

Marian Ivanov

(New) Root Memory checker

Outlook

- Motivation
- New memory checker
 - Implementation
 - User interface
 - Examples
- AliRoot observations

Motivation

- The AliRoot use too much memory
 - Memory checker needed
 - Valgrind and vtune – too slow – difficult to run realistic simulation reconstruction (factor 50 slow down)
- We need some automatic procedure to check the quality of code –
Optimally done during the nightly builds + Sending message to the top violators
 - Number of new – deletes
 - Total and current allocated space – development in time
 - Selective queries – per libraries – per functions

Implementation – Classes - Information

- TinfoStamp
 - memory allocation information – TotalCount, CurrentCount, TotalSize, CurrentSize
 - Code ID, StampNumber
- TcodeInfo
 - Code information – address of the code
 - TinfoStamps – current, last, max memory stamp, max alloc count
 - Integrated from all called function
- TstackInfo
 - Array of code information – stack
 - TinfoStamps – current, last, max memory stamp, max alloc count

Containers

- MemStatManager
 - std vector of CodeInfos
 - std vector of StackInfos
 - std vector of StampInfos – (evolving in time)
- Information dumped to the output tree
 - 1. On demand
 - 2. Automatic dump after reaching the predefined size

Principles

- Hook for alloc and free
 - Possibility to enable and disable
- Alloc hook:
 - Get the stack trace
 - Register the new stack trace if not registered yet
 - Register memory for given stack (increase counters)
- Free hook
 - Unregister memory for stack created given pointer (decrease counters)

User interface – acquiring data

- Start

- TMemStatDraw draw(100000,1000);

- User specify the auto stamp size - Allocated size, Number of allocation

- Make stamps – (inside the code - macro)

- draw.AddStamp("Start");

- funF();

- draw.AddStamp("funF");

