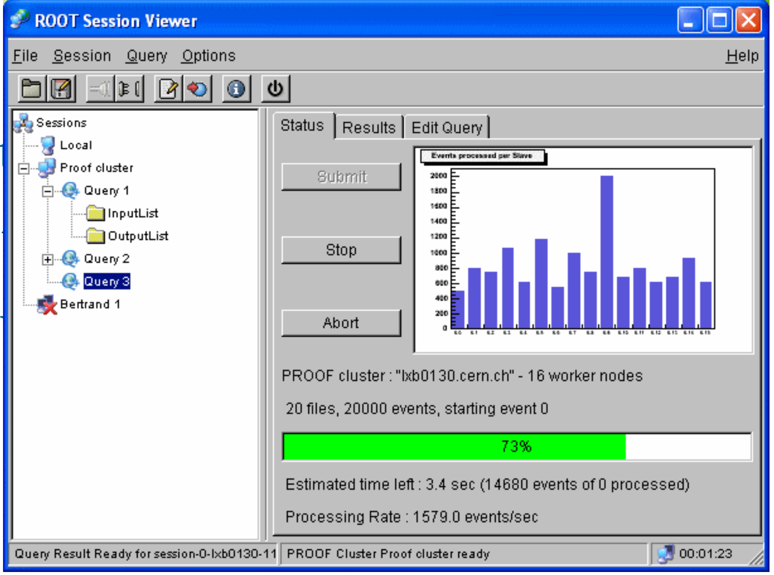












PROOF cluster : "lxb0130.cern.ch" - 16 worker nodes

20 files, 20000 events, starting event 0

73%

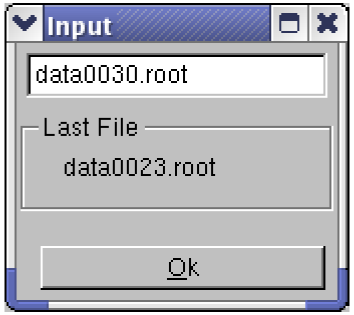
Estimated time left : 3.4 sec (14680 events of 0 processed)

Processing Rate : 1579.0 events/sec

Query Result Ready for session-0-lxb0130-11 | PROOF Cluster Proof cluster ready | 00:01:23

Status ❷

- Fast GUI prototyping via the CINT - embedded C++ interpreter
  - CINT supports from simple sequence of statements to complex class and method definitions
  - No need for special preprocessors or compilation
  - Macro can be edited and then re-executed via the CINT
  - Compiling macros help for fixing C++ errors



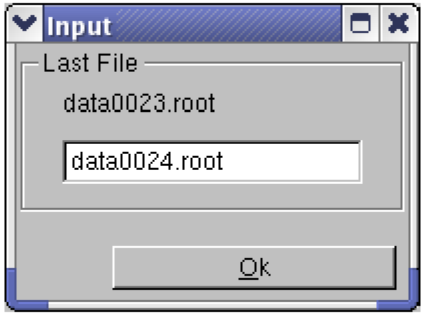
data0030.root

Last File

data0023.root

```
root [0] .x myDialog.C
root [1] .x myDialog.C
```

```
//   fText = new TGTextEntry(fMain, new TGTextBuffer(100));
//   fText->SetToolTipText("Enter the label and hit Enter key");
//   fText->Connect("ReturnPressed()", "MyDialog", this, "DoSetlabel()");
//   fMain->AddFrame(fText, new TGLayoutHints(kLHintsTop | kLHintsLeft, 5, 5, 5, 5));
     fGframe = new TGGroupFrame(fMain, "Last File");
     fLabel = new TGLabel(fGframe, "No Intut ");
     fGframe->AddFrame(fLabel, new TGLayoutHints(kLHintsTop | kLHintsLeft, 5, 5, 5, 5));
     fText = new TGTextEntry(fGframe, new TGTextBuffer(100));
     fText->SetToolTipText("Enter the label and hit Enter key");
     fText->Connect("ReturnPressed()", "MyDialog", this, "DoSetlabel()");
     fText->Resize(150, fText->GetDefaultHeight());
     fGframe->AddFrame(fText, new TGLayoutHints(kLHintsTop | kLHintsLeft, 5, 5, 5, 5));
     fMain->AddFrame(fGframe, new TGLayoutHints(kLHintsExpandX, 2, 2, 1, 1));
```



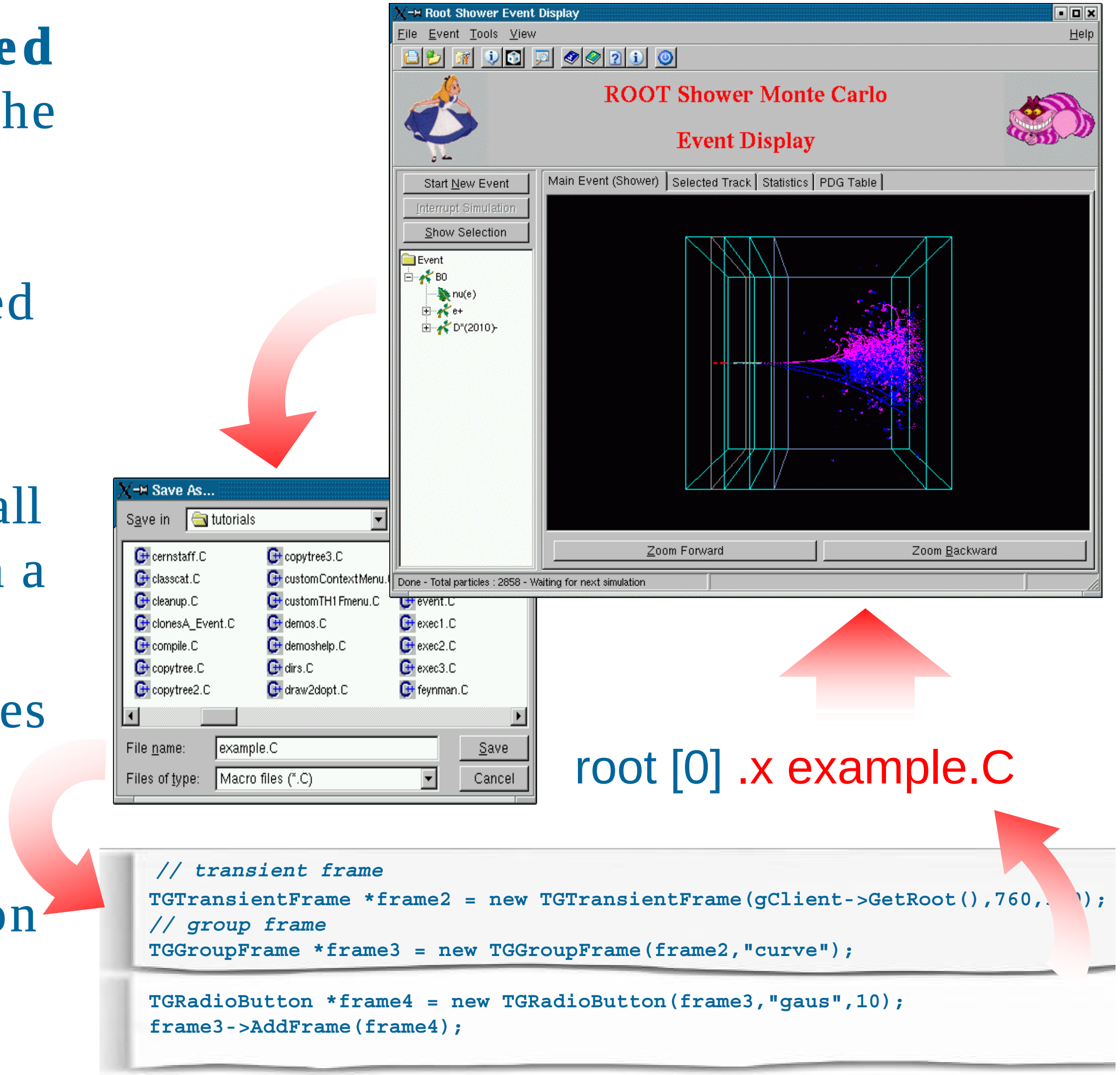
Last File

data0023.root

data0024.root

Status ❸

- Using *ctrl+S* any GUI can be **saved as a C++ macro file** thanks to the *SavePrimitive* methods implemented in all GUI classes. The generated macro can be edited and then executed via the CINT
- Executing the macro restores the complete original GUI as well as all created signal/slot connections in a global way
- Macros can be stored in ROOT files with the data.
- Running extracted macros from ROOT files restores the application to perform data analysis with the stored data.



