1600: memory leaks in NEMO3.6 stable

Report on memory leaks monitoring with the ALLINEA Advanced Memory Debugger and Memory Leak tool on the Athena system (https://sccmon.cmcc.it/)

NEMO3.6 stable rev.6287
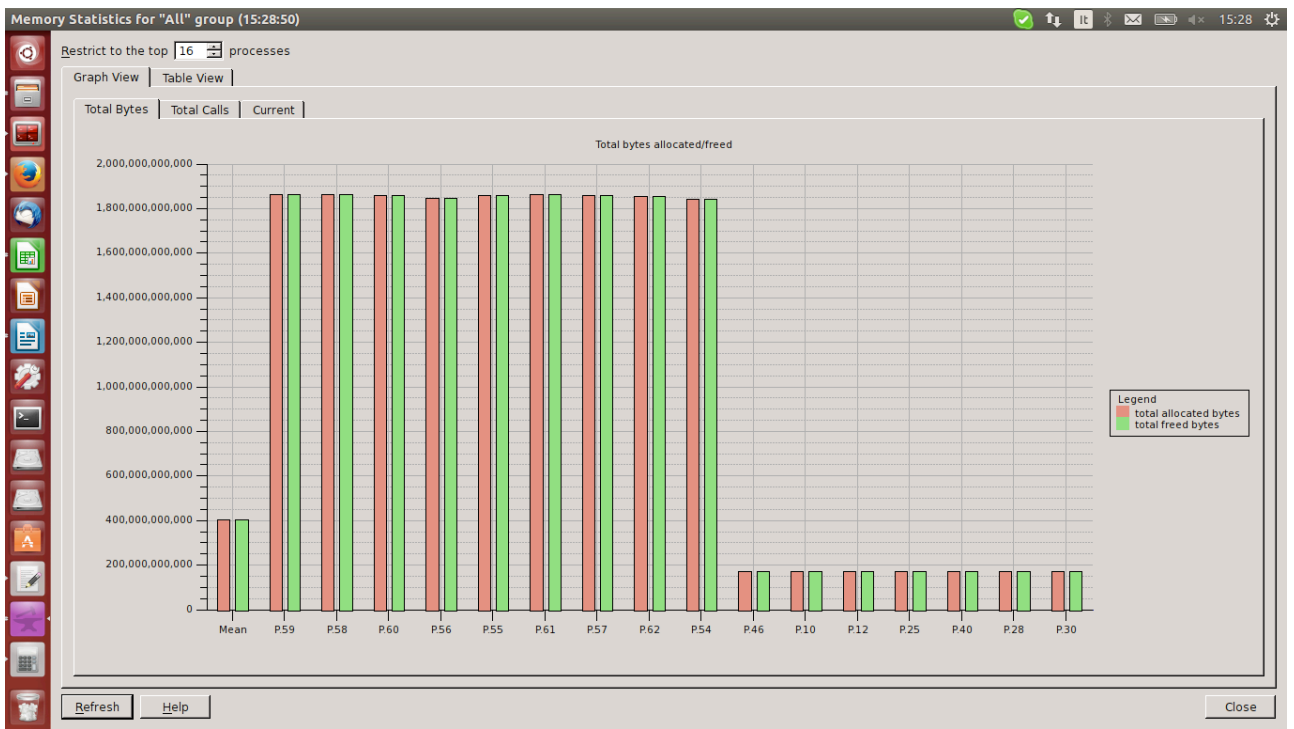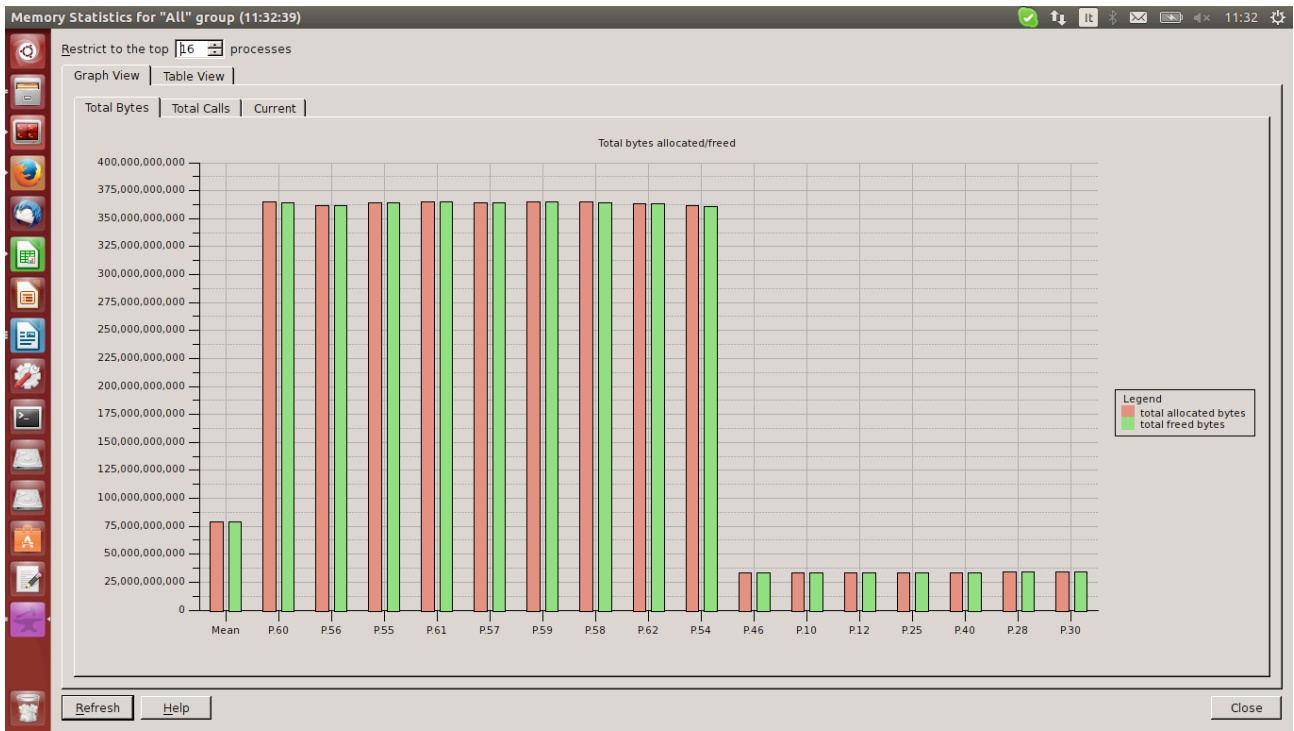
TEST 1 – without XIOS

