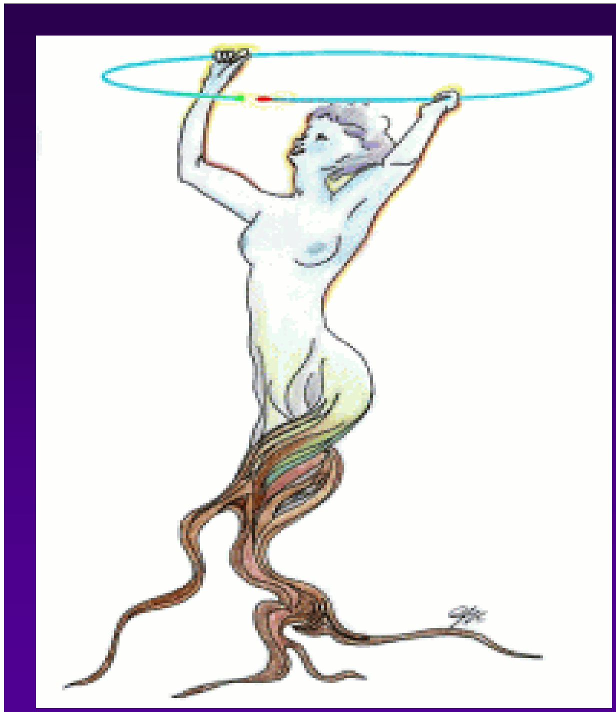


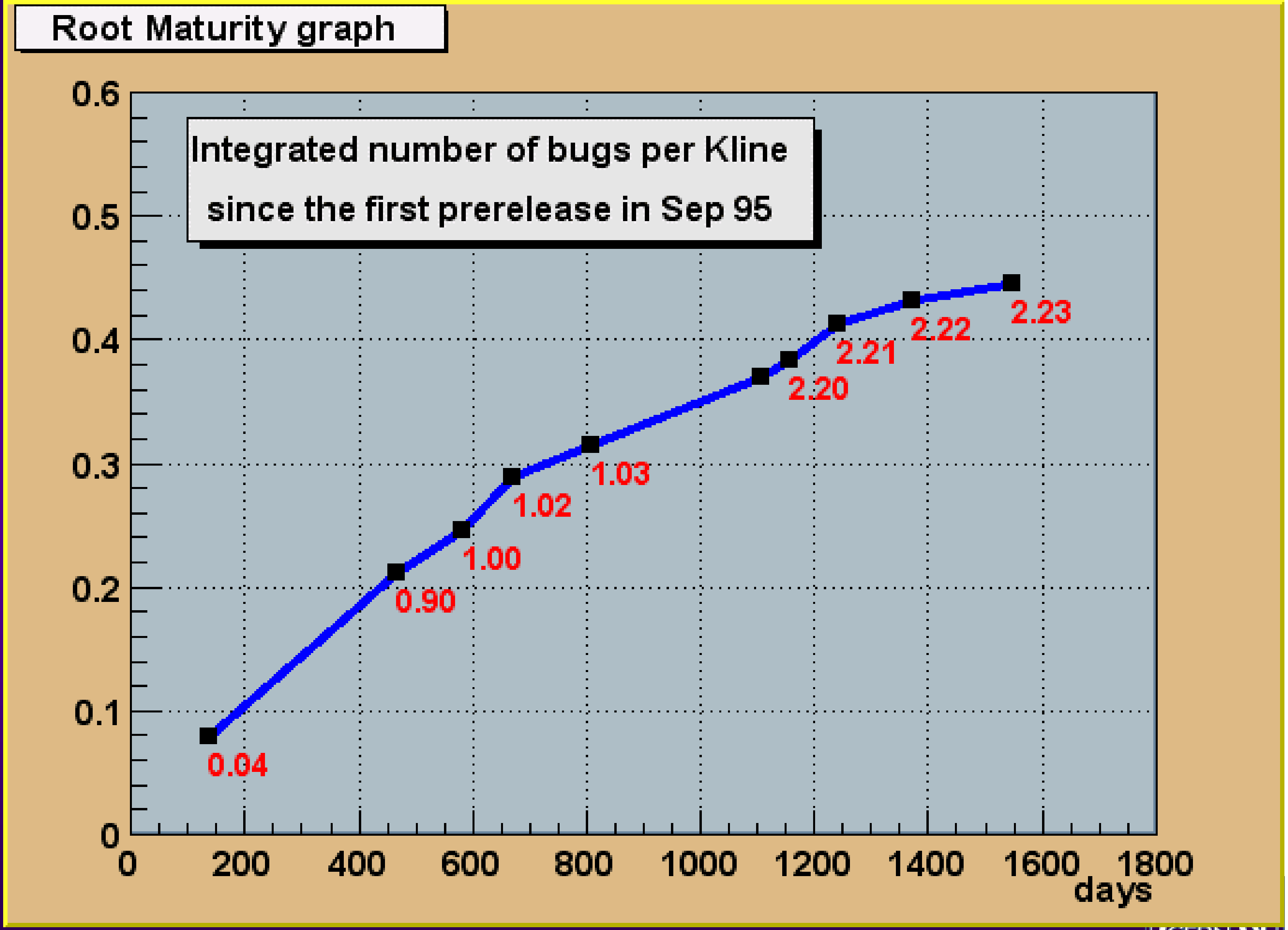
ROOT Status

BNL April 2000

René Brun/CERN

Project history

- Jan 95: Thinking/writing/rewriting/???
- April 95: proposal to NA49
- November 95: Public seminar, show Root 0.5
- Spring 96: adopt CINT
- Jan 97: Root version 1.0
- Jan 98: Root version 2.0
- Mar 99: Root version 2.21/08 (FNAL workshop)
- Feb 00: Root version 2.23/12 (CERN workshop)
- Developing version 2.24 (today 2.24/02)