Done - Total particles : 2858 - Waiting for next simulation

File name: example.C

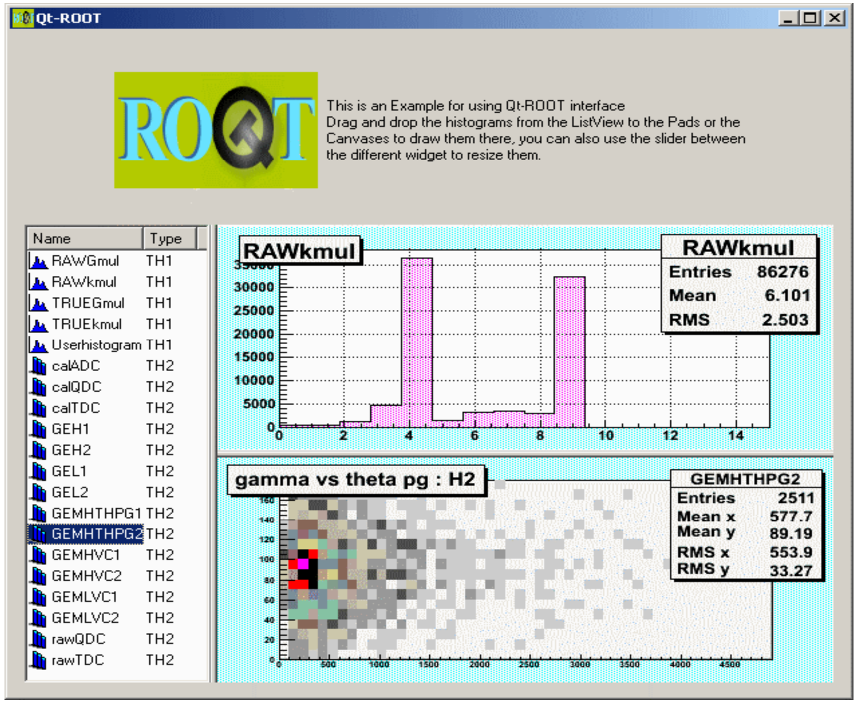
Files of type: Macro files (*.C)

root [0] .x example.C

```
// transient frame
TGTransientFrame *frame2 = new TGTransientFrame(gClient->GetRoot(),760,.  ));
// group frame
TGGroupFrame *frame3 = new TGGroupFrame(frame2,"curve");

TGRadioButton *frame4 = new TGRadioButton(frame3,"gaus",10);
frame3->AddFrame(frame4);
```

Status ❹

- Qt BNL (in ROOT CVS since 2004)
  - Uses Qt as a render engine for all ROOT graphics (GUI and canvas) via TGQt
  - ROOT Canvases can be embedded in Qt widgets (*talk by Valeri Fine)*
- Qt GSI (works since many years on Linux, Windows port made in 2006)
  - Lightweight interface that uses the Qt event loop to drive Qt widgets and the ROOT event loop to handle all ROOT events: GUI, timers, signals, etc.
  - Qt widgets are rendered via Qt, ROOT widgets are rendered either via TGX11 or TGWin32GDK
  - ROOT canvases can be embedded in Qt widgets
- Another way… (*talk by Bertrand Bellenot)*



This is an Example for using Qt-ROOT interface
Drag and drop the histograms from the ListView to the Pads or the Canvases to draw them there, you can also use the slider between the different widget to resize them.

Name	Type
RAWGmul	TH1
RAWkmul	TH1
TRUEGmul	TH1
TRUEkmul	TH1
Userhistogram	TH1
calADC	TH2
calQDC	TH2
calTDC	TH2
GEH1	TH2
GEH2	TH2
GEL1	TH2
GEL2	TH2
GEMHTHPG1	TH2
GEMHTHPG2	TH2
GEMHVC1	TH2
GEMHVC2	TH2
GEMLVC1	TH2
GEMLVC2	TH2
rawQDC	TH2
rawTDC	TH2

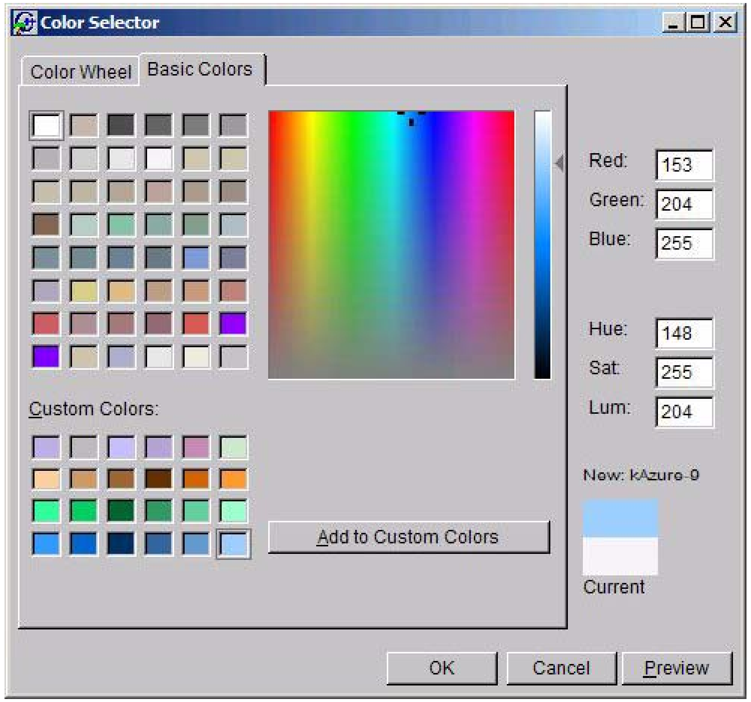
RAWkmul	
Entries	86276
Mean	6.101
RMS	2.503

GEMHTHPG2	
Entries	2511
Mean x	577.7
Mean y	89.19
RMS x	553.9
RMS y	33.27

GUI Classes ❶

- Triple slider widget allows an easy selection of a sub-range and a pointer value in a defined range of values.