- Destructor

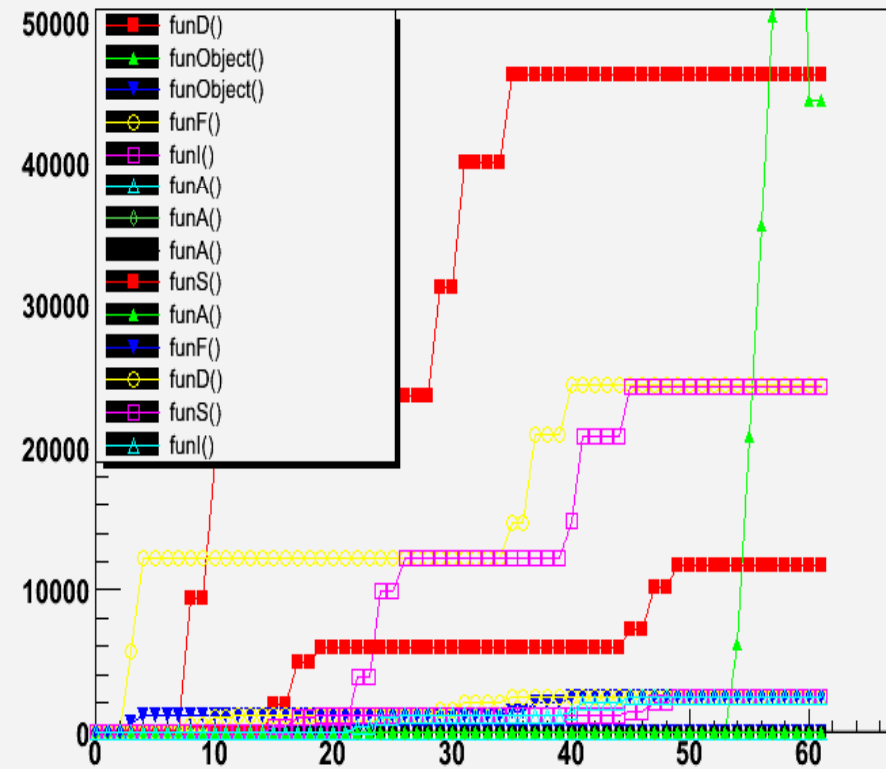
- Close the file with stamps

User interface – quering of information

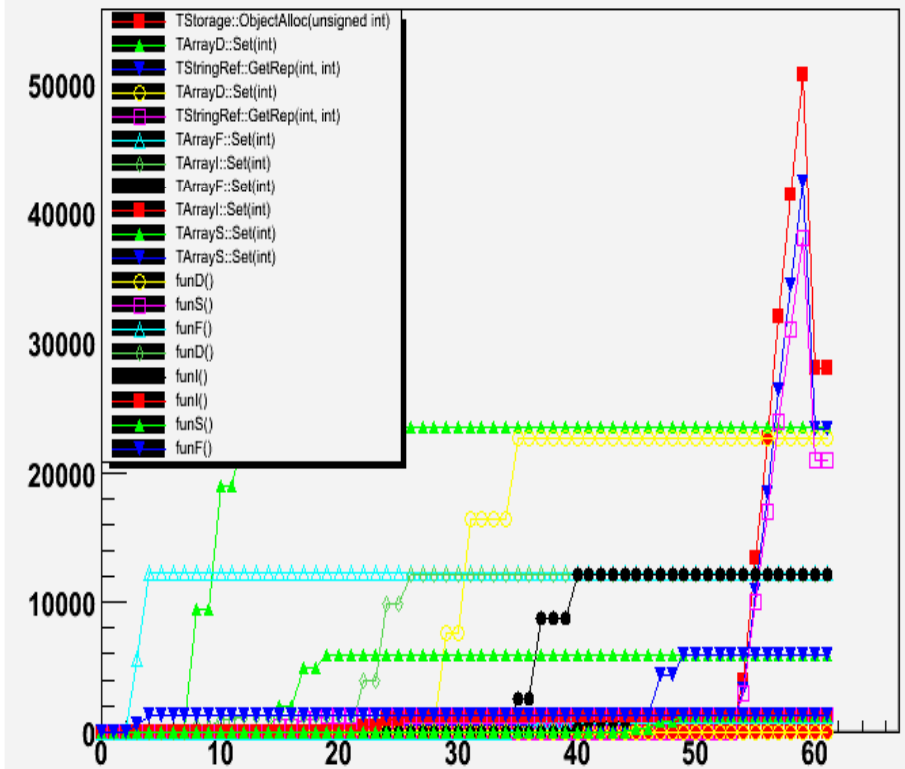
- Initialization from file - `TMemStatDraw draw("memstat.root")`
- Select code information
 - `draw.SelectCode("testMemstat", "fun", TMemStatDraw::kOR)`
 - `draw.SortCode(TMemStatDraw::kAllocSize, TMemStatDraw::kCurrent);`
 - `draw.PrintCode(10,10)`
- Select stack information
 - `draw.SelectStack(TMemStatDraw::kOR)`
 - `draw.SortStack(TMemStatDraw::kAllocSize, TMemStatDraw::kCurrent);`
 - `draw.PrintStack(10,10)`

