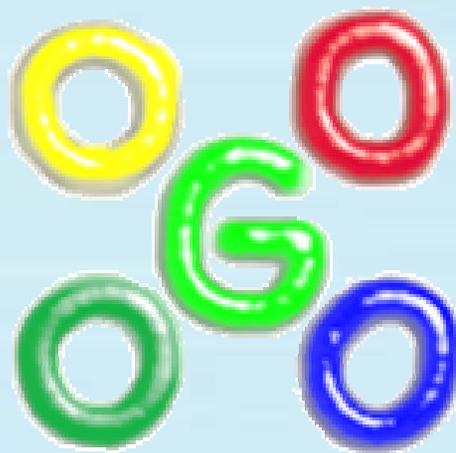




J. Adamczewski
M. Al-Turany
D. Bertini
H.G.Essel
S.Linev



Analysis Organization: Go4 Analysis Steps and TTask

ROOT workshop February 2004



Contents

- **The problem: organization of analysis**
- **ROOT TTask mechanism**
- **The Go4 analysis framework**
- **The Go4 analysis steps**
- **Upgrade of Go4 framework**

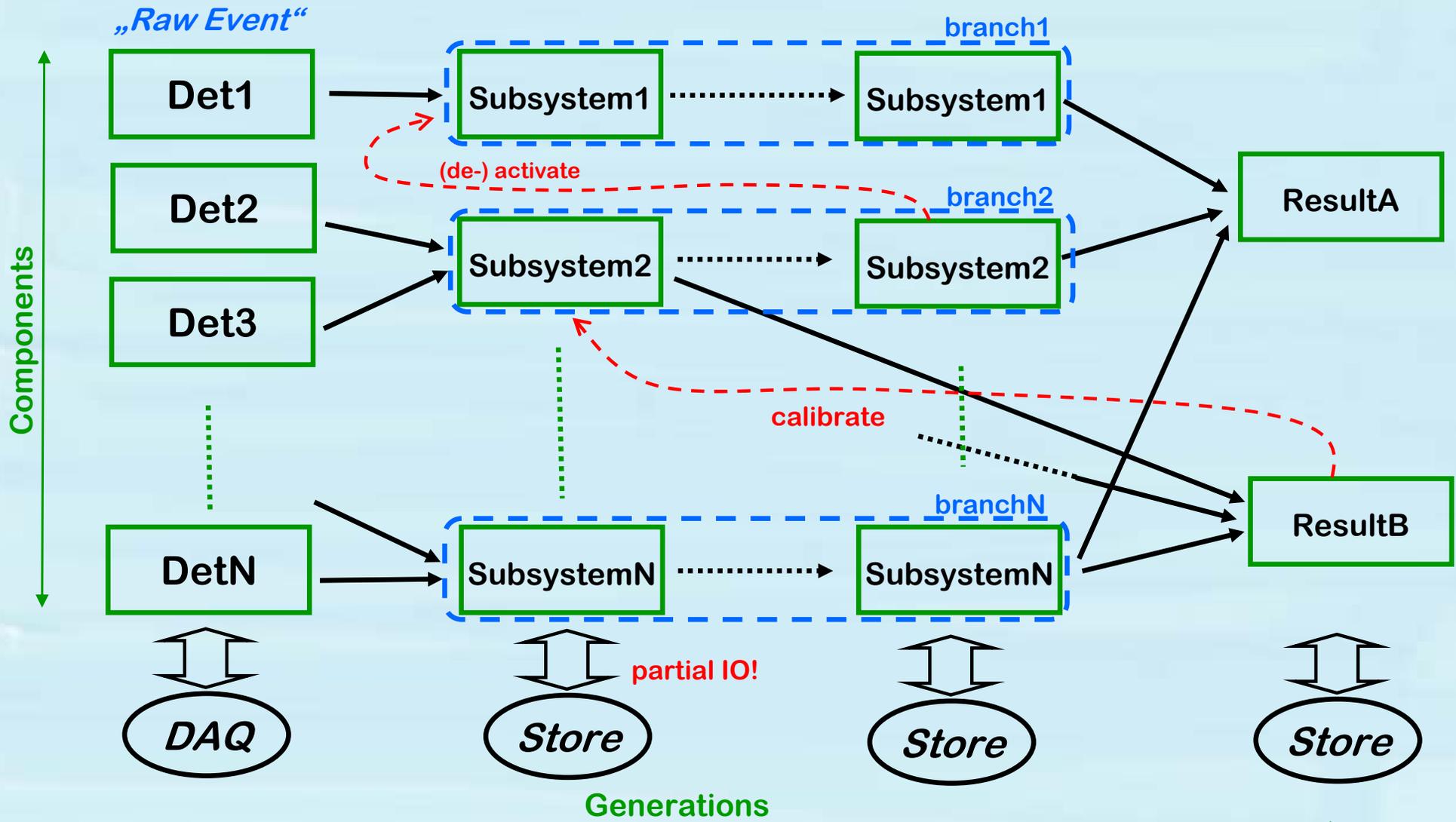


The problem

- **Modular** analysis
- Modules must be **set up** and **controlled**
(IO, processing, interactive, GUI)
- **General purpose framework for different experiments**



