Review of QNX Momentics

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QNX Neutrino

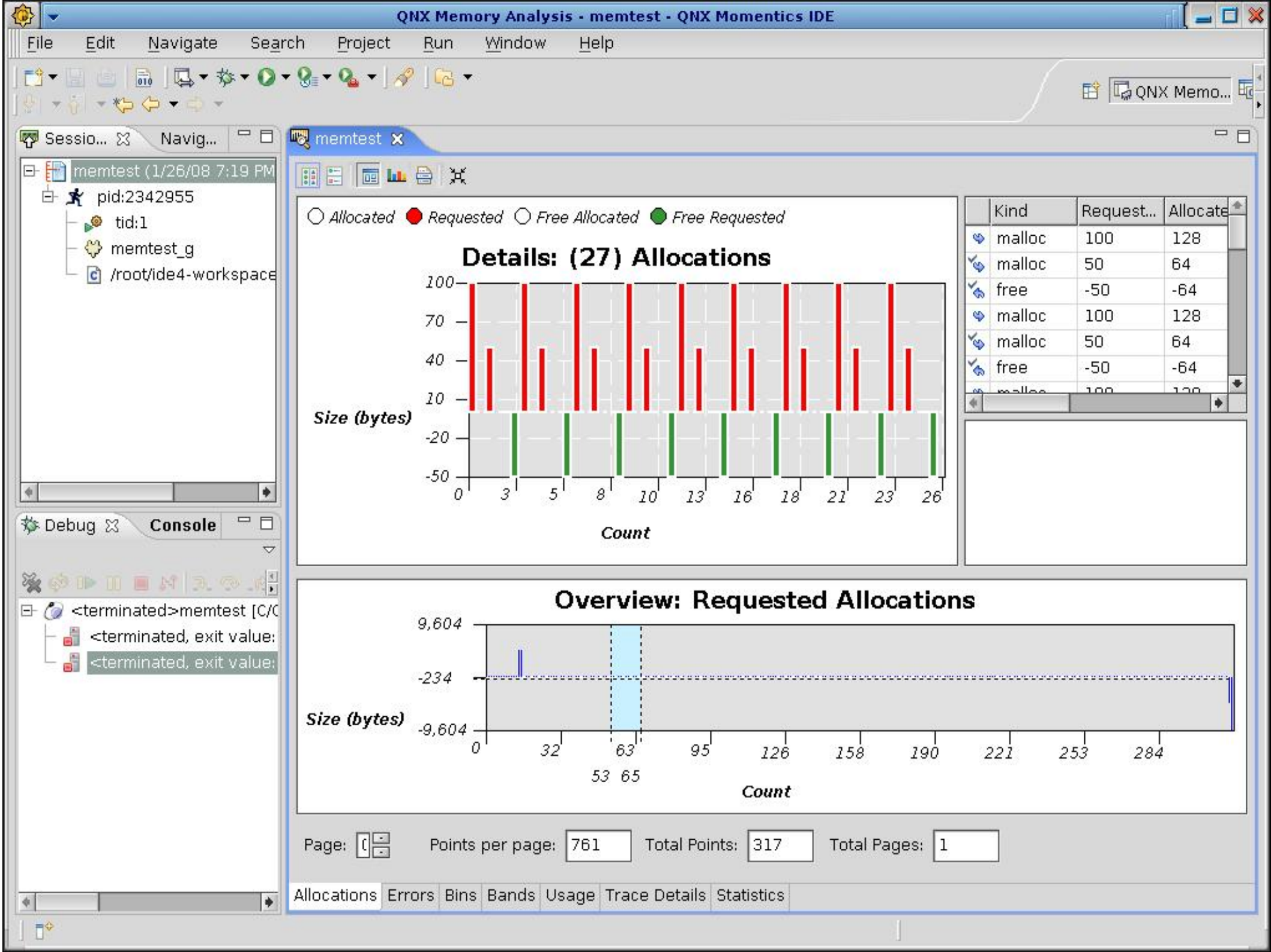
- QNX Neutrino
  - Real-time microkernel.
  - POSIX compliant.
  - Embedded systems market.
  - Proprietary.
  - Source code released.
- Architecture
  - x86, MIPS, PowerPC, SH-4, ARM.