- Color selection dialog

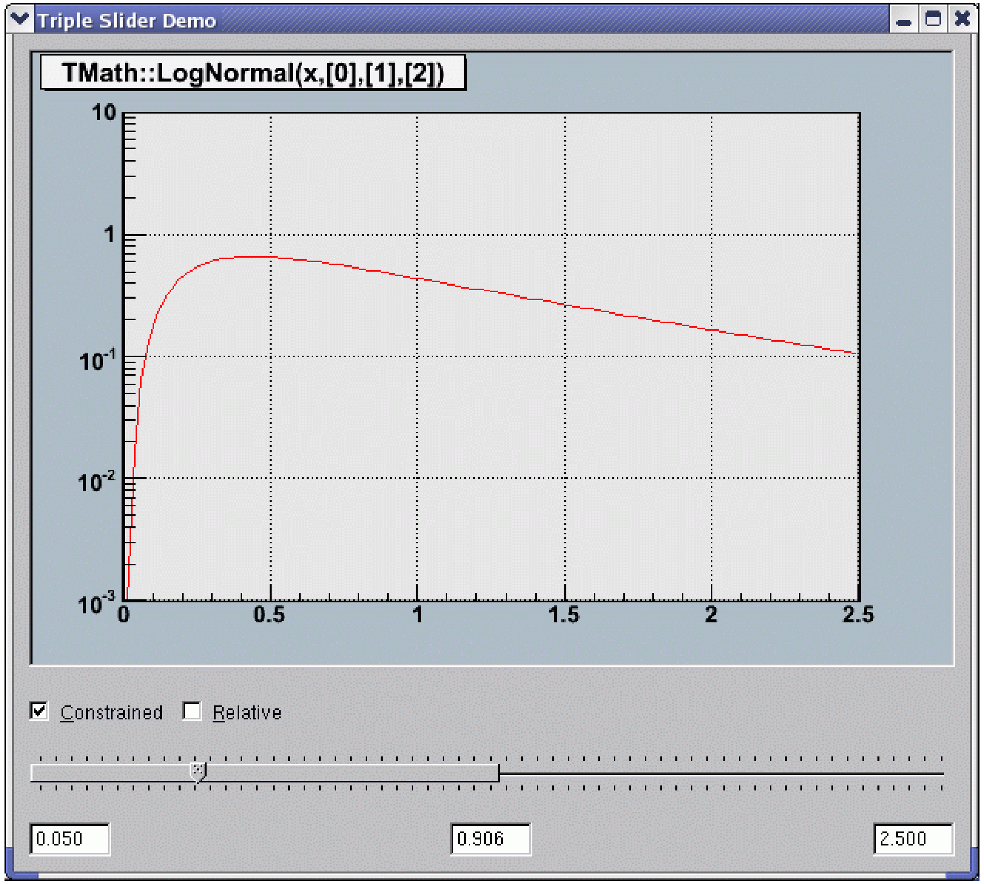


Color Selector

Red: 153
Green: 204
Blue: 255

Hue: 148
Sat: 255
Lum: 204

New: kAzure-9



Triple Slider Demo

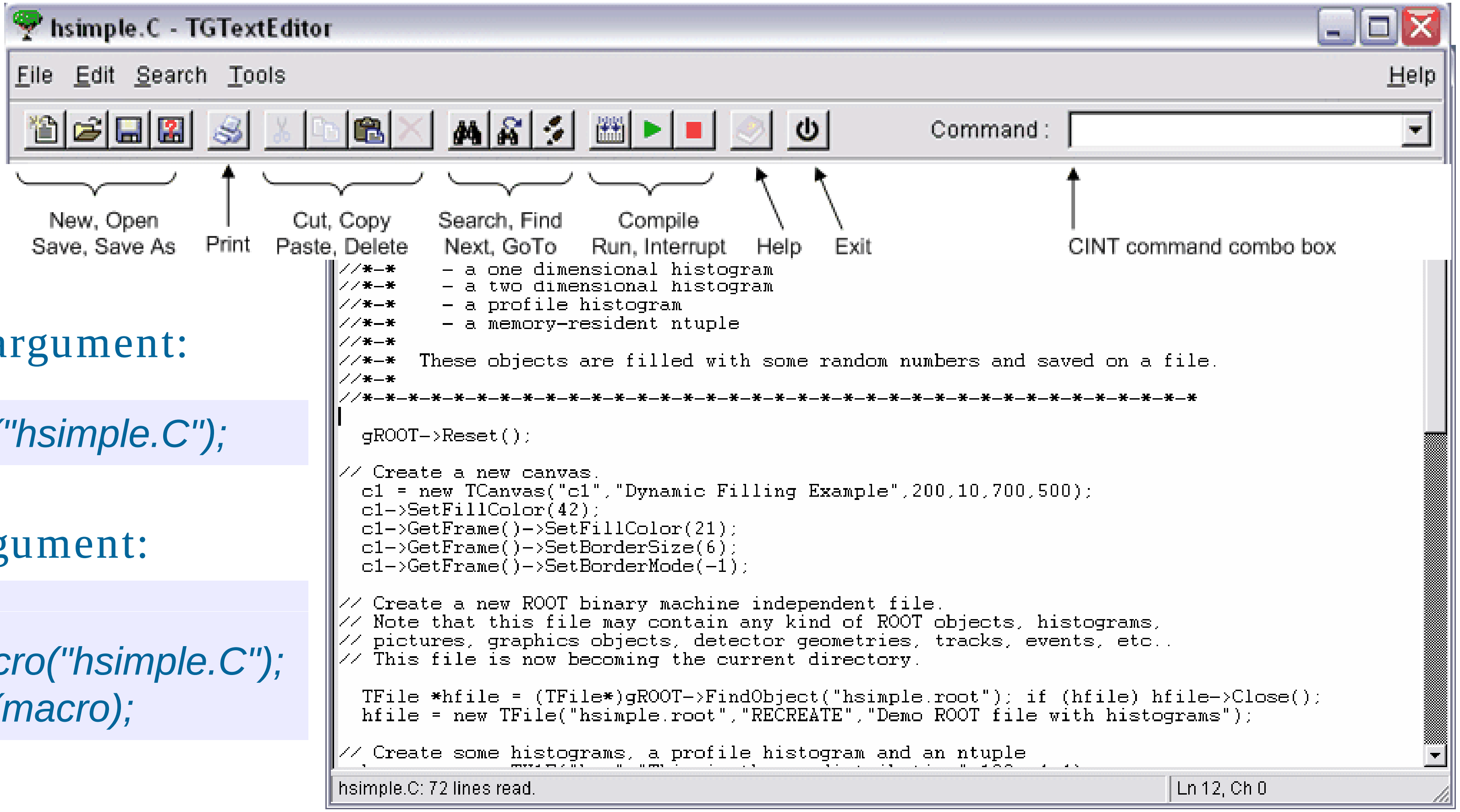
TMath::LogNormal(x,[0],[1],[2])

☑ Constrained ☐ Relative

0.050 0.906 2.500

GUI Classes ❷

- TGTextEditor provides all basic editor functionalities and most important is that it allows to compile and execute macros



```
//*-*    - a one dimensional histogram
//*-*    - a two dimensional histogram
//*-*    - a profile histogram
//*-*    - a memory-resident ntuple
//*-*
//*-*  These objects are filled with some random numbers and saved on a file.
//*-*
//*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*

  gROOT->Reset();

// Create a new canvas.
  c1 = new TCanvas("c1","Dynamic Filling Example",200,10,700,500);
  c1->SetFillColor(42);
  c1->GetFrame()->SetFillColor(21);
  c1->GetFrame()->SetBorderSize(6);
  c1->GetFrame()->SetBorderMode(-1);

// Create a new ROOT binary machine independent file.
// Note that this file may contain any kind of ROOT objects, histograms,
// pictures, graphics objects, detector geometries, tracks, events, etc..
// This file is now becoming the current directory.

  TFile *hfile = (TFile*)gROOT->FindObject("hsimple.root"); if (hfile) hfile->Close();
  hfile = new TFile("hsimple.root","RECREATE","Demo ROOT file with histograms");

// Create some histograms, a profile histogram and an ntuple
```

hsimple.C: 72 lines read. Ln 12, Ch 0

File name as the argument:

```
new TGTextEditor("hsimple.C");
```

TMacro as the argument:

```
TMacro *macro;
macro = new TMacro("hsimple.C");
new TGTextEditor(macro);
```

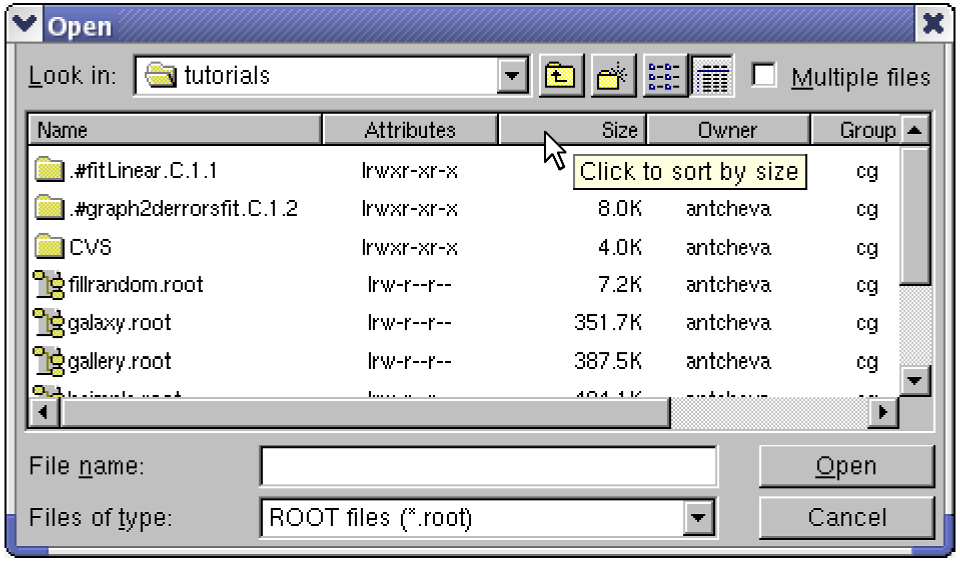
GUI Classes ❸

TGListView

- Space taken by each column can be resized
- Sorting columns by different criteria

TGMenuBar

- Chevron button – handles all menu titles when they cannot fit the menu bar area



Open

Look in: tutorials

□ Multiple files

Name	Attributes	Size	Owner	Group
.#fitLinear.C.1.1	lrwxr-xr-x			cg
.#graph2derrorsfit.C.1.2	lrwxr-xr-x	8.0K	antcheva	cg
CVS	lrwxr-xr-x	4.0K	antcheva	cg
fillrandom.root	lrw-r--r--	7.2K	antcheva	cg
galaxy.root	lrw-r--r--	351.7K	antcheva	cg
gallery.root	lrw-r--r--	387.5K	antcheva	cg

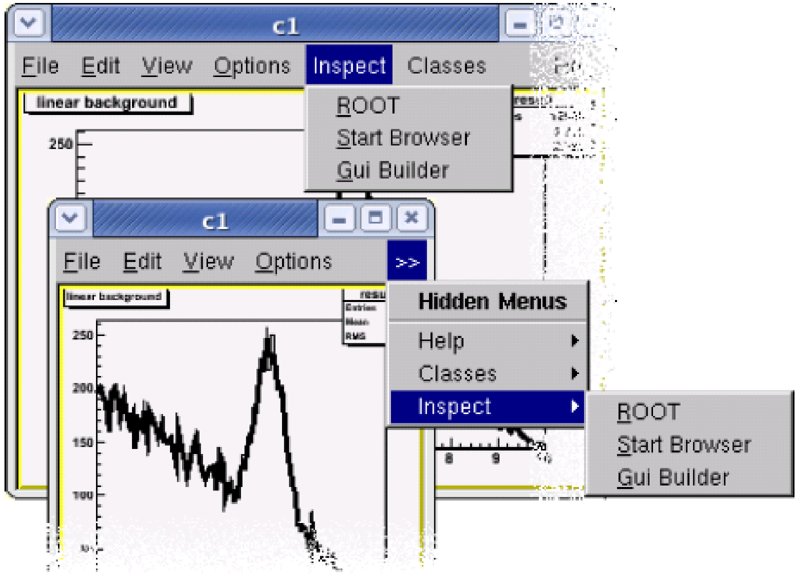
Click to sort by size

File name:

Files of type: ROOT files (*.root)

Open

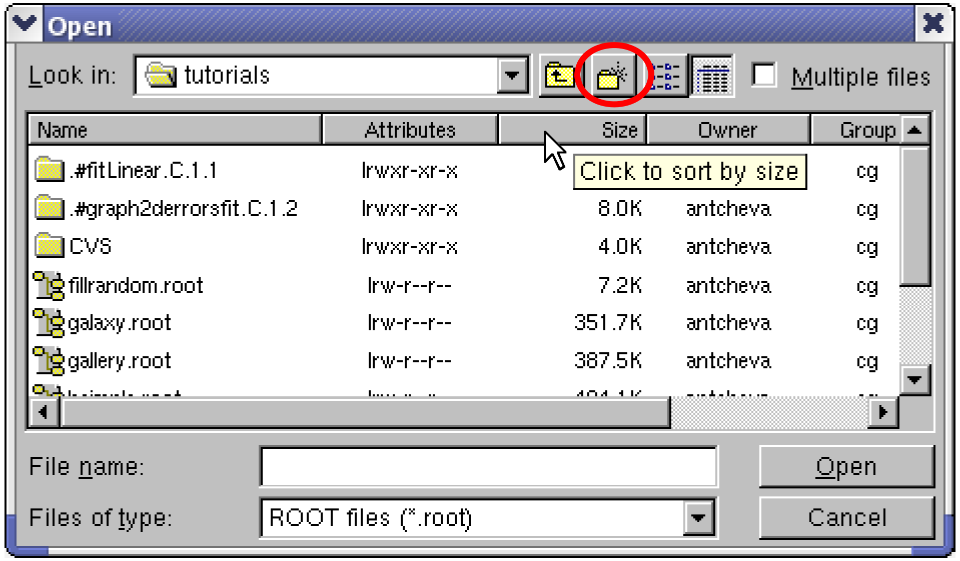
Cancel



GUI Classes ❹

TGFileDialog

- Creating new directory
- Sorting files by clicking on column header



Look in: tutorials

□ Multiple files

Name	Attributes	Size	Owner	Group
.#fitLinear.C.1.1	lrwxr-xr-x			cg
.#graph2derrorsfit.C.1.2	lrwxr-xr-x	8.0K	antcheva	cg
CVS	lrwxr-xr-x	4.0K	antcheva	cg
fillrandom.root	lrw-r--r--	7.2K	antcheva	cg
galaxy.root	lrw-r--r--	351.7K	antcheva	cg
gallery.root	lrw-r--r--	387.5K	antcheva	cg

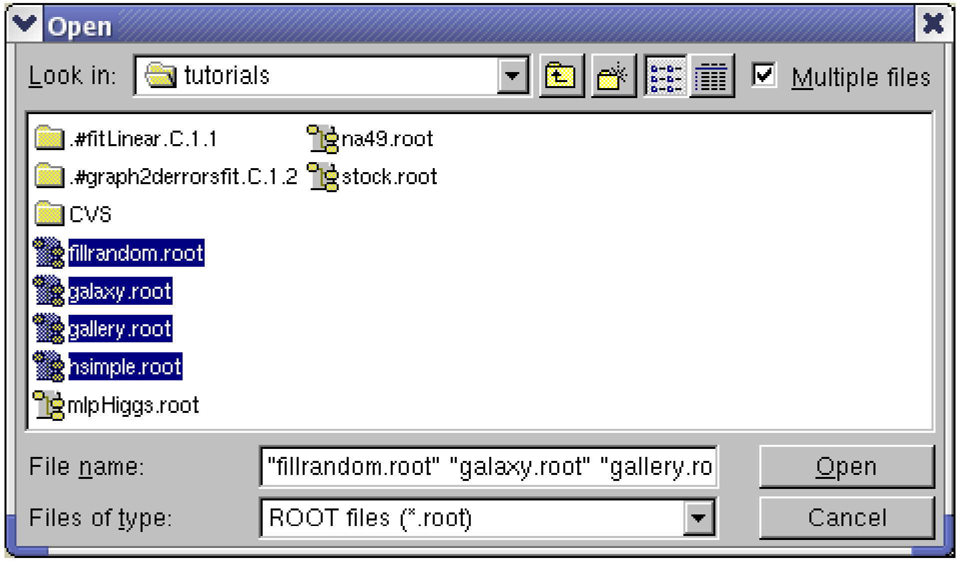
Click to sort by size

File name:

Files of type: ROOT files (*.root)

- Multiple ROOT files selection

```
TGFileInfo fi;
new TGFileDialog(fClient->GetDefaultRoot(), this, kFDOpen,&fi);
if (fi.fMultipleSelection && fi.fFileNamesList) {
   TObjString *el;
   TIter next(fi.fFileNamesList);
   while ((el = (TObjString *) next())) {
      new TFile(el->GetString(), "update");
   }
} else if (fi.fFilename) {
   new TFile(fi.fFilename, "update");
}
```



Look in: tutorials

☑ Multiple files

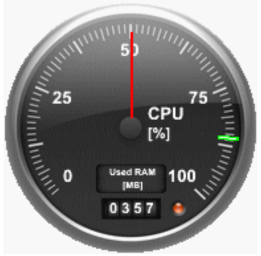
.#fitLinear.C.1.1
.#graph2derrorsfit.C.1.2
CVS
fillrandom.root
galaxy.root
gallery.root
hsimple.root
mlpHiggs.root
na49.root
stock.root

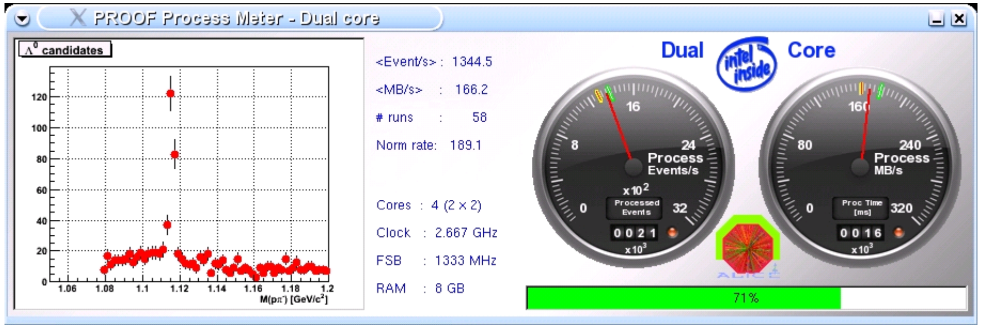
File name: "fillrandom.root" "galaxy.root" "gallery.ro

Files of type: ROOT files (*.root)

GUI Classes ❺

- TGSpeedo - has a shape of speedometer; can keep track of the highest displayed value

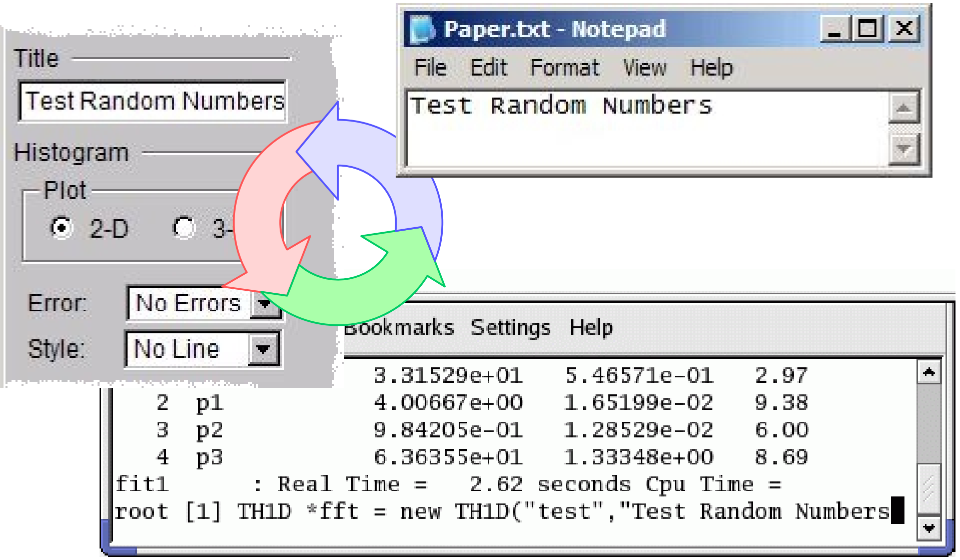




<Event/s> : 1344.5
<MB/s> : 166.2
# runs : 58
Norm rate: 189.1

Cores : 4 (2 x 2)
Clock : 2.667 GHz
FSB : 1333 MHz
RAM : 8 GB

- Many improvements in keyboard navigation (menu, buttons, ROOT dialogs)
- Copy/Paste text between ROOT GUI widgets and other application windows