The problem: General analysis organization



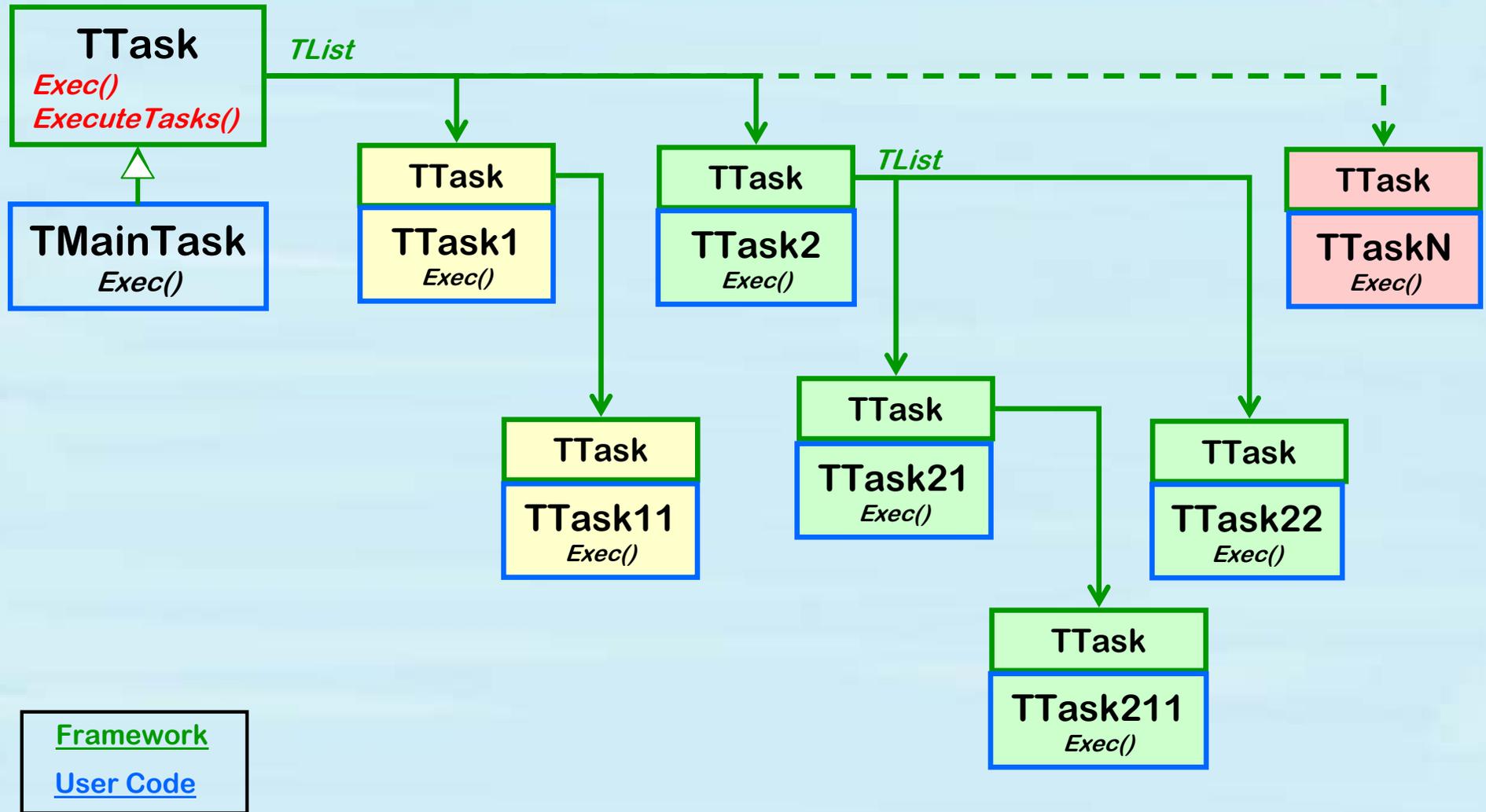


General analysis organization: use cases

- **Components** analysis may run as **independent branches**
each branch may be switched off
- **Store and retrieve** events / data structures of **each generation/each component**
partial IO for components
- **Set-up** (active components, range of generations, „calibration“ data)
should be easy *config script, GUI*
=> Framework with basic definitions required!