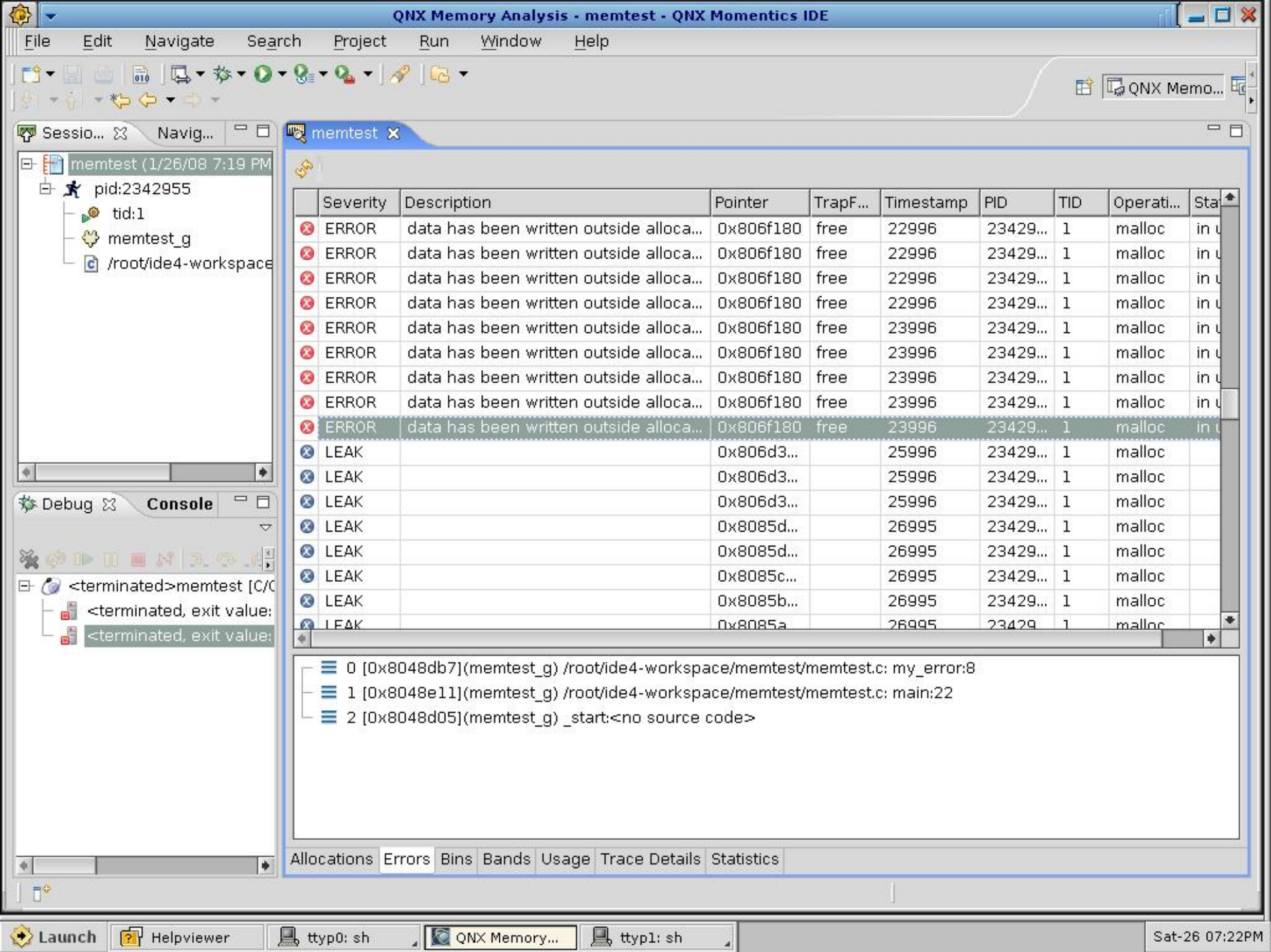
QNX Momentics

- Eclipse based IDE.
- C/C++ and embedded C++.
- Host platforms
  - Linux
  - QNX
  - Windows

Momentics - Features

- Memory Analysis
  - Detect leaks and errors.
  - Debug version of malloc library (libmalloc_g.so).
  - Trace memory allocation/deallocation.


QNX Memory Analysis - memtest - QNX Momentics IDE
File Edit Navigate Search Project Run Window Help
QNX Memo...
Sessio... Navig...
memtest (1/26/08 7:19 PM
pid:2342955
tid:1
memtest_g
/root/ide4-workspace
memtest
Allocated Requested Free Allocated Free Requested
Details: (27) Allocations
100
70
40
10
-20
-50
Size (bytes)
0 3 5 8 10 13 16 18 21 23 26
Count
Kind Request... Allocate
malloc 100 128
malloc 50 64
free -50 -64
malloc 100 128
malloc 50 64
free -50 -64
Debug Console
<terminated>memtest [C/C
<terminated, exit value:
<terminated, exit value:
Overview: Requested Allocations
9,604
-234
-9,604
Size (bytes)
0 32 63 95 126 158 190 221 253 284
53 65
Count
Page: Points per page: 761 Total Points: 317 Total Pages: 1
Allocations Errors Bins Bands Usage Trace Details Statistics