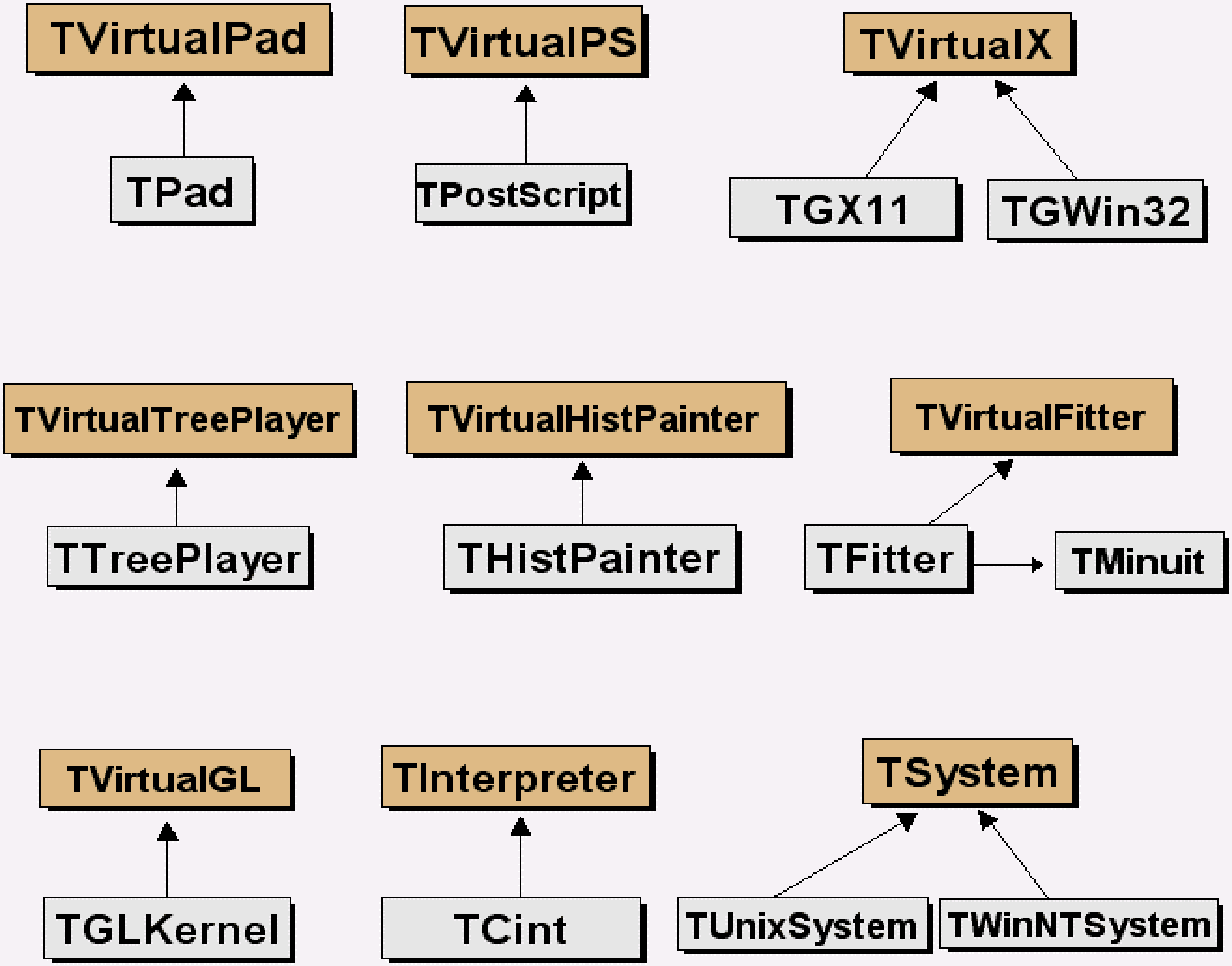
Root Maturity graph

Integrated number of bugs per Kline
since the first prerelease in Sep 95

Root abstract interfaces

- Following many comments received on modularity, Root version 2.23 includes a new set of abstract interfaces and a reorganisation of the libraries structure. This has been possible without breaking too much backward compatibility.
- The abstract interfaces have two functions:
  - Possibility for a user to redefine or extend a given implementation.
  - Minimize dependencies between classes and shared libraries.