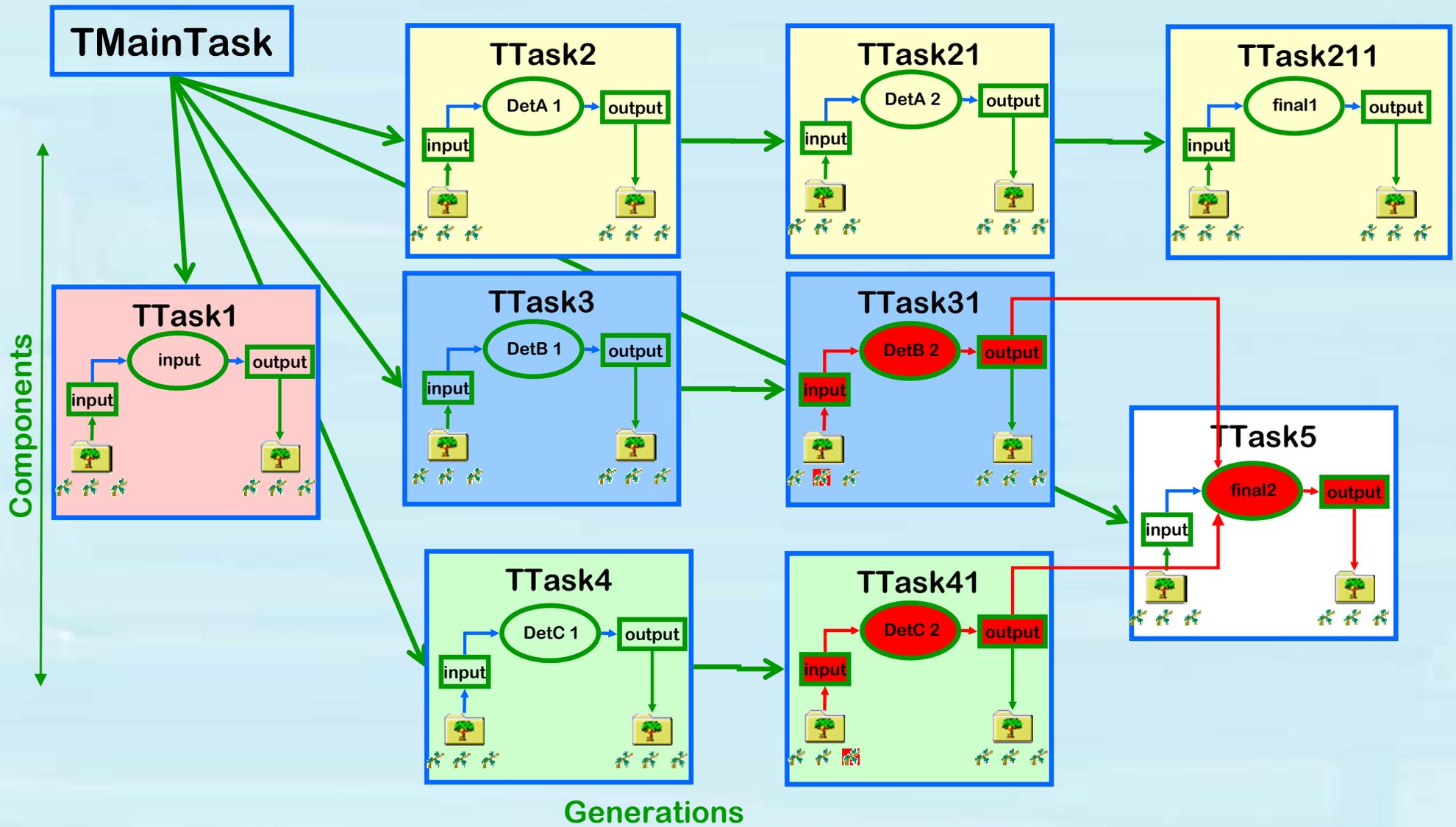


ROOT TTask mechanism



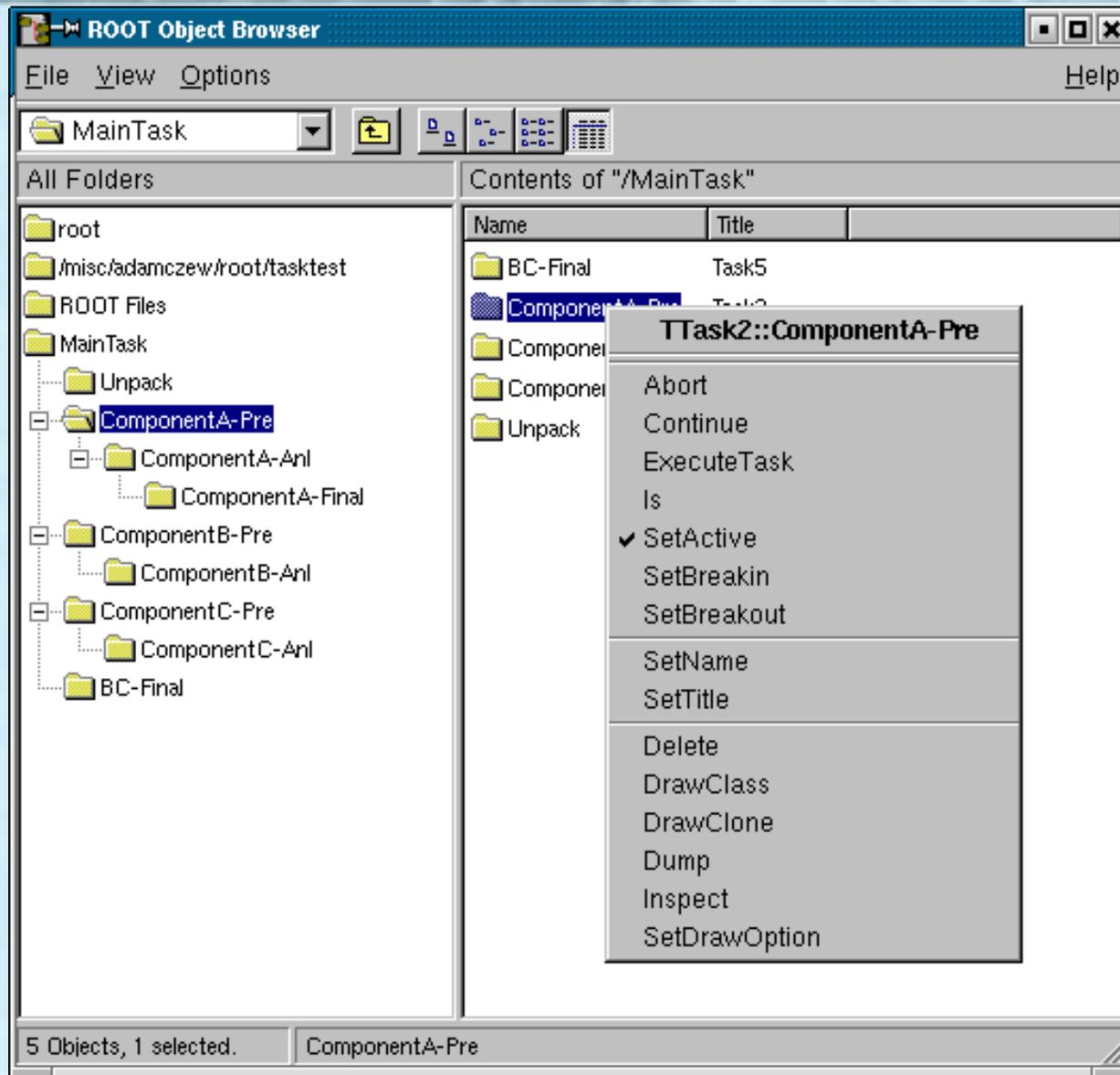


Logical mesh of TTasks





TTask control with TBrowser





ROOT TTask mechanism

- **Lightweight and flexible** framework: Inheritance of **one class** TTask
- **independent branches** and subbranches of tasks
- **GUI control** via TBrowser (branch view, activation, breakpoints)

- **data interface** between **dependend tasks** not given
user resonsibility! subframework?
- **IO interface** of intermediate results not given
user TTree, GUI controlled enable/disable? subframework?

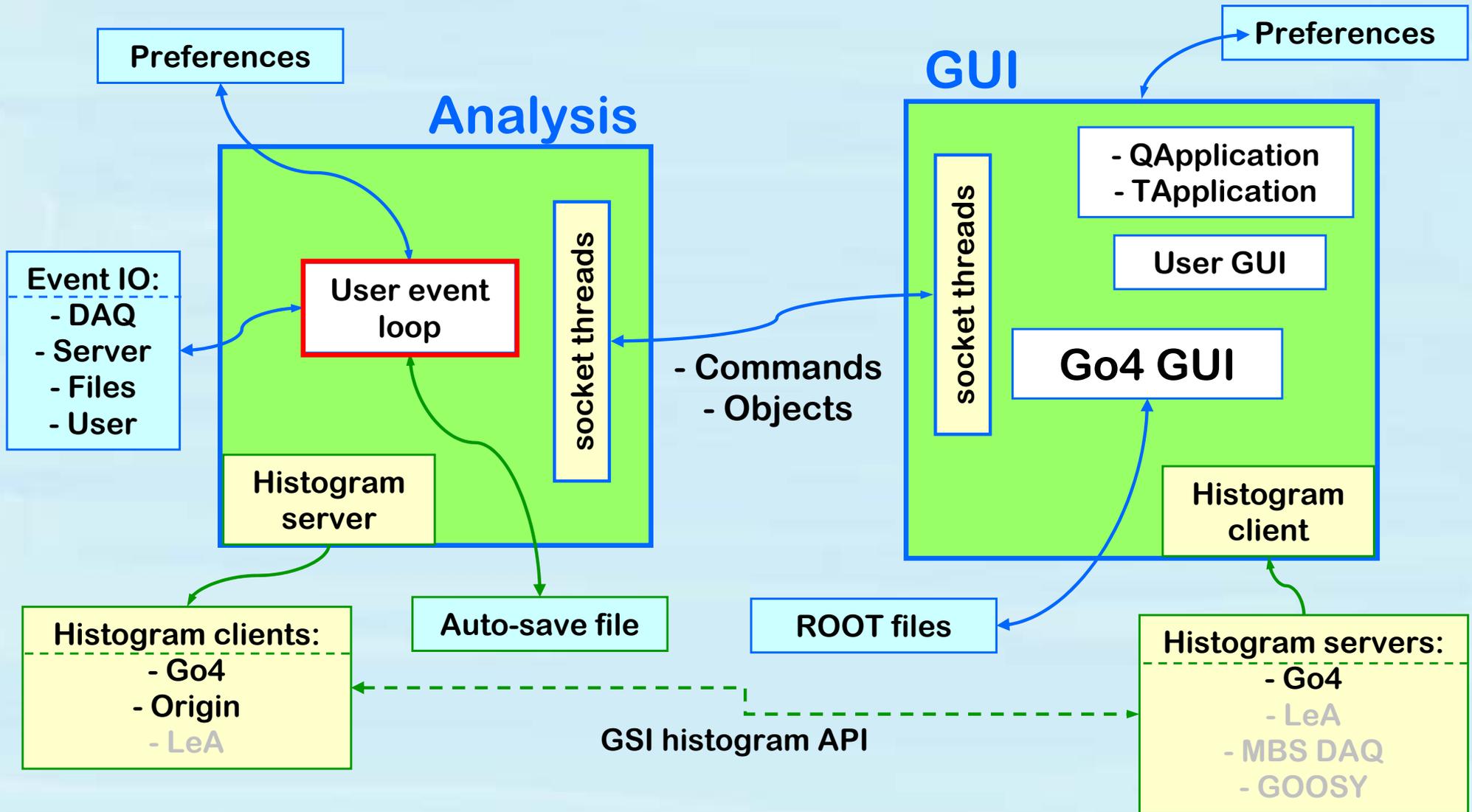


The Go4 (GSI Object Oriented Online Offline)

- **Framework** for many kinds of experiments (Atomic & Nuclear Physics)
- The analysis is written by the user (**unlimited ROOT**)
- **Services** (GSI DAQ, *analysis organization*, IO, ...) are provided
- **Batch mode** (CINT or compiled, off-line)
- **Interactive mode** (on-line or off-line):
 - A **non blocking GUI controls and steers the analysis**
 - Analysis may **run permanently** and can **update graphics asynchronously**
 - ROOT object transport between **analysis and GUI process**, multithreaded, sockets
 - GUI interfaces **ROOT and Qt graphics**
 - User defined GUI possible (Qt designer)