Title

Test Random Numbers

Histogram

Plot

● 2-D ○ 3-

Error: No Errors

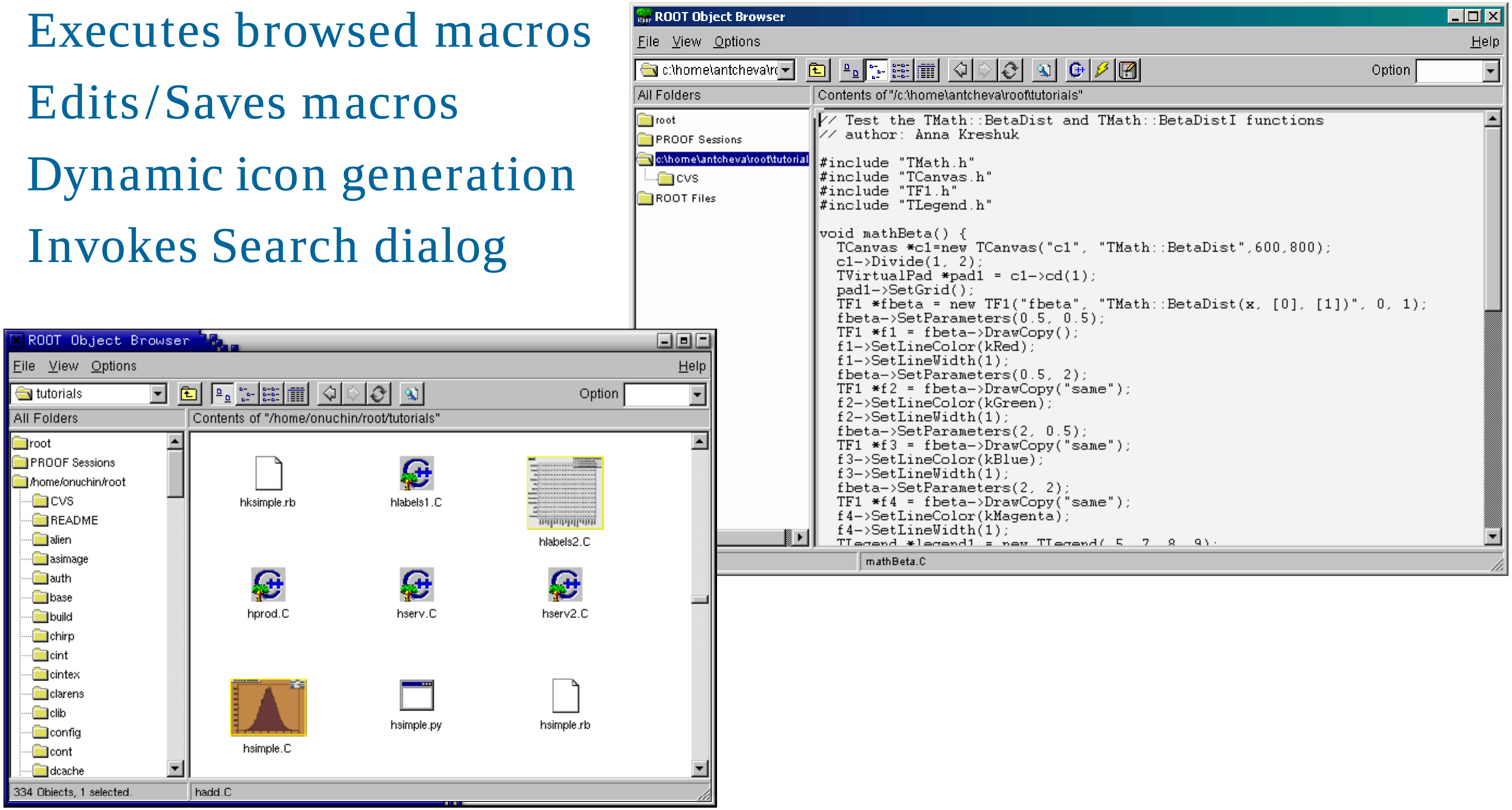
Style: No Line

```
Test Random Numbers
```

```
                    3.31529e+01    5.46571e-01    2.97
   2  p1            4.00667e+00    1.65199e-02    9.38
   3  p2            9.84205e-01    1.28529e-02    6.00
   4  p3            6.36355e+01    1.33348e+00    8.69
fit1       : Real Time =    2.62 seconds Cpu Time =
root [1] TH1D *fft = new TH1D("test","Test Random Numbers
```

Object Browser

- Executes browsed macros
- Edits/Saves macros
- Dynamic icon generation
- Invokes Search dialog



```
// Test the TMath::BetaDist and TMath::BetaDistI functions
// author: Anna Kreshuk

#include "TMath.h"
#include "TCanvas.h"
#include "TF1.h"
#include "TLegend.h"

void mathBeta() {
  TCanvas *c1=new TCanvas("c1", "TMath::BetaDist",600,800);
  c1->Divide(1, 2);
  TVirtualPad *pad1 = c1->cd(1);
  pad1->SetGrid();
  TF1 *fbeta = new TF1("fbeta", "TMath::BetaDist(x, [0], [1])", 0, 1);
  fbeta->SetParameters(0.5, 0.5);
  TF1 *f1 = fbeta->DrawCopy();
  f1->SetLineColor(kRed);
  f1->SetLineWidth(1);
  fbeta->SetParameters(0.5, 2);
  TF1 *f2 = fbeta->DrawCopy("same");
  f2->SetLineColor(kGreen);
  f2->SetLineWidth(1);
  fbeta->SetParameters(2, 0.5);
  TF1 *f3 = fbeta->DrawCopy("same");
  f3->SetLineColor(kBlue);
  f3->SetLineWidth(1);
  fbeta->SetParameters(2, 2);
  TF1 *f4 = fbeta->DrawCopy("same");
  f4->SetLineColor(kMagenta);
  f4->SetLineWidth(1);
  TLegend *legend1 = new TLegend(.5, .7, .8, .9);
```

Graphics Editor ❶

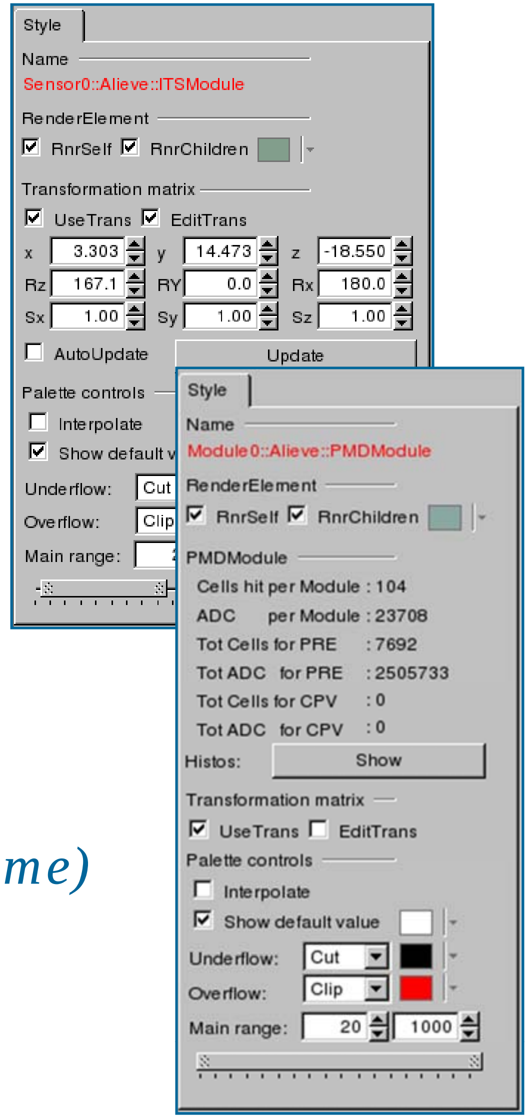
- Changed creation of object editors
  - TClass::New() for instantiation
  - Store it in a local TMap; inactive object editors are cached in memory for later reuse
- Handle visibility/order of class-editors by priority
- Full control over base-class editors' appearance by the virtual method:

*TGedFrame::ActivateBaseClassEditors(TClass *cl)*

- Handle the use of several tabs when needed by

*TGedFrame:: CreateEditorTabSubFrame(const Text_t *name)*

Needed by ALICE experiment



Style

Name
Sensor0::Alieve::ITSModule

RenderElement
☑ RnrSelf ☑ RnrChildren

Transformation matrix
☑ UseTrans ☑ EditTrans
x 3.303 y 14.473 z -18.550
Rz 167.1 RY 0.0 Rx 180.0
Sx 1.00 Sy 1.00 Sz 1.00
□ AutoUpdate Update

Palette controls
□ Interpolate
☑ Show default v
Underflow: Cut
Overflow: Clip
Main range:

Style

Name
Module0::Alieve::PMDModule

RenderElement
☑ RnrSelf ☑ RnrChildren

PMDModule
Cells hit per Module : 104
ADC per Module : 23708
Tot Cells for PRE : 7692
Tot ADC for PRE : 2505733
Tot Cells for CPV : 0
Tot ADC for CPV : 0
Histos: Show