Root Abstract Interfaces

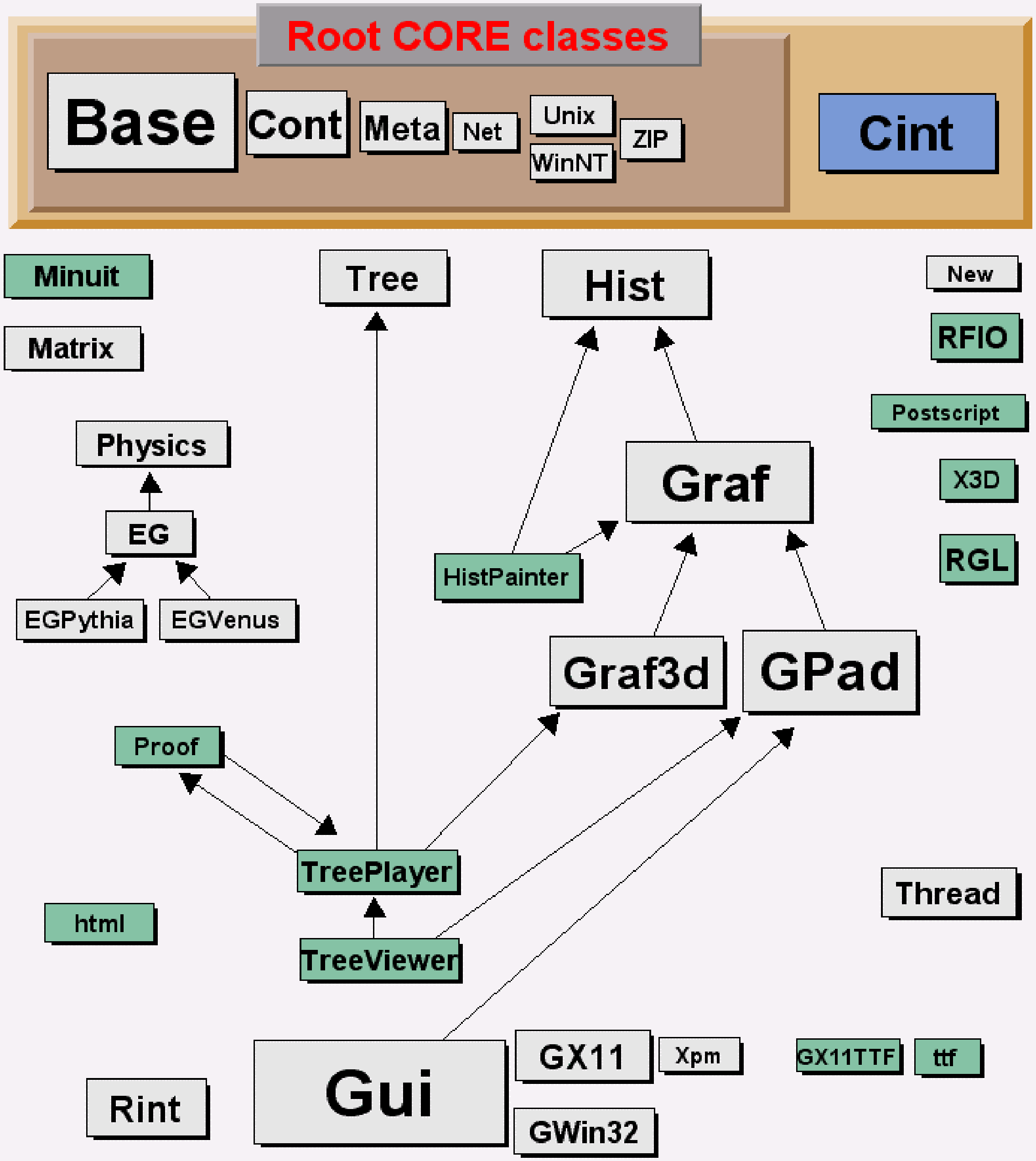


Lib reorganisation

- A major change (mainly internal) in version 2.23
- Work to minimize libraries/classes dependency
- The two are important
- A lot of coupling because of dictionaries
- Classes may be independent, but if they are in the same dictionary, you get an indirect coupling
- Importance of abstract interfaces .

Root Libs structure

- Root libs are a layered structure
- the CORE classes always required (support for RTTI, basic I/O and interpreter.
- The application libraries. You load only what you use. Separation between Data Objects and the high level classes acting on these objects. Example, a batch job uses only the Hist lib, no need to link HistPainter.



Root CORE classes

Base Cont Meta Net Unix WinNT ZIP

Cint

Minuit

Matrix

Physics

EG

EGPythia

EGVenus

Tree

Hist

HistPainter

Graf

Graf3d

GPad

Proof

TreePlayer

TreeViewer

html

Rint

Gui

GX11

Xpm

GWin32

GX11TTF

ttf

New

RFIO

Postscript

X3D

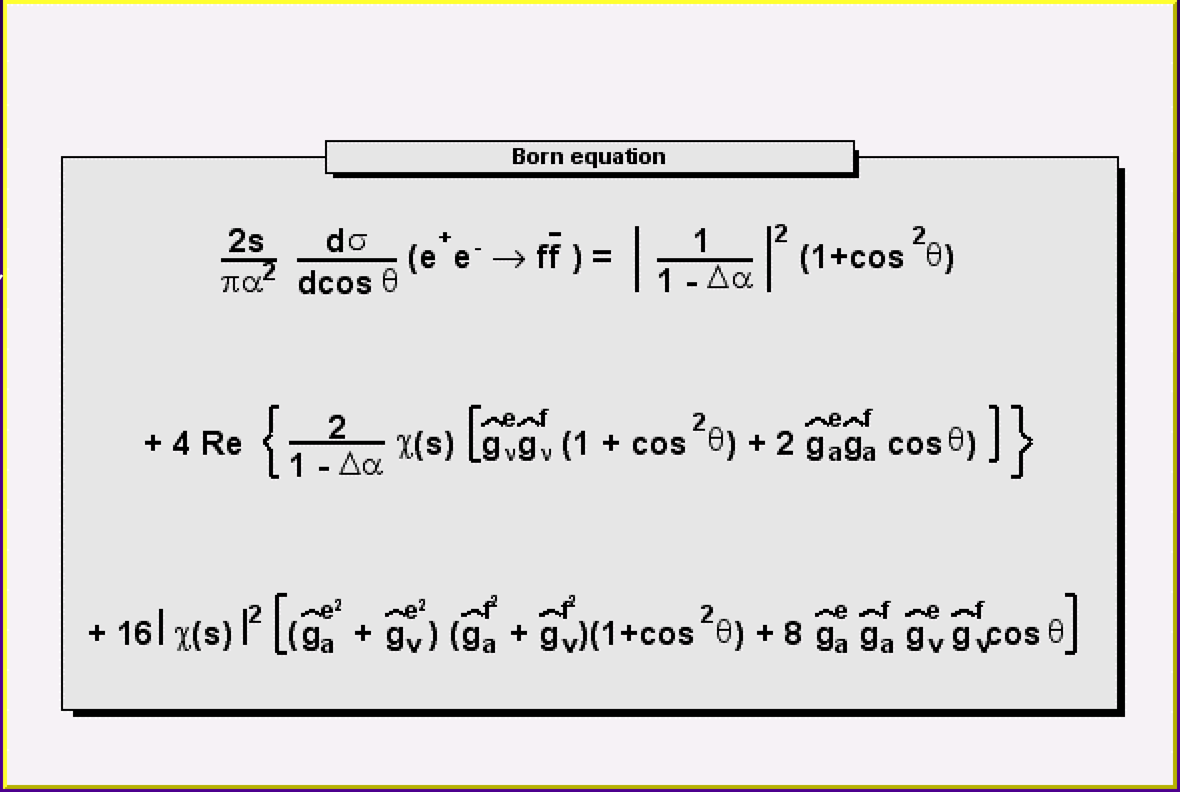
RGL

Thread

New graphics classes

- TGraphAssymErrors
- TLatex
- Axis titles, PaveLabels, PaveText use TLatex
- TLegend, TLegendEntry
- TCurlyArc, TCurlyLine (Otto Schaile)
- TAxis3D (Valery Fine)