Configuration: ORCA2-LIM3
Namelist parameters:

jpni = 9
jpnj = 7
jpnij = 63
nn_fsbc = 1
rn_rdt = 2880   rn_rdt has been halved to preserve model stability
nn_write=1000
nn_stock=1000
nn_itend = 30000

Memory allocation has been monitored at regular intervals (every 5000 timesteps). It seems to be constant during the execution. Moreover, no memory leaks have been detected (the number of allocated/deallocated byte for each process is constant during the run). The table reports the monitoring time step, the total currently memory allocated (by all the processes) and the range of memory currently allocated by the single process.

# time step	Total currently allocated (GB)	Currently allocated (MB)
5000	13,35	211,45 – 212,94
10000	13,35	211,47 – 212,97
15000	13,35	211,45 – 212,94
20000	13,35	211,46 – 212,96
25000	13,35	211,51 – 213,46
30000	13,35	211,48 – 213,95

The screenshots report the total bytes allocated by the top (memory intensive) 16 processes respectively after the first 5000 time steps and at the end of the run. We can notice that memory allocated by the north pole processes is about 10 times the memory allocated by the other ones. Anyway, the memory allocated at each time step is always deallocated.

Memory Statistics for "All" group (11:32:39)

Restrict to the top 16 processes

Graph View | Table View

Total Bytes | Total Calls | Current

Total bytes allocated/freed

Legend
total allocated bytes
total freed bytes

Refresh | Help | Close

Memory Statistics for "All" group (15:28:50)

Restrict to the top 16 processes

Graph View | Table View

Total Bytes | Total Calls | Current

Total bytes allocated/freed

Legend
total allocated bytes
total freed bytes

Refresh | Help | Close

TEST 2 – with XIOS (attached mode)

As test 1, with XIOS activated in attached mode.

In this case, we can note that the memory allocated and not freed gradually increases up to ~6%.

# time step	Total currently allocated (GB)	Currently allocated (GB)
5000	108,55	1,55 – 2,59
10000	110,83	1,59 – 2,62
15000	112,02	1,60 – 2,64
20000	112,82	1,62 – 1,76
25000	113,38	1,63 – 1,76
30000	114,15	1,64 – 2,67

Memory Statistics for "All" group (16:41:53)