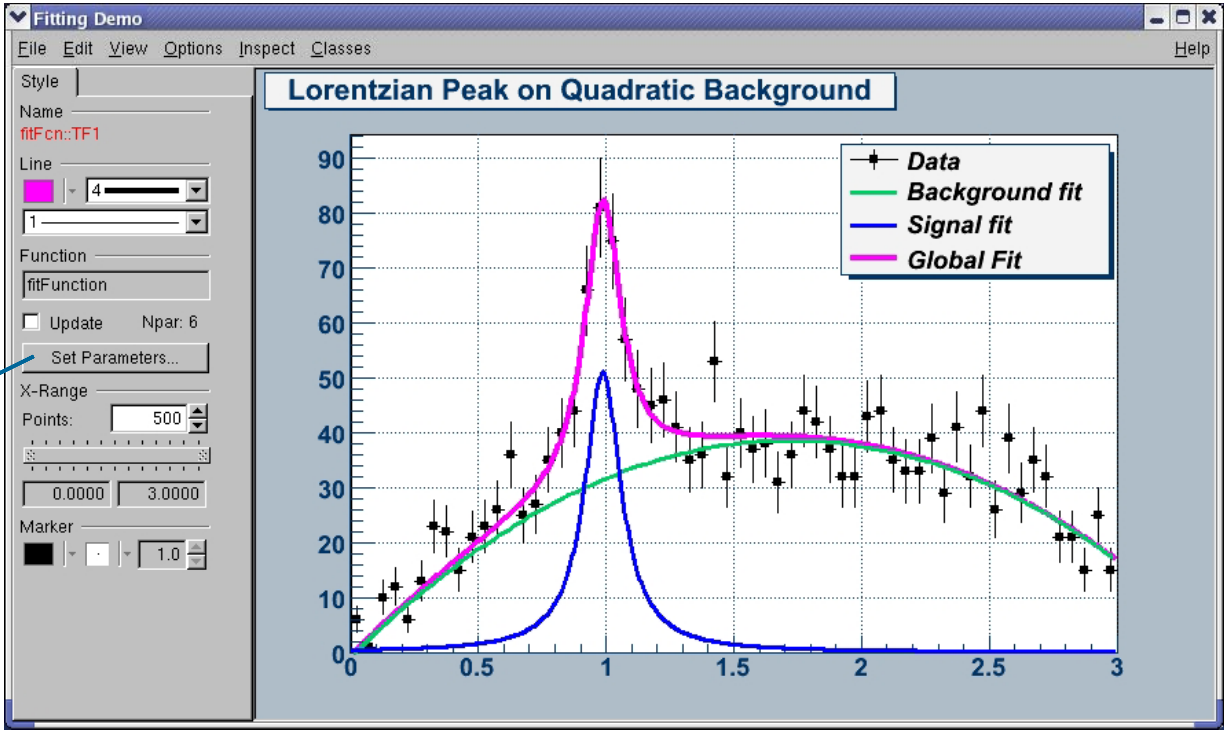
Transformation matrix
☑ UseTrans □ EditTrans

Palette controls
□ Interpolate
☑ Show default value
Underflow: Cut
Overflow: Clip
Main range: 20 1000

Graphics Editor ❷

New Editors:

- TF1Editor and its Set Parameters dialog
- TLineEditor



Name: fitFcn::TF1

Line: 4, 1

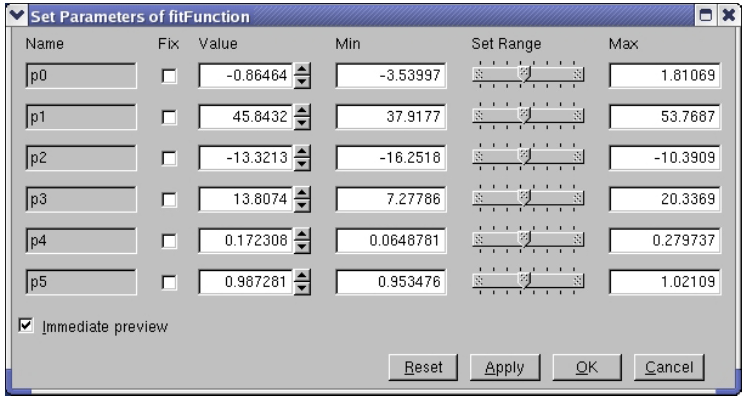
Function: fitFunction

☐ Update Npar: 6

X-Range: Points: 500

0.0000 3.0000

Marker: · 1.0



Name	Fix	Value	Min	Set Range	Max
p0	☐	-0.86464	-3.53997		1.81069
p1	☐	45.8432	37.9177		53.7687
p2	☐	-13.3213	-16.2518		-10.3909
p3	☐	13.8074	7.27786		20.3369
p4	☐	0.172308	0.0648781		0.279737
p5	☐	0.987281	0.953476		1.02109

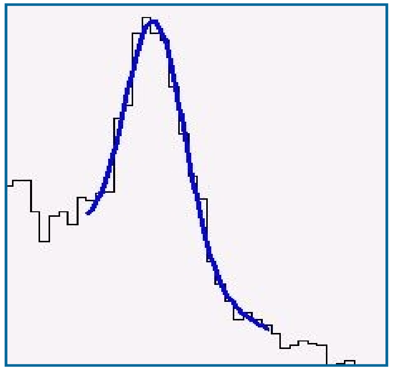
☑ Immediate preview

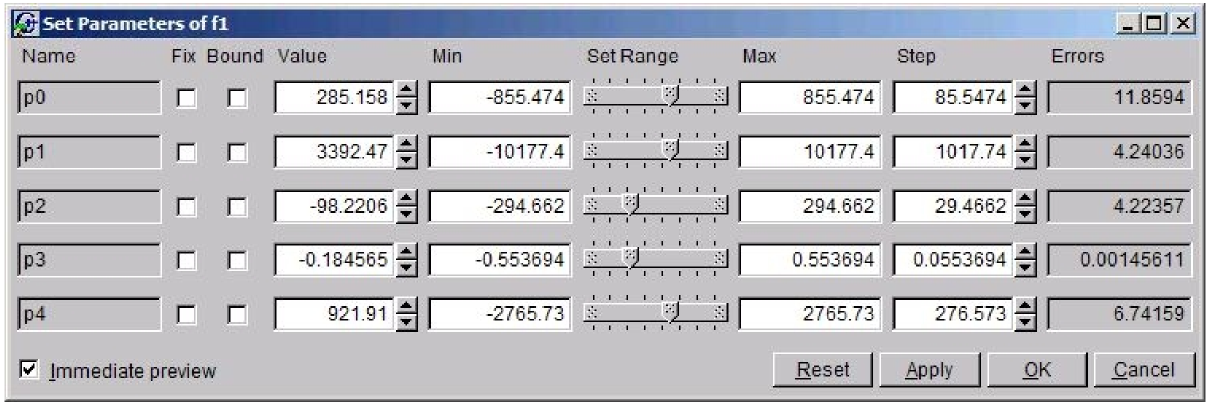
- TGeo editors use the same mechanism *(poster by Mihaela Gheata)*

New Fit Panel ❶

General tab

- Replaces the old Fit Panel interface
- When activated, users can select objects drawn in ROOT canvas for fitting in the usual way (left mouse click)

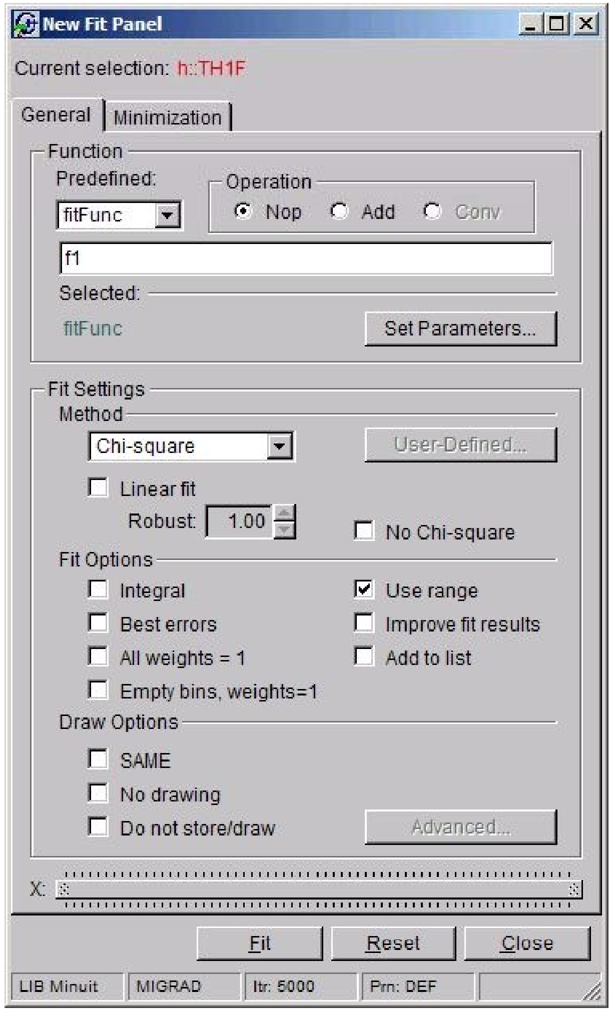




Name	Fix	Bound	Value	Min	Set Range	Max	Step	Errors
p0	□	□	285.158	-855.474		855.474	85.5474	11.8594
p1	□	□	3392.47	-10177.4		10177.4	1017.74	4.24036
p2	□	□	-98.2206	-294.662		294.662	29.4662	4.22357
p3	□	□	-0.184565	-0.553694		0.553694	0.0553694	0.00145611
p4	□	□	921.91	-2765.73		2765.73	276.573	6.74159