TLate
X

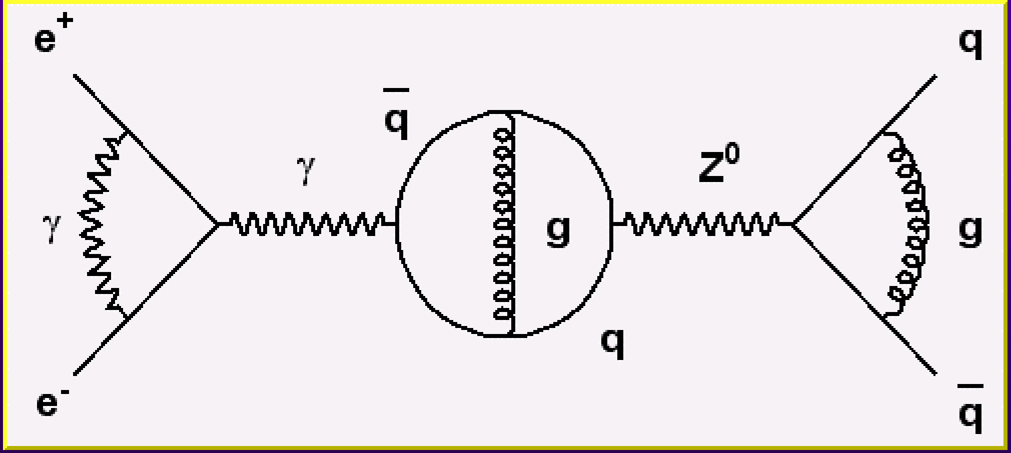


Born equation

$$\frac{2s}{\pi\alpha^2}\frac{d\sigma}{d\cos\theta}(e^+e^-\rightarrow f\bar{f}) = \left|\frac{1}{1-\Delta\alpha}\right|^2(1+\cos^2\theta)$$

$$+\,4\,\mathrm{Re}\left\{\frac{2}{1-\Delta\alpha}\chi(s)\left[\widetilde{g}_v^e\widetilde{g}_v^f(1+\cos^2\theta)+2\,\widetilde{g}_a^e\widetilde{g}_a^f\cos\theta\right]\right\}$$

$$+\,16|\chi(s)|^2\left[(\widetilde{g}_a^{e^2}+\widetilde{g}_v^{e^2})(\widetilde{g}_a^{f^2}+\widetilde{g}_v^{f^2})(1+\cos^2\theta)+8\,\widetilde{g}_a^e\widetilde{g}_a^f\widetilde{g}_v^e\widetilde{g}_v^f\cos\theta\right]$$