Restrict to the top 16 processes

Graph View | Table View

Total Bytes | Total Calls | Current

Total bytes allocated/freed

Legend
total allocated bytes
total freed bytes
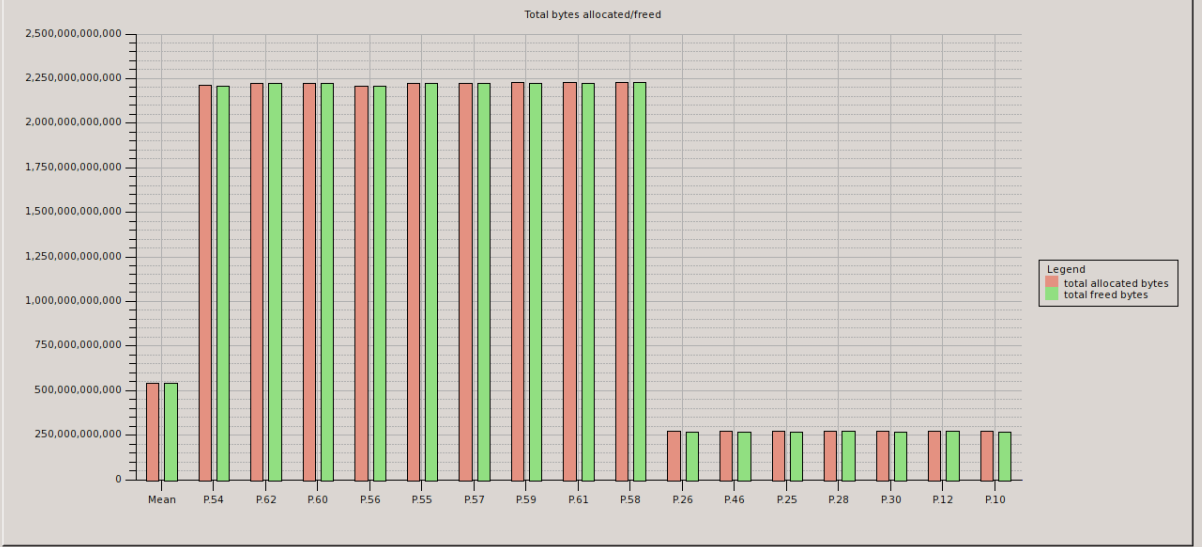
Refresh | Help | Close

NEMO3.6 stable rev.7654

Before evaluating the memory behavior of NEMO with XIOS2, NEMO3.6_stable code has been updated at rev.7654. NEMO execution has been monitored by using the ALLINEA Advanced Memory Debugger and Memory Leak tool by running the code without XIOS, with XIOS v.1 and XIOS v.2. The same configuration and namelist parameters used for TEST 1 and 2 have been used also for these tests.


TEST 3 – without XIOS

Memory allocation has been monitored at regular intervals (every 5000 timesteps). As shown in the following table neither memory increase nor memory leaks have been detected during the whole execution.

Nemo 3.6 rev.6287 – no XIOS			
# time step	Total currently allocated (GB)	Currently allocated (MB)	Free System Memory (GB)
5000	13,41	212,43 – 213,88	209,43
10000	13,41	212,43 – 213,86	208,67
15000	13,41	212,43 – 213,98	208,56
20000	13,41	212,42 – 213,89	208,55
25000	13,41	212,43 – 213,87	208,58
30000	13,41	212,43 – 213,88	208,81

The screenshots report the total bytes allocated by the top (memory intensive) 16 processes respectively after the first 5000 time steps and at the end of the run. As before, memory allocated by the north pole processes is about 10 times the memory allocated by the other ones. Anyway, the memory allocated at each time step is always deallocated.
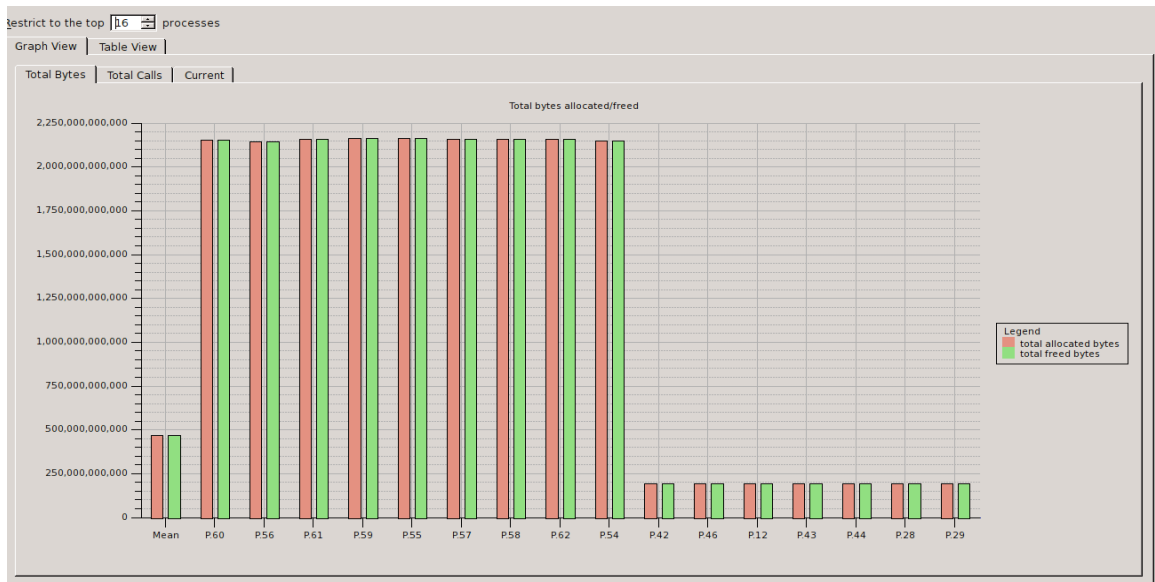
TEST 4 – with XIOS v.1 (attached mode)