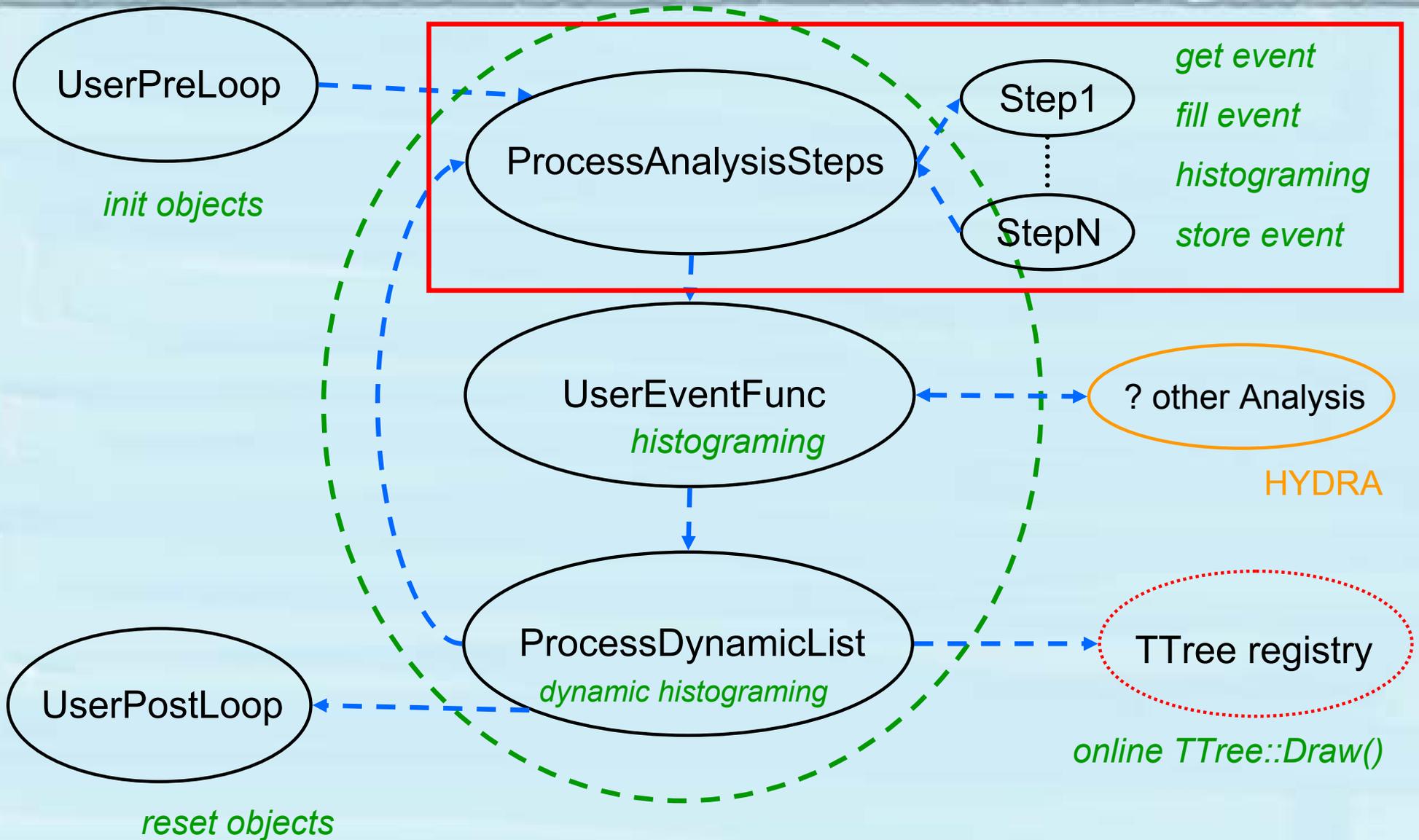


Go4 Processes: GUI & Analysis



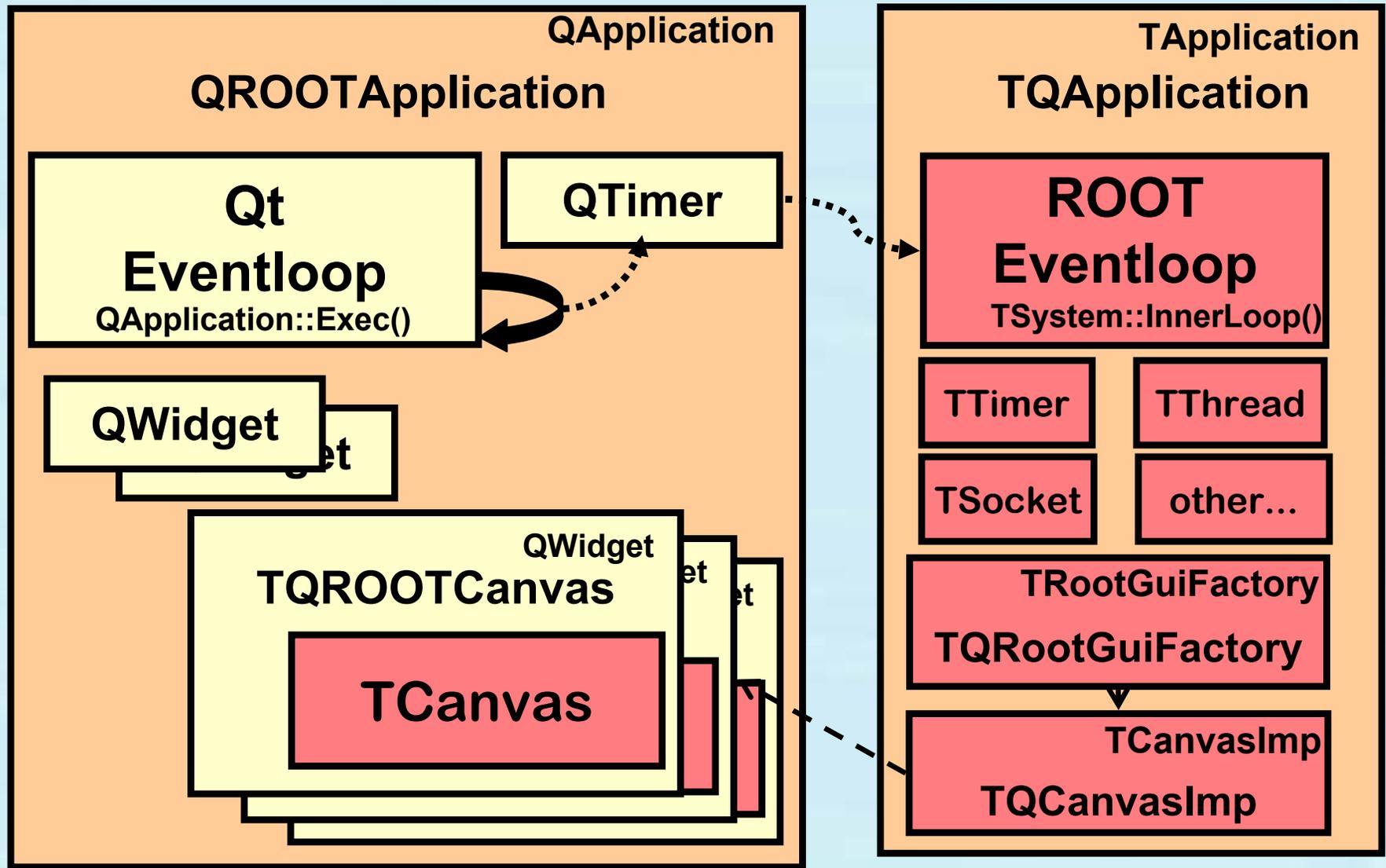


Eventloop Actions





Go4 GUI: ROOT Qt interface to ROOT





Go4 Releases

- **Go4** v1.x GSI internal release (May 2002)
- **Go4** v2.0 public release (Nov 2002)
- **Go4** v2.1 public release (Jan 2003)
- **Go4** v2.2 public release (Mar 2003)
- **Go4** v2.3 public release (May 2003)
- **Go4** v2.4 public release (Aug 2003)
- **Go4** v2.5 public release (Dec 2003)

Linux: Debian 3.0, Suse 8.1, Suse 8.2, RedHat 7.3, RedHat 9.0

Compiler: gcc 2.95, gcc 3.2, gcc 3.3

Users: GSI-FRS, SHIP, Euroball/RISING,
HADES (online monitor), Atomic physics,...