Time development

Graph



Graph



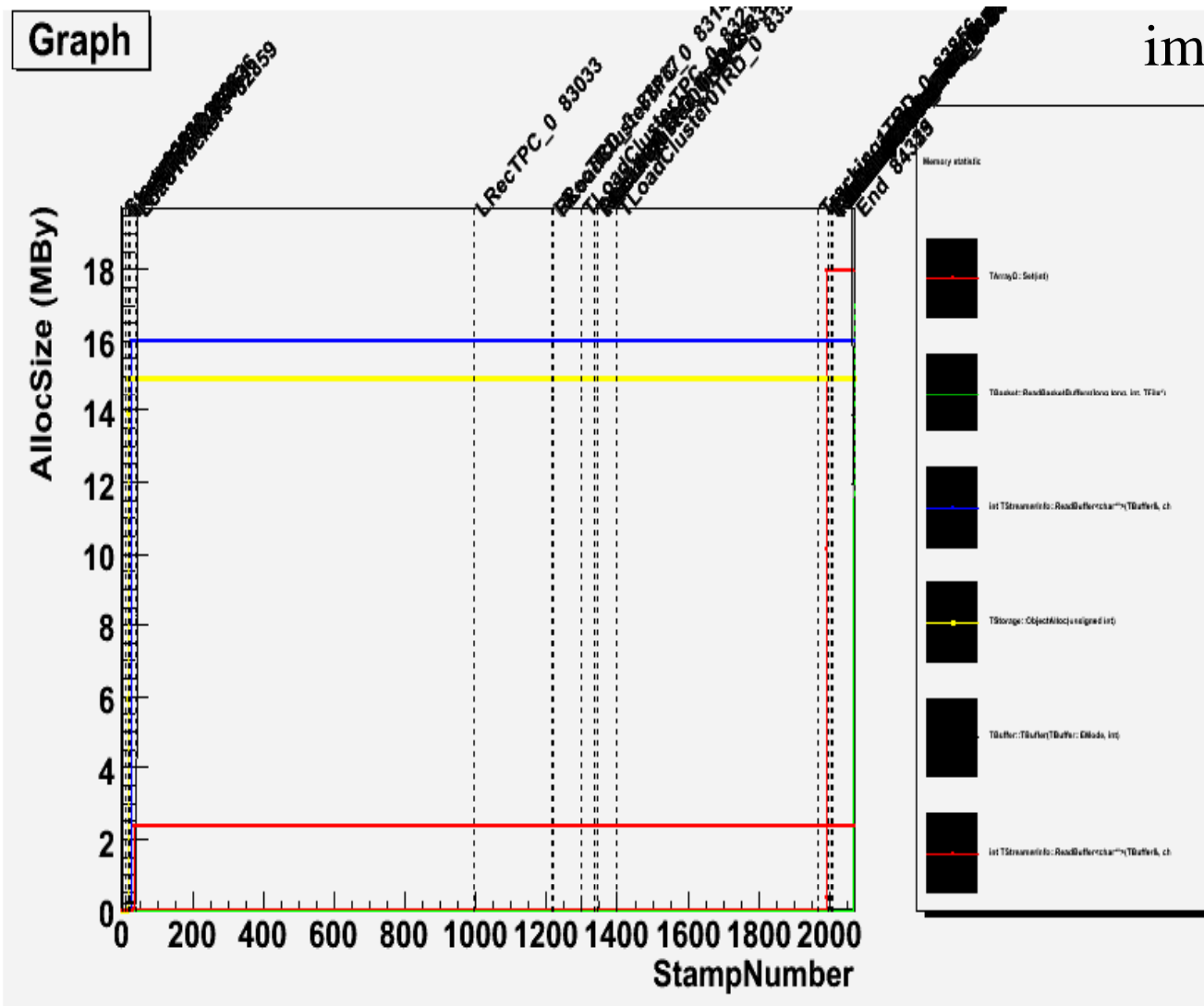
AliRoot example (print)

```
draw.Print("stackdeep 20");
```

```
ID=259440  Sort=9 TotalCount  TotalSize  Count  Size
Current stamp 1993 259440 55.000000 17953760.000000 55 17953760
Max Alloc stamp 1992 259440 55.000000 17953760.000000 55 17953760
Max Size stamp 1992 259440 55.000000 17953760.000000 55 17953760
2 /home/miranov/root6/v5-16-00/lib/libCore.so TArrayD::Set(int)
3 /home/miranov/root6/v5-16-00/lib/libCore.so TArrayD::Streamer(TBuffer&)
4 /home/miranov/root6/v5-16-00/lib/libCore.so TArrayD::StreamerNVirtual(TBuffer&)
5 /home/miranov/root6/v5-16-00/lib/libCore.so [0x662db15]
6 /home/miranov/root6/v5-16-00/lib/libCint.so Cint::G__CallFunc::Execute(void*)
7 /home/miranov/root6/v5-16-00/lib/libCore.so Cint::G__CallFunc::Exec(void*)
8 /home/miranov/root6/v5-16-00/lib/libCore.so TMethodCall::Execute(void*)
9 /home/miranov/root6/v5-16-00/lib/libCore.so TStreamerBase::ReadBuffer(TBuffer&, char*)
10 /home/miranov/root6/v5-16-00/lib/libRIO.so int TStreamerInfo::ReadBuffer<char*>(TBuffer&, char** const&, int, int)
11 /home/miranov/root6/v5-16-00/lib/libRIO.so TBufferFile::ReadClassBuffer(TClass*, void*, int, unsigned int, unsigned int)
12 /home/miranov/root6/v5-16-00/lib/libHist.so TH2D::Streamer(TBuffer&)
13 /home/miranov/root6/v5-16-00/lib/libCore.so TClass::Streamer(void*, TBuffer&)
14 /home/miranov/root6/v5-16-00/lib/libRIO.so TBufferFile::ReadObjectAny(TClass const*)
15 /home/miranov/root6/v5-16-00/lib/libCore.so TObjArray::Streamer(TBuffer&)
16 /home/miranov/root6/v5-16-00/lib/libCore.so TClass::Streamer(void*, TBuffer&)
17 /home/miranov/root6/v5-16-00/lib/libRIO.so TBufferFile::ReadObjectAny(TClass const*)
18 /home/miranov/root6/v5-16-00/lib/libRIO.so TBufferFile::ReadFastArray(void**, TClass const*, int, bool, TMemberInfo*)
19 /home/miranov/root6/v5-16-00/lib/libRIO.so int TStreamerInfo::ReadBuffer<char*>(TBuffer&, char** const&, int, int)
20 /home/miranov/root6/v5-16-00/lib/libRIO.so TBufferFile::ReadClassBuffer(TClass*, void*)
21 /home/miranov/AliRoot7/HEAD/lib/tgt_linux/libTRDbase.so AliTRDCalPID::Streamer(TBuffer&)
Summary for selected:
0 0 47947485.000000 29909237625.000000 770147 209170892
```

Drawing

draw.Draw("stackdeep 20");
A lot of space for
improvement



Future plans

- The code committed in AliRoot
- The system dependent function in separate class TMemStatDepend
 - e.g Backtrace information
 - Not (yet) implemented on all platforms
- GUI – Not working yet – Space for optimization
 - Not critical part
- Integration to the AliRoot ?
 - Problems with platforms
 - My local version of AliSysInfo::AddStamp call memory checker