As test 3, with XIOS1 activated in attached mode in the NEMO3.6 stable rev.6287 version, neither memory increase nor memory leaks have been detected during the whole execution.

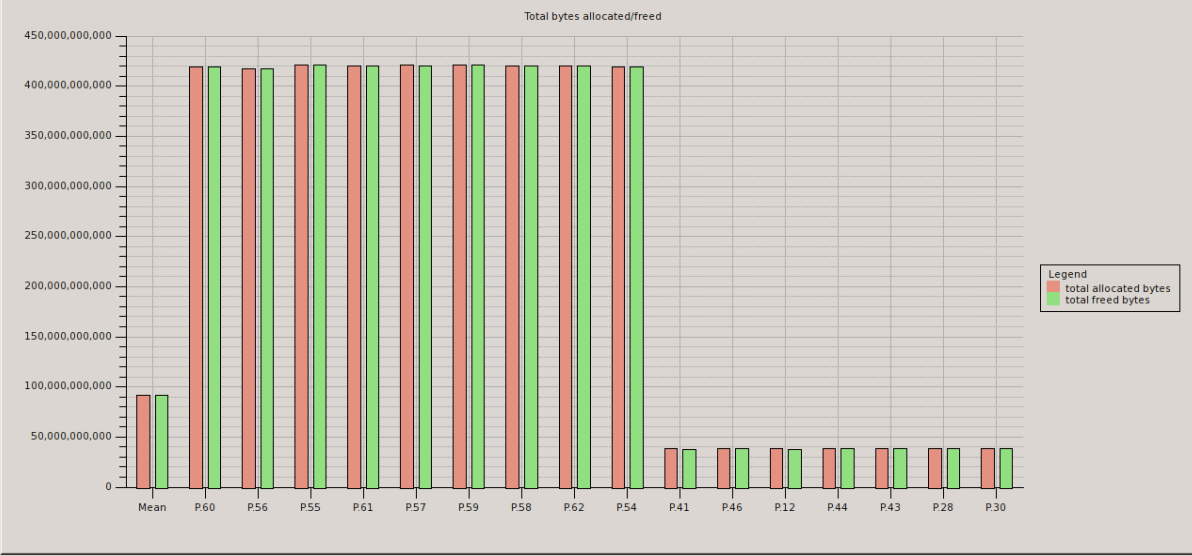|	Nemo 3.6 rev.6287 – with XIOS1		
# time step	Total currently allocated (GB)	Currently allocated (MB)	Free System Memory (GB)
5000	13,97	221,30 – 222,81	195,89
10000	13,98	221,34 – 223,36	195,70
15000	13,97	221,30 – 222,83	195,30
20000	13,97	221,31 – 222,93	195,02
25000	13,98	221,31 – 223,55	194,73
30000	13,97	221,30 – 222,83	194,55

TEST 5 – with XIOS v.2 (attached mode)

As for test 3 and 4, with XIOS2 activated in attached mode in the NEMO3.6 stable rev.6287 version, the memory allocation is constant during the whole execution and no memory leak is detected.

# time step	Nemo 3.6 rev.6287 – with XIOS2		
	Total currently allocated (GB)	Currently allocated (MB)	Free System Memory (GB)
5000	12,22	193,47 – 194,99	193,31
10000	12,22	193,47 – 195,54	193,05
15000	12,22	193,48 – 194,99	192,55
20000	12,22	193,47 – 194,99	192,40
25000	12,22	193,47 – 194,99	192,18
30000	12,22	193,47 – 194,99	192,15

Graph View | Table View

Total Bytes | Total Calls | Current

Total bytes allocated/freed

Legend
total allocated bytes
total freed bytes

Graph View | Table View

Total Bytes | Total Calls | Current

Total bytes allocated/freed

Legend
total allocated bytes
total freed bytes