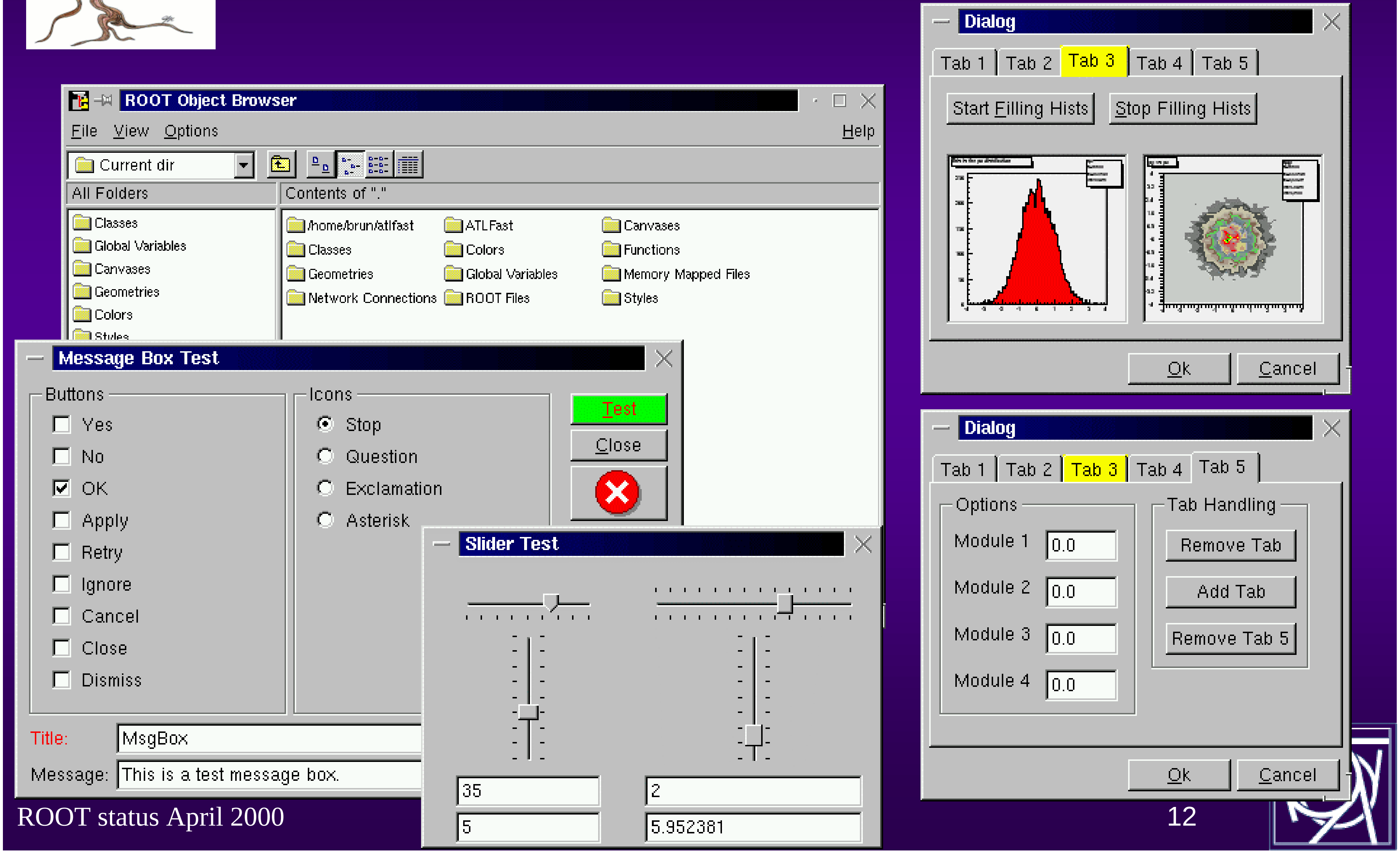


TCurlyArc
TCurlyLine
TWavyLine

TStyle

- New styles Bold and Video added to Plain & Default
- New attributes
- New color palette

Basic widgets



ROOT Object Browser

Current dir

All Folders

- Classes
- Global Variables
- Canvases
- Geometries
- Colors
- Styles

Contents of "."

/home/brun/atlfast	ATLFast	Canvases
Classes	Colors	Functions
Geometries	Global Variables	Memory Mapped Files
Network Connections	ROOT Files	Styles

Message Box Test

Buttons

- □ Yes
- □ No
- ☑ OK
- □ Apply
- □ Retry
- □ Ignore
- □ Cancel
- □ Close
- □ Dismiss

Icons

- ● Stop
- ○ Question
- ○ Exclamation
- ○ Asterisk

Title: MsgBox

Message: This is a test message box.