Standard GUI

Go4 v2.5-5

File Tools Analysis Settings Windows Help

scatter ---No errors--- Cartesian X: Linear Y: Linear Z: Linear Auto Scale

Memory Monitor Analysis

Name

- fiCrate2[16]
- fiCrate3[16]
- fiCrate4[16]
- Histograms
- Parameters
- Pictures
 - Cr1Ch01
 - Cr1Ch02
 - Cr1Ch03
 - Cr1Ch04
 - Cr1Ch05
 - Cr1Ch1x2
- His1
- His1g
- His2
- His2g
- Picture1
- condSet
- Trees
 - UnpackxTree
 - XXXUnpackEvent.
 - XXXUnpackEvent.TC
 - XXXUnpackEvent.F.
 - XXXUnpackEvent.F.
 - XXXUnpackEvent.F.

General Editor - Condition Editor

cHis2 bound to: His2 autorefresh

cHis2 His2 ALL visible

Returns Result Regular

All counts: 28055 True counts: 19439

Limits Stats Cursor

Xmin: 100 Xmax: 2000

Ymin: Ymax:

Edit Parameter: CaliPar

Parameter CaliPar TXXXCalibPar

Object Members

Name	Type	Value
------	------	-------

Fit panel

Fitter Tools Settings

Name Fitter

Minimizer Peak finder

use polynom of order 1

Variant 1 ROOT (2) Vari

Noise factor: 3.7

Minimal noise 5

Channel sumup 2

Rebuild + -

Use pad Find Fit Draw Pars Pad V 1 : in panel V 1

Condition histogram

Statistics	Value
Mean	678.3
RMS	314
Underflow	4
Overflow	0
Integral	6.8e+05

C: Ready

SetPalette 1 Canvas: Pad: Divide Pad into 1 x 1

Date	Time	Description	Type
19.02.04	14.03.41	Analysis nameslist was requested from client...	Info

1875.248 Current Ev/s 2634.359 Average Ev/s 23 s 63000 Events 2004-02-19 14:04:03



User GUI (Qt)

Parameter Setup for SHIP

The screenshot shows the Go4 v2.4-0 software interface. The main window displays a scatter plot on the left and a terminal window at the bottom. The 'Print Parameter Dialog' is open, showing various settings for printing analysis results. The dialog includes sections for General, CORRELATION SEARCH, Recoil, and Print Values.

Print Parameter Dialog

09:35:11: Values taken from analysis.

Enable Printing

Destination:

Print to scr Print to file Filename: out-e5.167.dat

Print Conditions:

- time from: 110,10 to: 500,20 sec
- ekev from: 8000,00 to: 12000,00 kev
- emev from: 500,00 to: 8000,00 ch
- tof from: 1000,00 to: 1200,00 ch
- egam from: 100,00 to: 500,00 kev
- xy1t from: 600,00 to: 670,00 ch
- xy1b from: 220,00 to: 280,00 ch
- xy1t from: 600,00 to: 670,00 ch
- xy1b from: 220,00 to: 280,00 ch
- ekevbox from: 600,00 to: 670,00 kev
- emevbox from: 220,00 to: 280,00 sec

In Pause in Pulse AntiTOF AntiVeto T2 bit T3 bit

Strip No. 6

Print Values:

<input checked="" type="checkbox"/> time	<input type="checkbox"/> xylt	<input type="checkbox"/> box strip	<input checked="" type="checkbox"/> eclo3	<input type="checkbox"/> t2 bit	<input type="checkbox"/> pu4
<input checked="" type="checkbox"/> tmp	<input type="checkbox"/> xy1b	<input type="checkbox"/> ekev box	<input checked="" type="checkbox"/> eclo4	<input type="checkbox"/> t3 bit	<input type="checkbox"/> pu5
<input checked="" type="checkbox"/> pausebit	<input checked="" type="checkbox"/> emev	<input checked="" type="checkbox"/> emev box	<input checked="" type="checkbox"/> tofbit	<input type="checkbox"/> pu1	<input type="checkbox"/> pu6
<input checked="" type="checkbox"/> strip	<input type="checkbox"/> xy1t	<input checked="" type="checkbox"/> eclo1	<input checked="" type="checkbox"/> tof	<input type="checkbox"/> pu2	<input type="checkbox"/> pu7

Terminal output:

```
*** TSHIPAnalysis:
Last event: 55747663
RUNING TIME: 2627
COULOMB FLUX: 0
G04-***> AnalysisClient MyAnalysis has STOPPED ana
*** TSHIPAnalysis:
G04-***> AnalysisClient MyAnalysis has STOPPED ana
First event: 55747663
no. 100000 time: 14400,7264 s

*** TSHIPAnalysis: PostLoop
Last event: 55890643 Total events: 142980
RUNING TIME: 16727
COULOMB FLUX: 1
G04-***> AnalysisClient MyAnalysis has STOPPED ana
```



User GUI (Qt)

On-line monitoring of HADES

The screenshot displays the MDC Go4 Online GUI with several monitoring plots and a configuration window. The main window is titled "MDC Go4 online" and contains the following plots:

- Mdc_Raw_Error_Stat**: A 2D histogram showing error bit vs. sub event size.
- Mdc_Raw_Roc_SubEvent_Siz**: A 2D histogram showing ratio vs. sub event size.
- Mdc_hcutstat**: A 2D histogram showing ratio vs. sub event size.
- Mdc_hcal1hits**: A 3D histogram showing hits vs. sector and time.
- Mdc_timeCal1**: A plot showing counts vs. time.
- trigger online monitor**: A central panel with a table of statistics and several plots showing mean multiplicities for different sub-detectors.

The statistics table in the trigger online monitor shows the following data:

#Leptons / #Hits	sec0	sec1	sec2	sec3	sec4	sec5
g: 3.27	s0: 0.49	s1: 0.48	s2: 0.56	s3: 0.55	s4: 0.62	s5: 0.57

The configuration window, titled "Hades Configuration", contains the following settings:

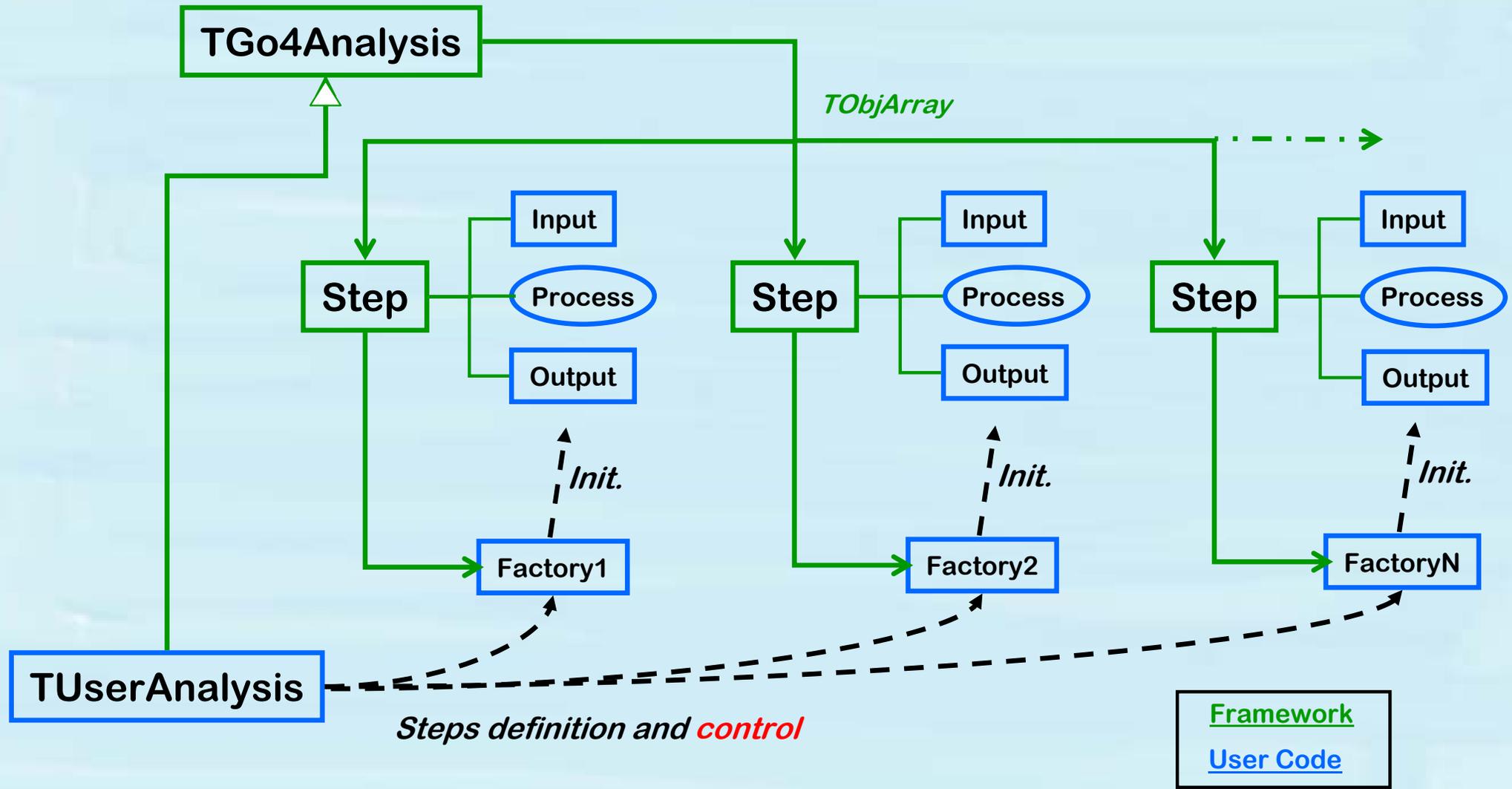
- General Specs**: Tree Size (kBytes) 0, Refresh rate (nev) 0.
- Eventloop**: nLoop 100, sleep 100, maxrate 1000.
- Refresh**: Triggerrefresh 500, StartRefresh 500, RichRefresh 500, RichODRefresh 500, MdcRefresh 500, ToRefresh 500, TofinoRefresh 500, ShowerRefresh 500.
- Tasks**: Trigger, Start (hit), Rich (cal), Mdc (fit), To (cal), Tofino (cal), ShowerTofino, Shower (hit).
- MDC SETUP**: Calibrator (TimeCuts, NoStartAndCal).
- TrackFinder**: magnet on, single Chamber, nLayers (6, 6, 6, 6, 10, 50, 10, 30), Segments (6, 6, 6, 6, 1, 3).
- Filter**: single Chamber.

Buttons for "get Configuration" and "submit Configuration" are located at the bottom of the configuration window.

Courtesy HADES coll.



Go4 Analysis steps





GUI control of steps

Go4 v2.5-5

File Tools Analysis Settings Windows Help

Memory Monitor Analysis

Name

- EventObjects
 - EventProcessors
 - FRSAn1Proc
 - FRSCalibrProc
 - FRSSortProc
 - FRSUnpackProc
 - EventSources
 - /misc/linev/Analysis/F
 - EventStores
 - 113_UPA.root
 - Events
 - FRSAn1Event
 - FRSCalibrEvent
 - FRSSortEvent
 - FRSUnpackEvent
 - TGo4EventElement
 - qdummy
 - qevent_nr
 - qlength
 - qsubtype
 - qtrigger
 - qtype
 - vme0[21][32]
 - MhsEvent.-10-1

Analysis Configuration

Unpack Sort Calibr Analysis User

Step Control

Disable Step Disable Source Disable Store

EventSource

MBS File (*.lmd)

Name: /misc/linev/Analysis/FRS/lmdfiles/r113_f0004.lmd

Port:

Tagfile:

Args:

0 all 1 1 s

First Last Step Timeout

EventStore

Go4FileStore (1 tree/step) (*.root)

Name: 113_UPA.root

99 32 kB 5

Split Buffer Compress Overwrite

Auto Save File

test_ASF.root

100000 s 5 Overwrite

Interval Compress

Analysis Configuration File

Go4AnalysisPrefs.root

Go4AnalysisPrefs.root

Submit Get Active Config.

Current Ev/s 873.2673 Average Ev/s 4 s 475 Events 2004-02-10 16:40:18



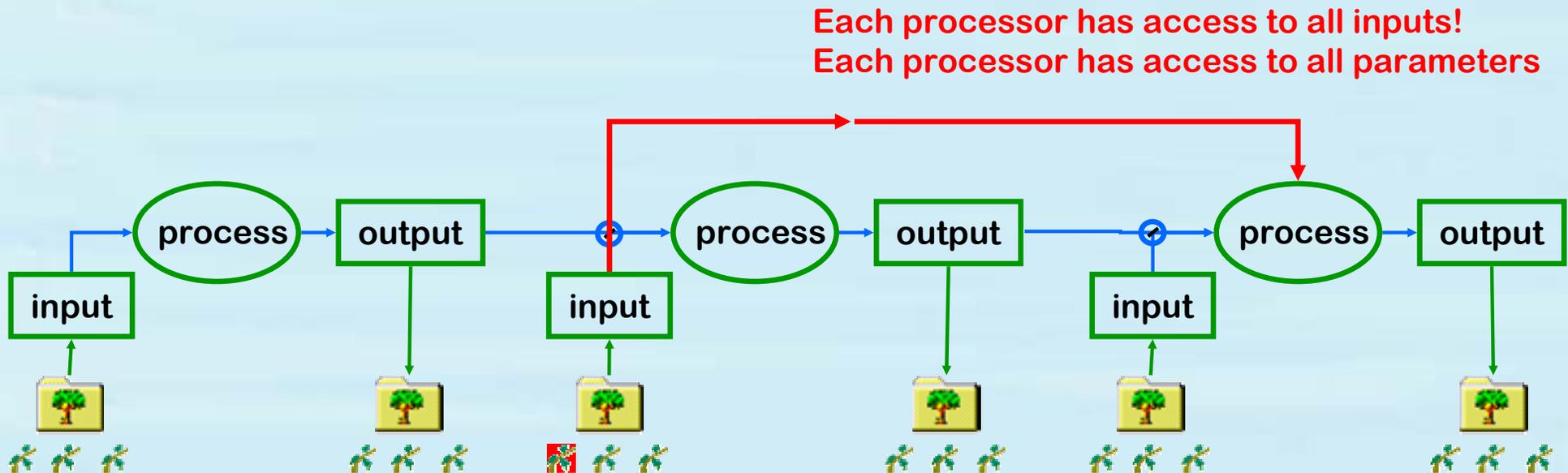
Go4 Analysis steps

Chain of analysis steps processed **sequentially**

Each step can be **en/disabled** (framework)