☑ Immediate preview

- Status bar displays information about the current minimization settings



Current selection: h::TH1F

Function

Predefined: fitFunc

Operation: ● Nop ○ Add ○ Conv

f1

Selected: fitFunc

Fit Settings

Method: Chi-square

□ Linear fit

Robust: 1.00

□ No Chi-square

Fit Options

□ Integral

☑ Use range

□ Best errors

□ Improve fit results

□ All weights = 1

□ Add to list

□ Empty bins, weights=1

Draw Options

□ SAME

□ No drawing

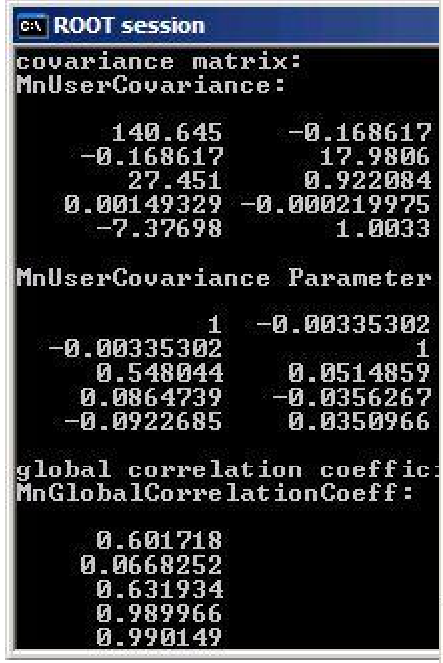
□ Do not store/draw

LIB Minuit | MIGRAD | Itr: 5000 | Prn: DEF

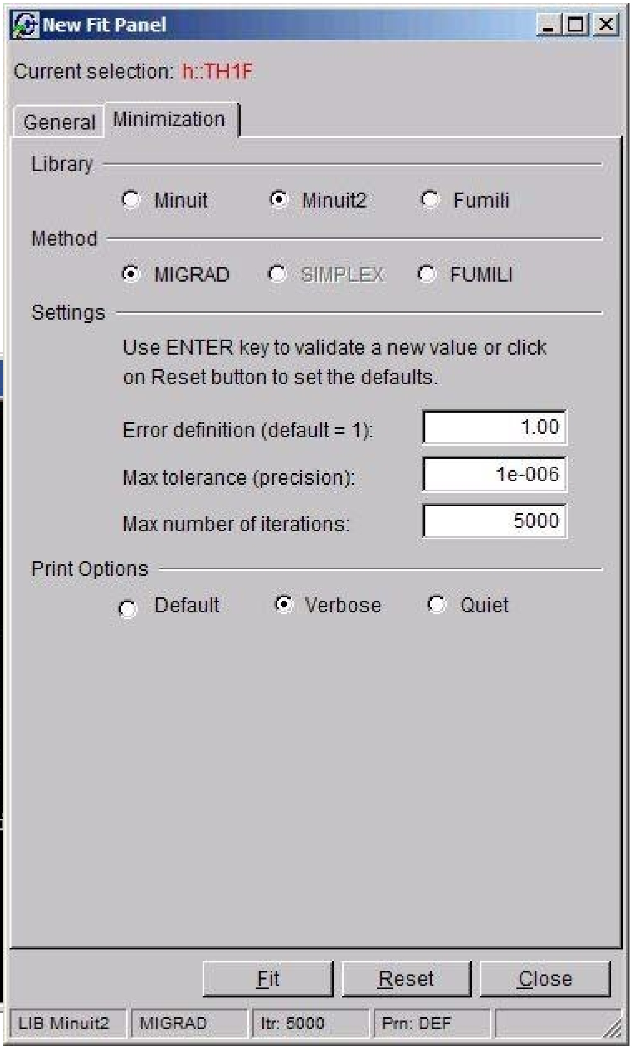
New Fit Panel ❷

Minimization tab

- Interactive library selection
- Choice of minimization method
- Users can specify values for:
  - Error definition
  - Maximum tolerance
  - Maximum number of iterations
- Print Options:
  - Default
  - Verbose
  - Quite



```
covariance matrix:
MnUserCovariance:

      140.645    -0.168617
    -0.168617      17.9806
       27.451     0.922084
   0.00149329 -0.000219975
     -7.37698       1.0033

MnUserCovariance Parameter

            1  -0.00335302
  -0.00335302            1
     0.548044    0.0514859
    0.0864739   -0.0356267
   -0.0922685    0.0350966

global correlation coeffici
MnGlobalCorrelationCoeff:

     0.601718
    0.0668252
     0.631934
     0.989966
     0.990149
```



Current selection: h::TH1F

Library: ○ Minuit ● Minuit2 ○ Fumili

Method: ● MIGRAD ○ SIMPLEX ○ FUMILI

Settings

Use ENTER key to validate a new value or click on Reset button to set the defaults.