Slider Test

35	2
5	5.952381

Dialog

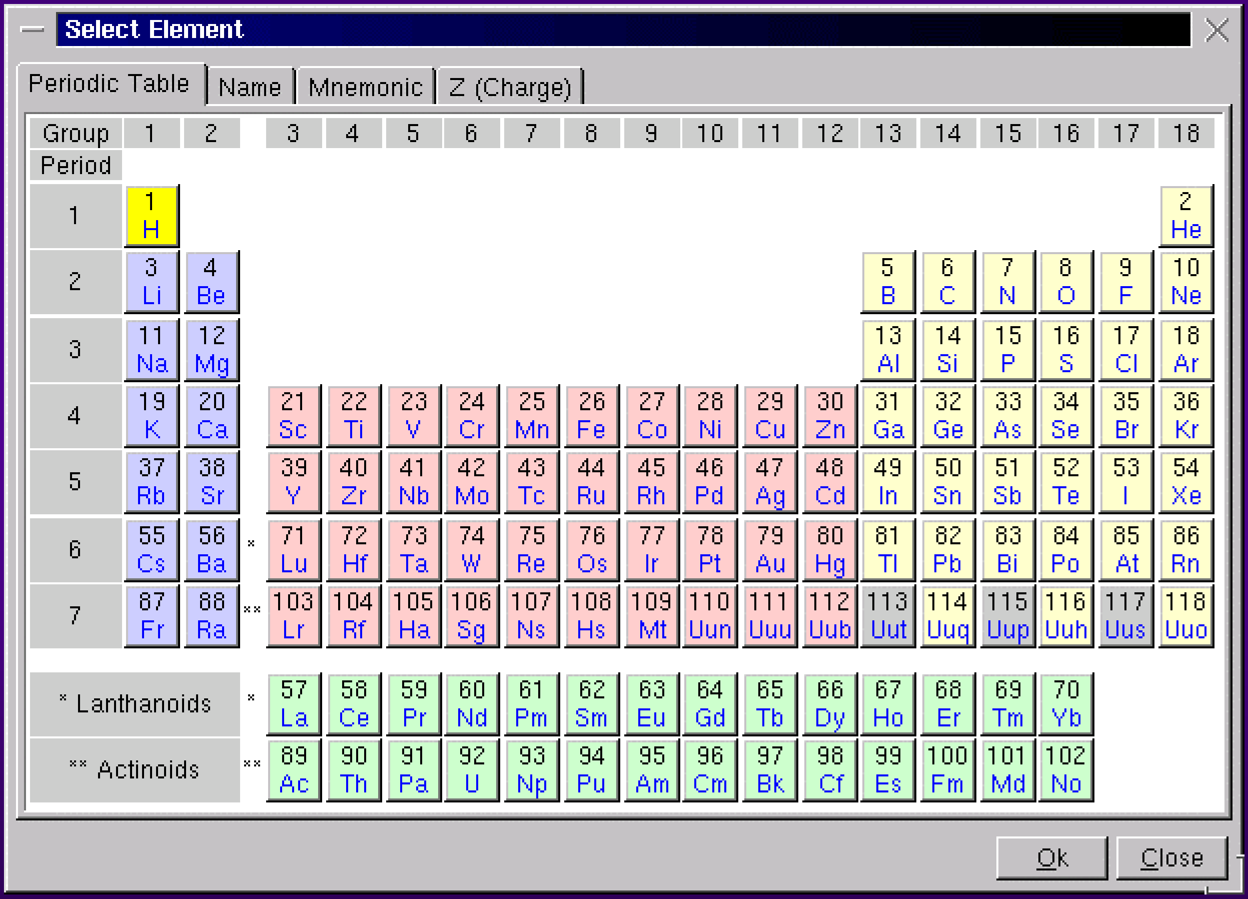
Dialog

Options

Module 1	0.0
Module 2	0.0
Module 3	0.0
Module 4	0.0

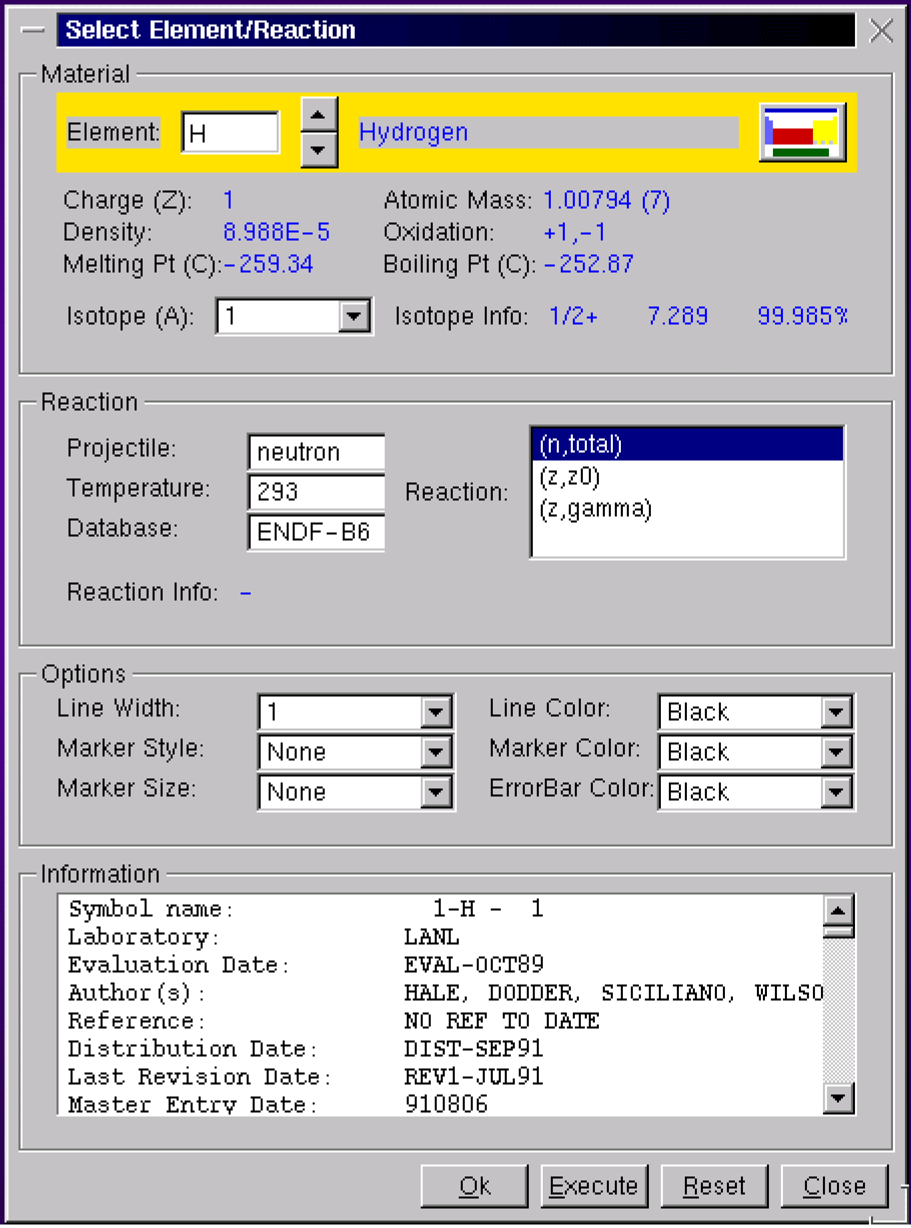
Tab Handling

GUI User example



Group	1	2		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Period																			
1	1 H																		2 He
2	3 Li	4 Be												5 B	6 C	7 N	8 O	9 F	10 Ne
3	11 Na	12 Mg												13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
4	19 K	20 Ca		21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
5	37 Rb	38 Sr		39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
6	55 Cs	56 Ba	*	71 Lu	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
7	87 Fr	88 Ra	**	103 Lr	104 Rf	105 Ha	106 Sg	107 Ns	108 Hs	109 Mt	110 Uun	111 Uuu	112 Uub	113 Uut	114 Uuq	115 Uup	116 Uuh	117 Uus	118 Uuo
* Lanthanoids			*	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb		
** Actinoids			**	89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No		

Graphical user Interface



Select Element/Reaction

Material

Element: H

Hydrogen

Charge (Z): 1

Atomic Mass: 1.00794 (7)

Density: 8.988E-5

Oxidation: +1,-1

Melting Pt (C): -259.34

Boiling Pt (C): -252.87

Isotope (A): 1

Isotope Info: 1/2+ 7.289 99.985%

Reaction

Projectile: neutron

Temperature: 293

Database: ENDF-B6

Reaction: (n,total)

(z,z0)

(z,gamma)