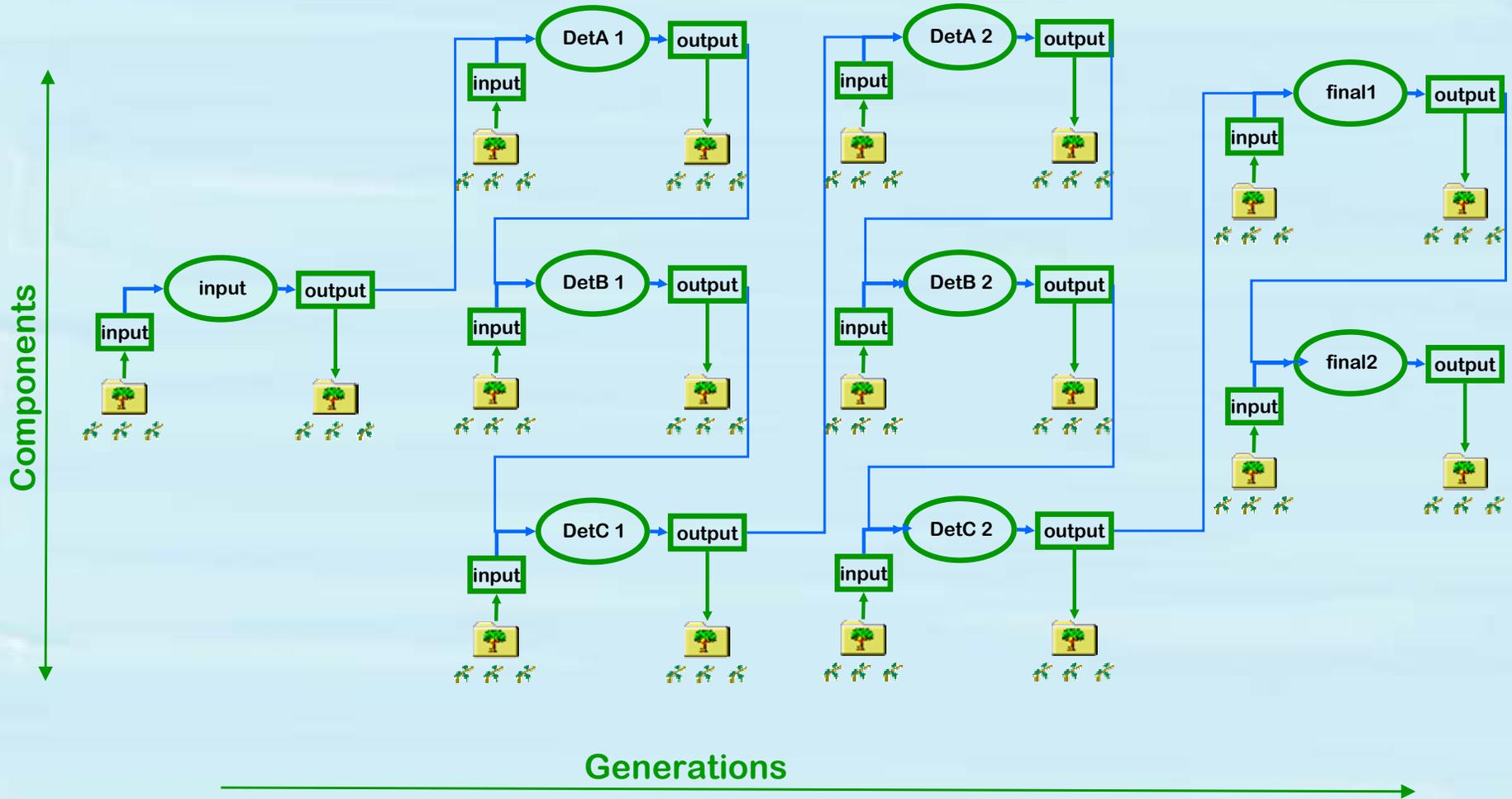
Input/output can be switched (framework)

Partial IO (steered by **application**)