Error definition (default = 1): 1.00

Max tolerance (precision): 1e-006

Max number of iterations: 5000

Print Options: ○ Default ● Verbose ○ Quiet

LIB Minuit2 | MIGRAD | Itr: 5000 | Prn: DEF

Next Steps

GUI widgets

- Multi-line labels
- TGHtml
- TGTable

High level GUIs

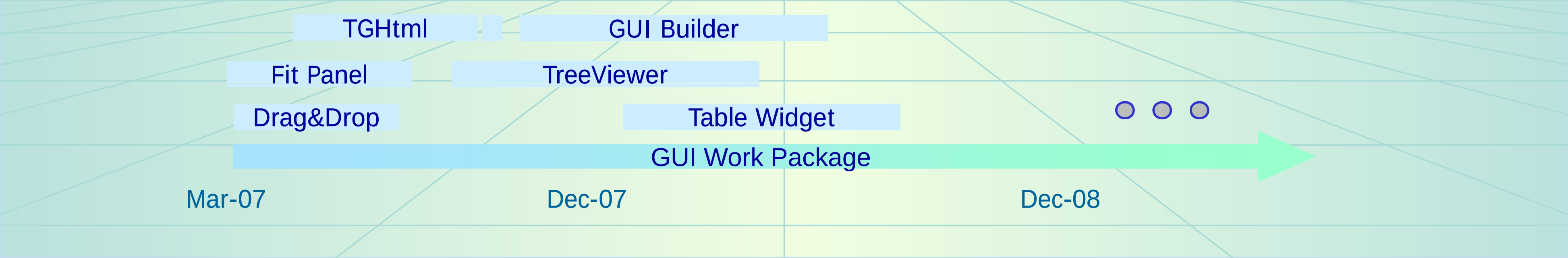
- Fit Panel
- Tree Viewer
- GUI Builder

Drag/Drop

Undo/Redo tools

Documentation

- GUI Tutorials
- On-line help



TGHtml

GUI Builder

Fit Panel

TreeViewer

Drag&Drop

Table Widget

○ ○ ○

GUI Work Package

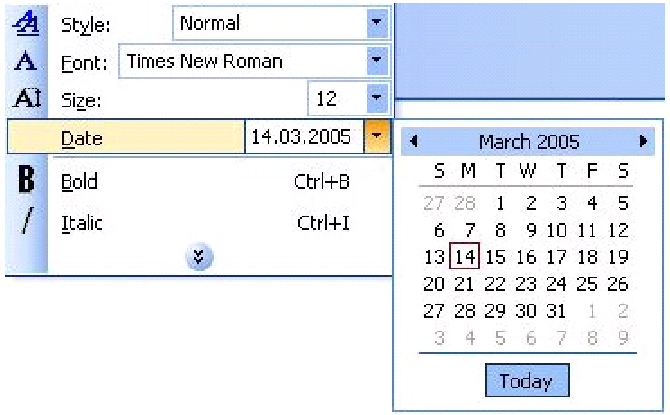
Mar-07

Dec-07

Dec-08

Future Plans ❶

Complex Menu Entries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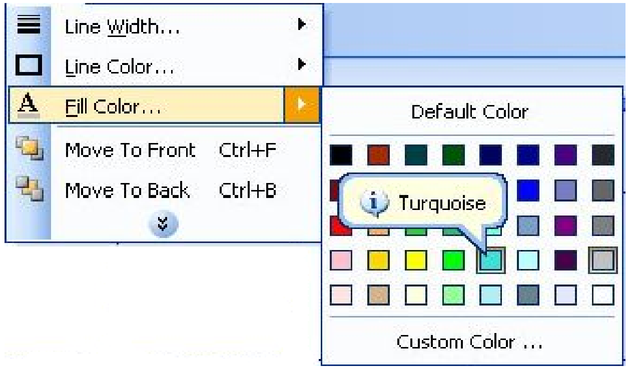
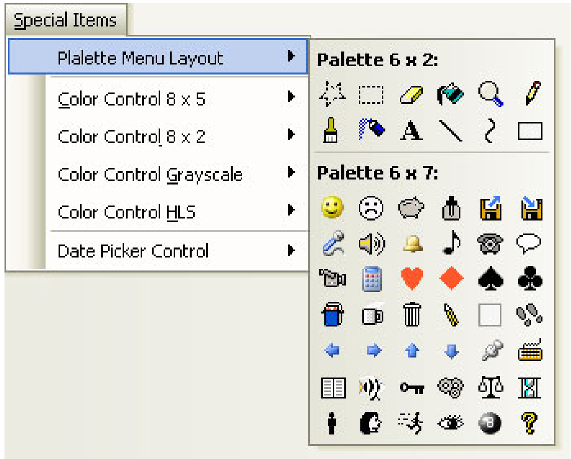
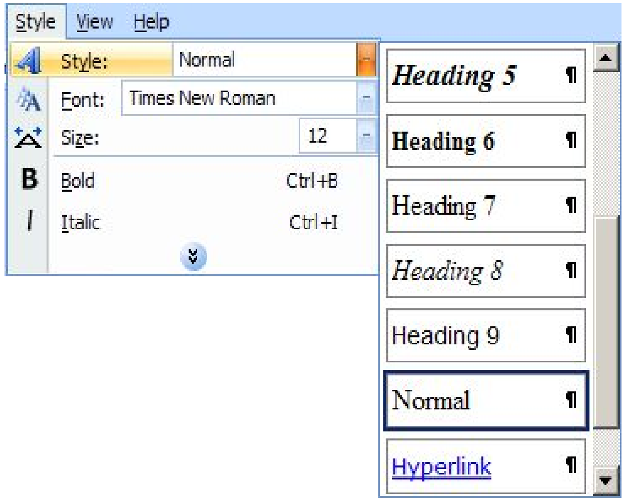
Date 14.03.2005



Palette Menu

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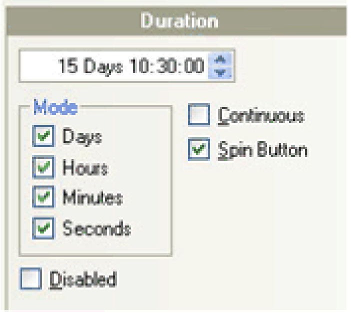
Future Plans ❷

Date/Time Widgets



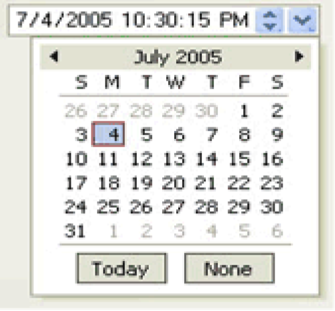
Duration

15 Days 10:30:00

Mode
☑ Days
☑ Hours
☑ Minutes
☑ Seconds

□ Continuous
☑ Spin Button

□ Disabled

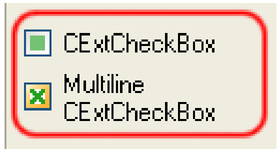


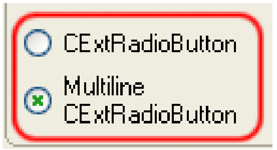
7/4/2005 10:30:15 PM

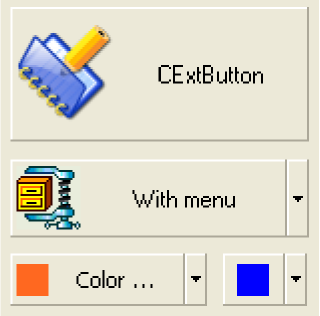
July 2005

S	M	T	W	T	F	S
26	27	28	29	30	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31	1	2	3	4	5	6

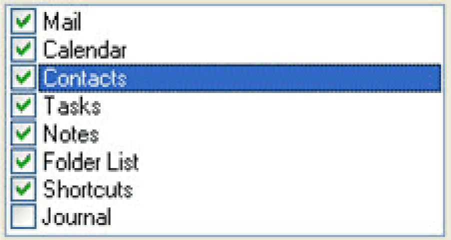
Buttons





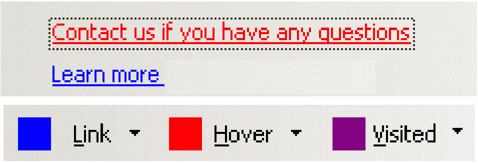


Check-List Box

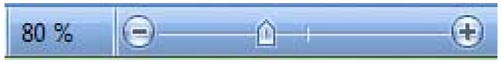


☑ Mail
☑ Calendar
☑ Contacts
☑ Tasks
☑ Notes
☑ Folder List
☑ Shortcuts
□ Journal

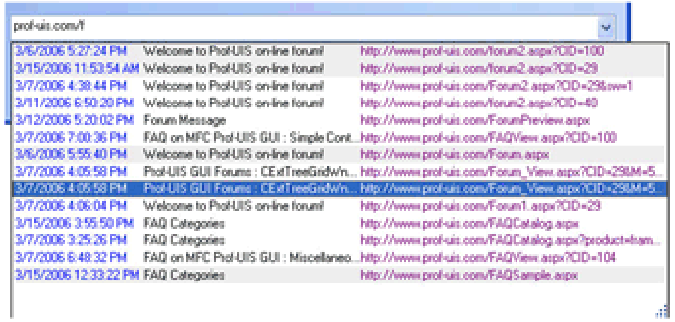
Hyperlink Label



Zoom Slider



Multi-column Combo Box



prof-uis.com/f

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3/6/2006 5:27:24 PM    Welcome to Prof-UIS on-line forum!        http://www.prof-uis.com/forum2.aspx?CID=100
3/15/2006 11:53:54 AM  Welcome to Prof-UIS on-line forum!        http://www.prof-uis.com/forum2.aspx?CID=29
3/7/2006 4:38:44 PM    Welcome to Prof-UIS on-line forum!        http://www.prof-uis.com/Forum2.aspx?CID=29&sw=1
3/11/2006 6:50:20 PM   Welcome to Prof-UIS on-line forum!        http://www.prof-uis.com/forum2.aspx?CID=40
3/12/2006 5:20:02 PM   Forum Message                             http://www.prof-uis.com/ForumPreview.aspx
3/7/2006 7:00:36 PM    FAQ on MFC Prof-UIS GUI : Simple Cont...  http://www.prof-uis.com/FAQView.aspx?CID=100
3/6/2006 5:55:40 PM    Welcome to Prof-UIS on-line forum!        http://www.prof-uis.com/Forum.aspx
3/7/2006 4:05:58 PM    Prof-UIS GUI Forums : CExtTreeGridWn...   http://www.prof-uis.com/Forum_View.aspx?CID=29&M=5...
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3/7/2006 4:06:04 PM    Welcome to Prof-UIS on-line forum!        http://www.prof-uis.com/Forum1.aspx?CID=29
3/15/2006 3:55:50 PM   FAQ Categories                            http://www.prof-uis.com/FAQCatalog.aspx
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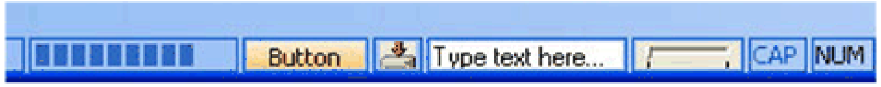
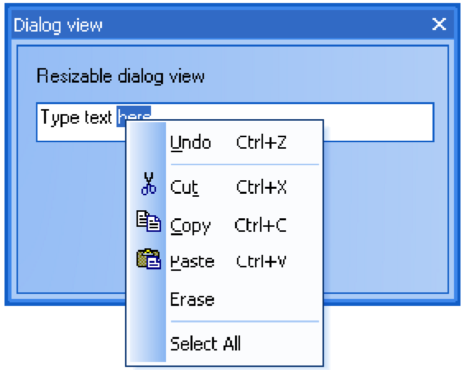
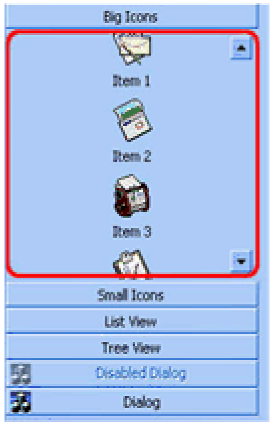
Enhanced Use of Status Bar



On-fly Edit Controls



Shutter



Thank you!