Reaction Info: -

Options

Line Width: 1

Line Color: Black

Marker Style: None

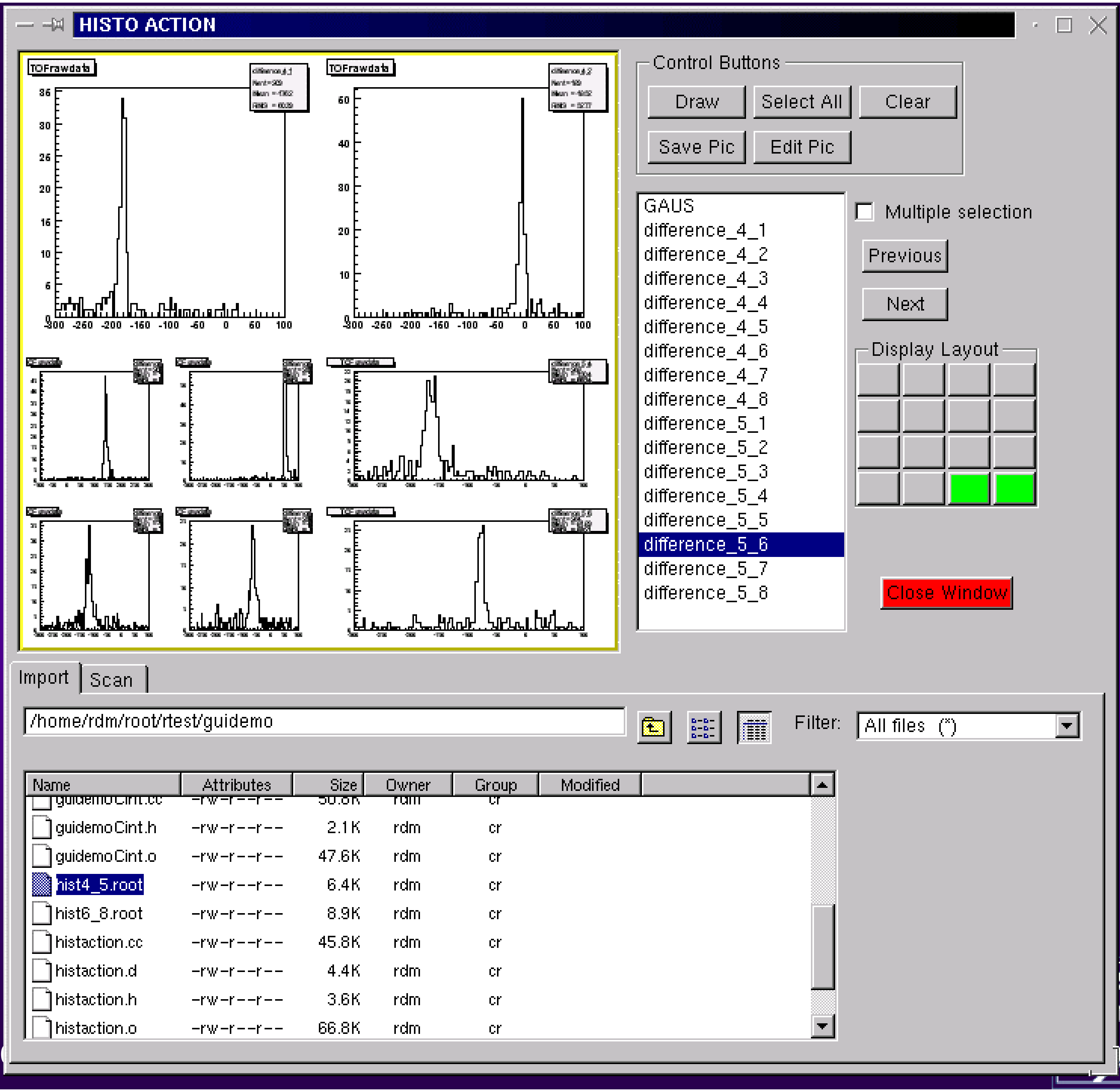
Marker Color: Black

Marker Size: None

ErrorBar Color: Black

Information

```
Symbol name:              1-H -  1
Laboratory:             LANL
Evaluation Date:        EVAL-OCT89
Author(s):              HALE, DODDER, SICILIANO, WILSO
Reference:              NO REF TO DATE
Distribution Date:      DIST-SEP91
Last Revision Date:     REV1-JUL91
Master Entry Date:      910806
```



GAUS
difference_4_1
difference_4_2
difference_4_3
difference_4_4
difference_4_5
difference_4_6
difference_4_7
difference_4_8
difference_5_1
difference_5_2
difference_5_3
difference_5_4
difference_5_5
difference_5_6
difference_5_7
difference_5_8

/home/rdm/root/rtest/guidemo

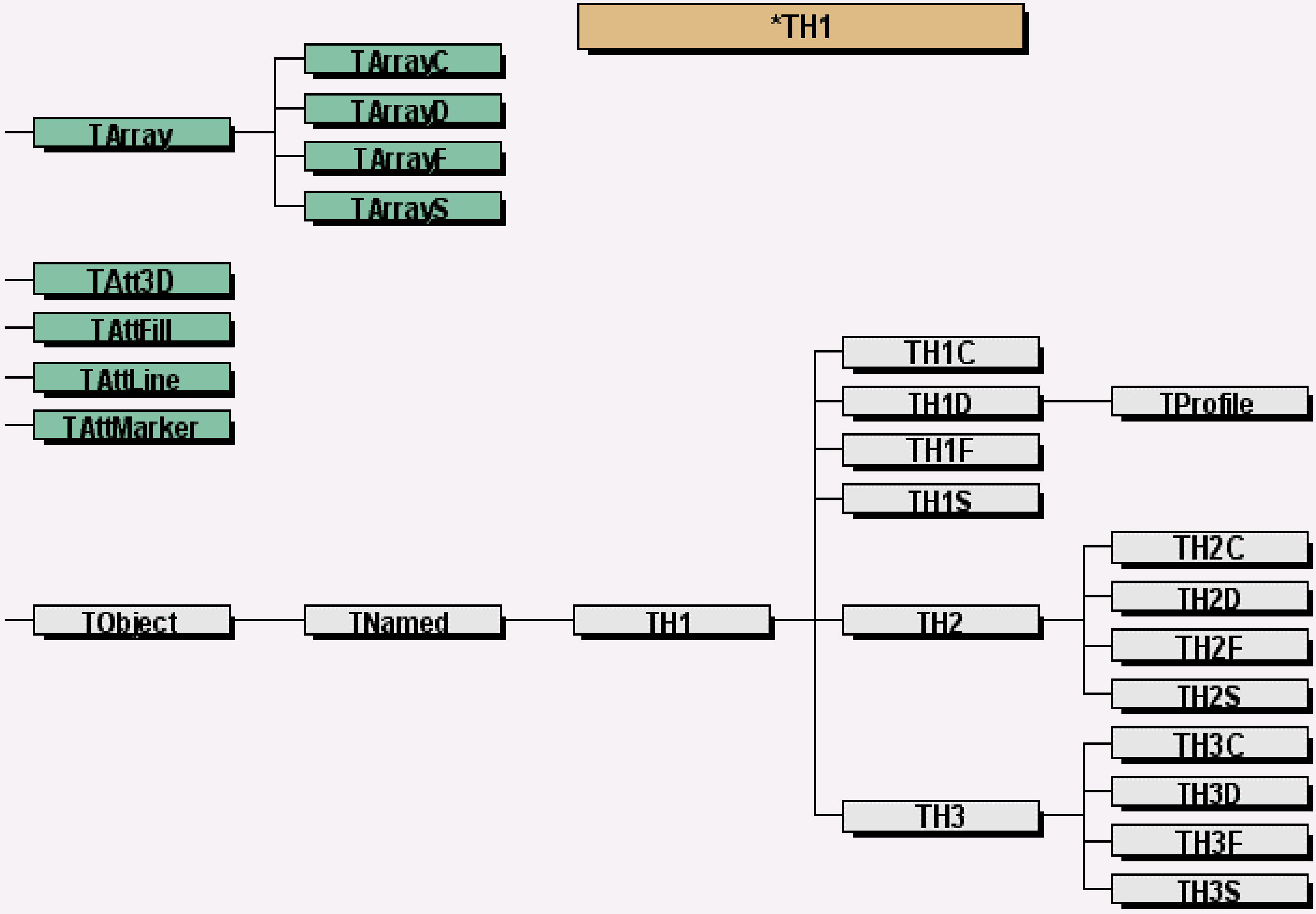
Name	Attributes	Size	Owner	Group	Modified
guidemoCint.cc	-rw-r--r--	50.8K	rdm	cr	
guidemoCint.h	-rw-r--r--	2.1K	rdm	cr	
guidemoCint.o	-rw-r--r--	47.6K	rdm	cr	
hist4_5.root	-rw-r--r--	6.4K	rdm	cr	
hist6_8.root	-rw-r--r--	8.9K	rdm	cr	
histaction.cc	-rw-r--r--	45.8K	rdm	cr	
histaction.d	-rw-r--r--	4.4K	rdm	cr	
histaction.h	-rw-r--r--	3.6K	rdm	cr	
histaction.o	-rw-r--r--	66.8K	rdm	cr	