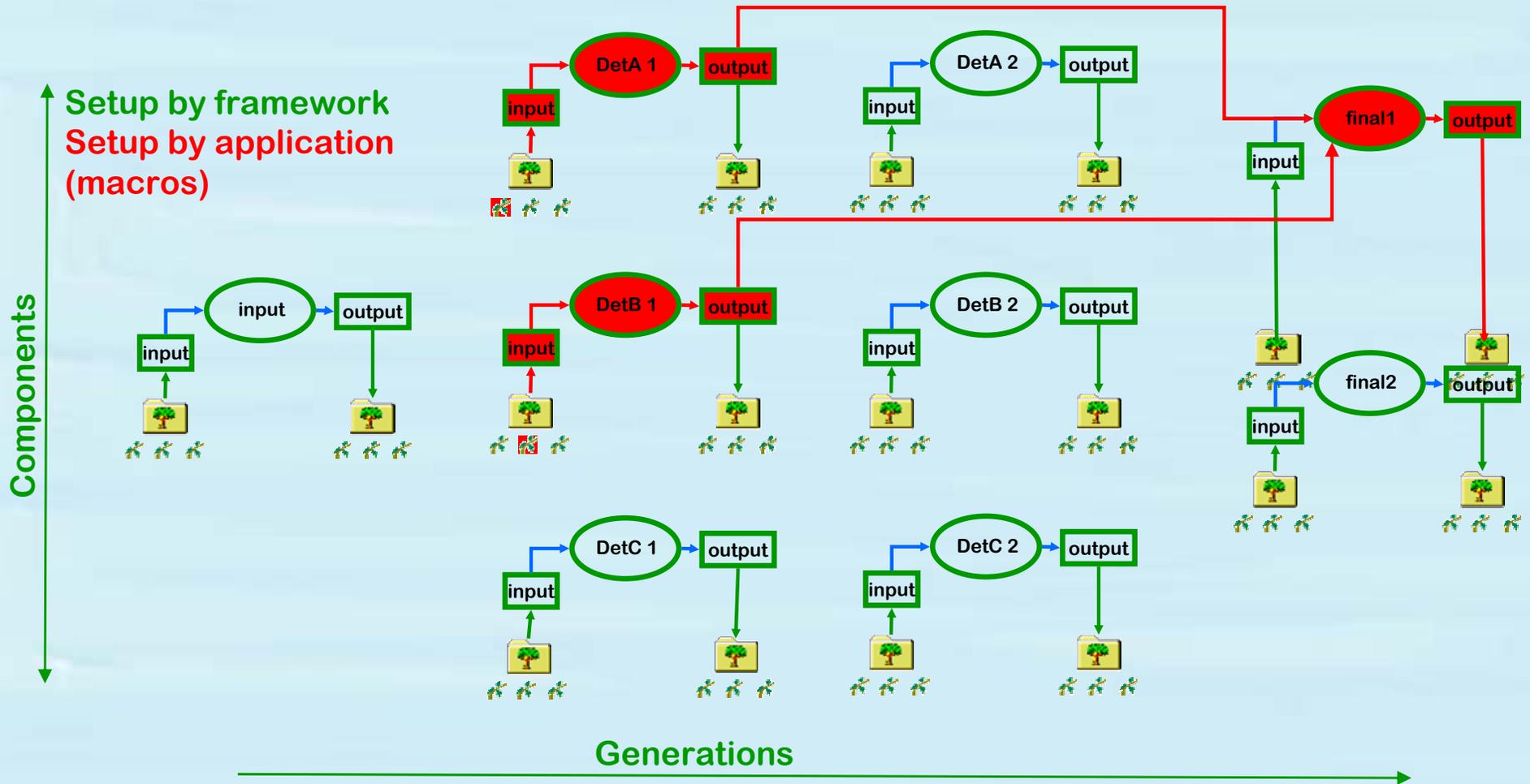


Logical mesh of steps



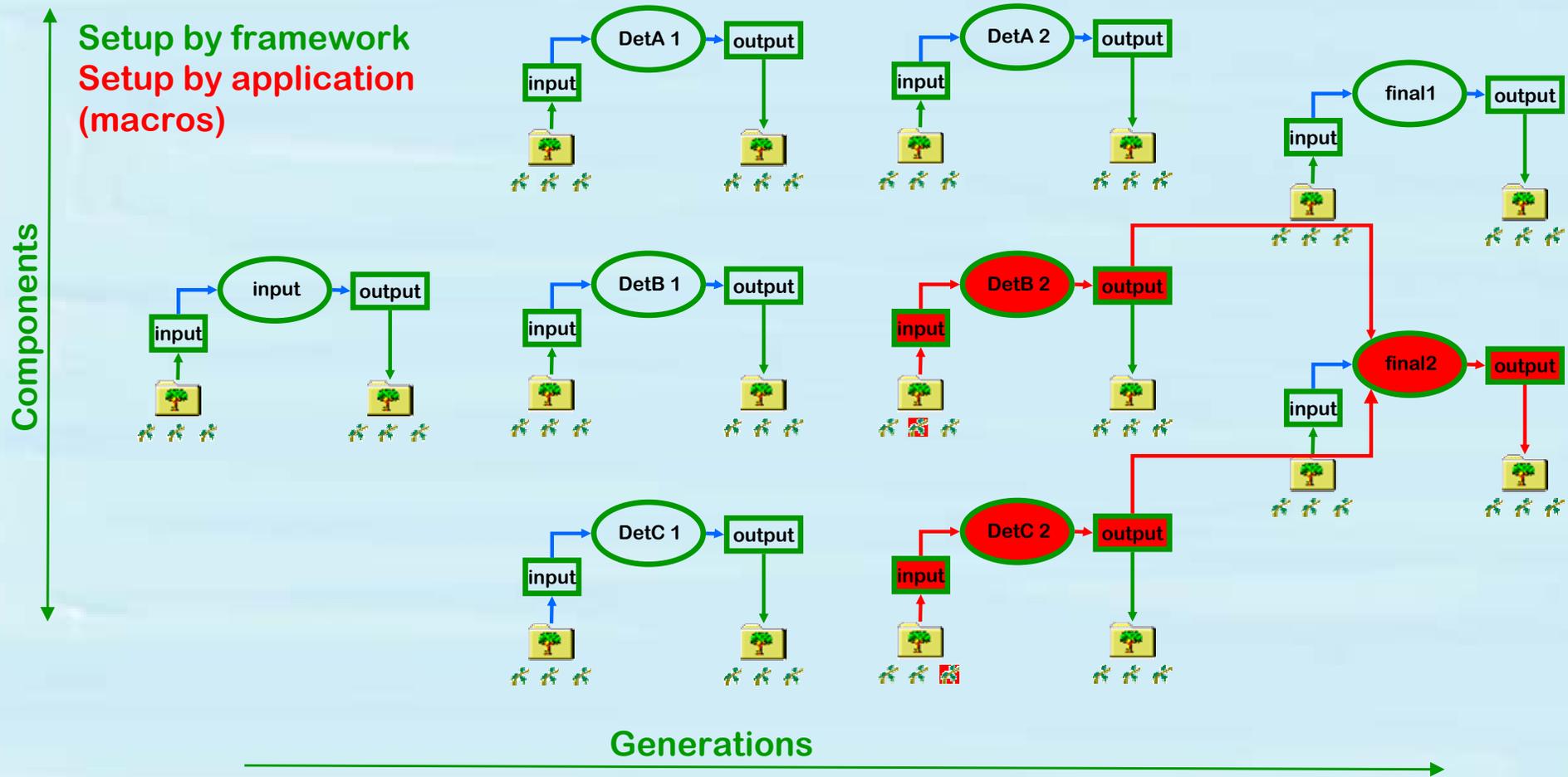


Logical mesh of steps





Logical mesh of steps





Go4 analysis organisation

- Designed for linear flow of analysis, generation oriented
- Abstract Interfaces for IO, data structures, processing
- User defined factory for each step
- Fully controlled by framework (GUI, macros)

- **No hierarchy of substeps** (no execution branches)
- **Control of multiple inputs** for one step **not supported** by framework
- **Logical mesh setup** possible, but **not yet controlled by framework**

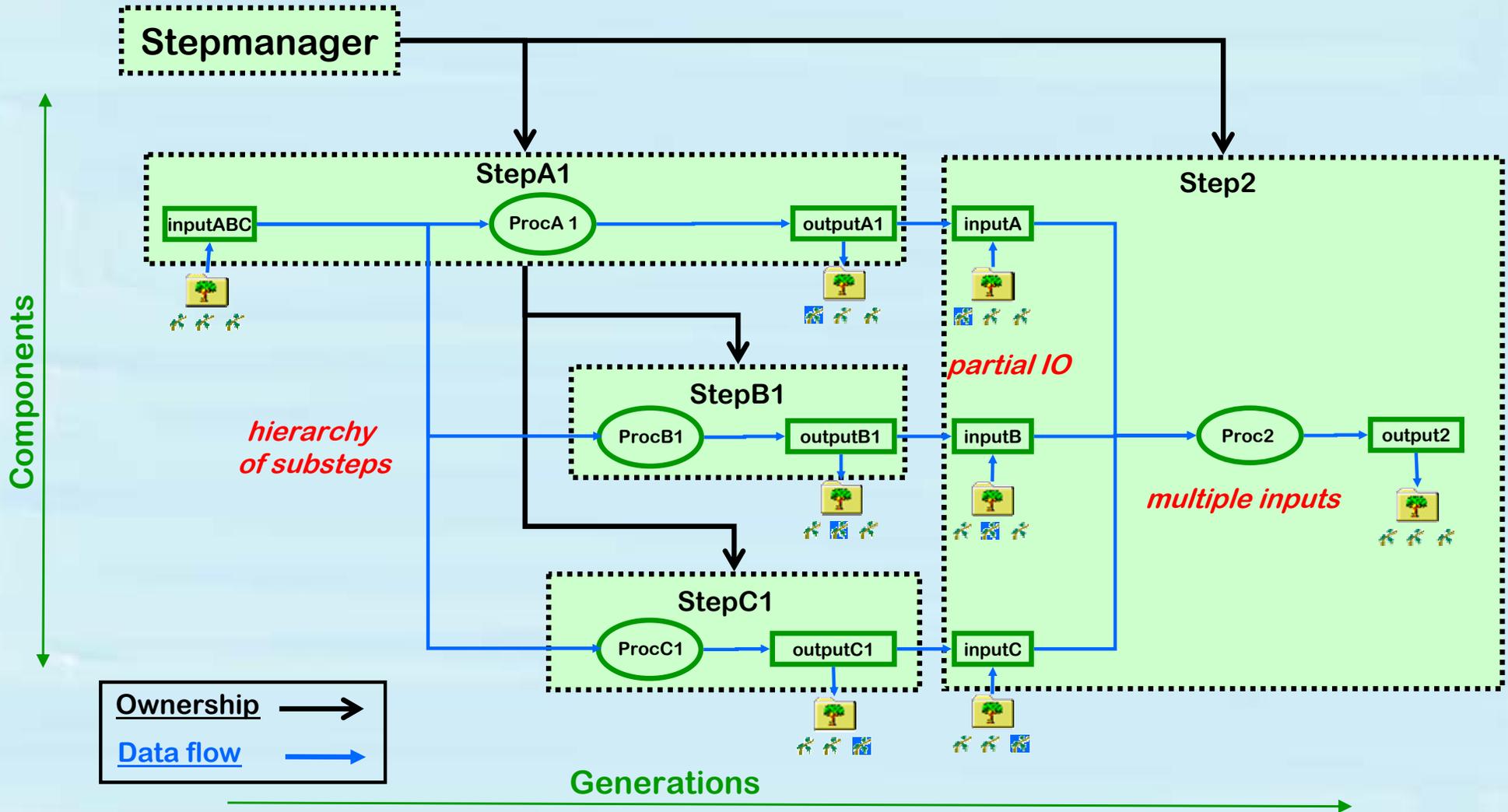


Further Go4 developments

- **Advanced framework interfaces:**
 - Control of **multiple IO** for each step
 - Control of data flow in **analysis mesh**
- Analysis steps redesign for **hierarchical structure** (TTask subclass!)
- Extend standard **analysis configuration GUI** for above cases



Further Go4 framework developments





The End.