TExec class

- TPad::AutoExec
  - Root > TCanvas c1("c1");
  - Root > c1.AddExec("ex1",".x exec1.C");
- TExec::Draw
  - Root > TExec exec("ex2","DoSomething();")
  - Root > exec.Draw()
- TH1::GetListOfFunctions()->Add(exec)
  - Nice to add graphics primitives depending on the histogram bin contents.

Development version 2.24

- 2.23/12 is frozen since February
  - Stable. No major problems found so far
- First dev version introduced this week
  - New TH2, TH3 inheritance from TH1
  - Secure rootd daemon
  - Extensions in the script compiler
  - More powerful rootcint
  - Byte-swapping optimisation on Linux
  - TMath: new Bessel functions
  - TSpline classes (cubic, quintic)


*TH1
TArray
TArrayC
TArrayD
TArrayF
TArrayS
TAtt3D
TAttFill
TAttLine
TAttMarker
TObject
TNamed
TH1
TH1C
TH1D
TProfile
TH1F
TH1S
TH2
TH2C
TH2D
TH2F
TH2S
TH3
TH3C
TH3D
TH3F
TH3S

Script Compiler

- Extensions to TSystem such that the following will nicely work:

```
root> .L stress.cxx
root> stress();            // will interpret
root> .L stress.cxx
root> stress();            // will interpret a new version
root> .L stress.cxx++
root> stress();            // will execute compiled code
root> .L stress.cxx++  // not recompiled if stress.cxx is not newer.
root> stress();            // will execute new compiled code
```

Secure rootd deamon

Rootd now supports secure authentication by using the SRP package from Stanford (http://srp.stanford.edu/srp/).

SRP, Secure Remote Passwords,

uses a so called "asymmetric key exchange protocol" in which no passwords are ever send over the wire.

read about the main features of SRP look at:

http://jafar.stanford.edu/srp/advantages.html

Now when creating a TNetFile object via TFile::Open("root://....") libSRPAuth.so will be loaded if it exits and the secure login protocol will be used. Note that other rootd trafic is not encrypted.

Improved byte-swapping on Linux

Changes in include Bytes.h to support an optimized byte swapping code on Linux machines (thanks to Sasha Vanyashin).

The Bytes.h uses asm macros from the #include <byteswap.h>
This is a part of the GNU C library: /usr/include/byteswap.h
and /usr/include/bits/byteswap.h.
Because the byteswap.h is missing on many Linux systems, a copy of this include is provided in Byteswap.h

Problems

- Windows/NT support in general
- support for old TGWin32 classes becoming a problem
- need full implementation of TVirtualX
- FNAL work with Java could be a solution
- Documentation in a poor status
- Need more Howtos, examples
- Good start with FNAL tutorials

Our intention to upgrade the documentation for the CERN School of Computing in Grece in September

JAVA and ROOT

- **step1: Transparent access to C++/Root services via web applets or JRE. (In development with FNAL)**
- **step2: Exchange of objects (data objects only) between C++, Java. Easy to do via the CINT RTTI. Could be very quickly implemented.**
- **Step3: Full Java integration. Implement C++ methods on the Java classes where it makes sense**

ROOT users

ATLAS	79
ALICE	55
PHENIX	49
STAR	47
CDF	46
CMS	40
BABAR	38
JLAB	38
D0	28
NA49	28
H1	24
HERA-B	24
LHCB	20
L3	19
PHOBOS	18
HADES	17
DELPHI	15
WA98	13
BELLE	11
COMPASS	11
KLOE	9
ZEUS	9
AMS	8
OPAL	8
AUGER	7
MINOS	7
AMANDA	6
BRAHMS	6
GLAST	6
NOMAD	6
LIGO	5
ALEPH	5
HERMES	5
INTEGRAL	5
ANTARES	4
BES	4
CELESTE	4
CHORUS	4
SLD	4
VIRGO	4
NA48	3
CLEO	3
NA50	3
SNO	3
FINUDA	2
DIRAC	2
ATIC	2
BLAST	2
COSMOS	2
NA44	2
NA45	2
TAPS	2
WASA	2
ACCESS	1
ASTER	1
BAIKAL	1
CHIMERA	1
CHOOZ	1
HEGRA	1
ICARUS	1
JLC	1
NA47	1
NSLS	1

ROOT HEP Users in **roottalk**

hep	**917**
scientific	**264**
commercial	**129**
private	**67**
all	**1377**
experiments	**63**