QNX Memory Analysis - memtest - QNX Momentics IDE
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QNX Memo...
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memtest_g
/root/ide4-workspace
Debug Console
<terminated>memtest [C/C
<terminated, exit value:
<terminated, exit value:
memtest
Severity Description Pointer TrapF... Timestamp PID TID Operati... Sta
ERROR data has been written outside alloca... 0x806f180 free 22996 23429... 1 malloc in u
ERROR data has been written outside alloca... 0x806f180 free 22996 23429... 1 malloc in u
ERROR data has been written outside alloca... 0x806f180 free 22996 23429... 1 malloc in u
ERROR data has been written outside alloca... 0x806f180 free 22996 23429... 1 malloc in u
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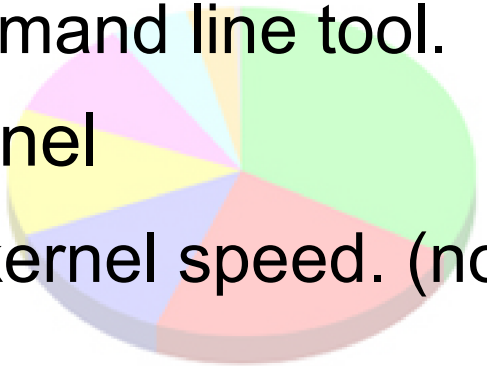
ERROR data has been written outside alloca... 0x806f180 free 23996 23429... 1 malloc in u
ERROR data has been written outside alloca... 0x806f180 free 23996 23429... 1 malloc in u
LEAK 0x806d3... 25996 23429... 1 malloc
LEAK 0x806d3... 25996 23429... 1 malloc
LEAK 0x806d3... 25996 23429... 1 malloc
LEAK 0x8085d... 26995 23429... 1 malloc
LEAK 0x8085d... 26995 23429... 1 malloc
LEAK 0x8085c... 26995 23429... 1 malloc
LEAK 0x8085b... 26995 23429... 1 malloc
0 [0x8048db7](memtest_g) /root/ide4-workspace/memtest/memtest.c: my_error:8
1 [0x8048e11](memtest_g) /root/ide4-workspace/memtest/memtest.c: main:22
2 [0x8048d05](memtest_g) _start:<no source code>
Allocations Errors Bins Bands Usage Trace Details Statistics
Launch Helpviewer ttyp0: sh QNX Memory... ttyp1: sh
Sat-26 07:22PM

System Trace Analysis

- Trace Activation
  - remotely from IDE.
  - tracelogger command line tool.
- Instrumented kernel
  - 98% of regular kernel speed. (no logging).
- Events
  - System calls, scheduling activities, interrupt handling.
  - thread/process creation, destruction and state changes.



C/C++ - test.kev - QNX Momentics IDE

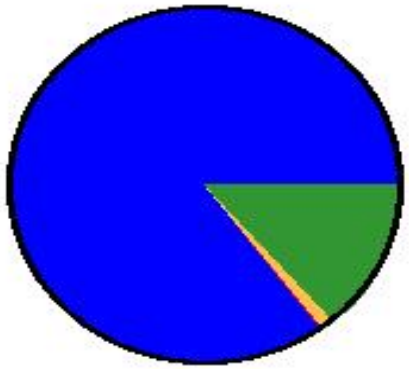
File Edit Refactor Navigate Search Project Run System Profiler Window Help

C/C++ QNX

test.kev

Summary

System Activity

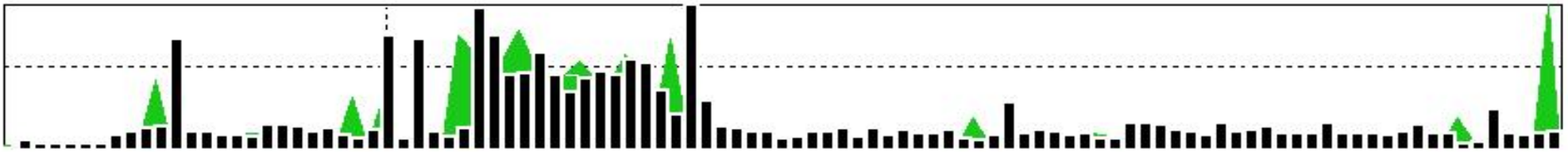


Name	%	Time
Idle	85.0%	19sec 513ms
User	13.6%	3sec 125ms
System	1.1%	249ms
Interr...	0.3%	71ms

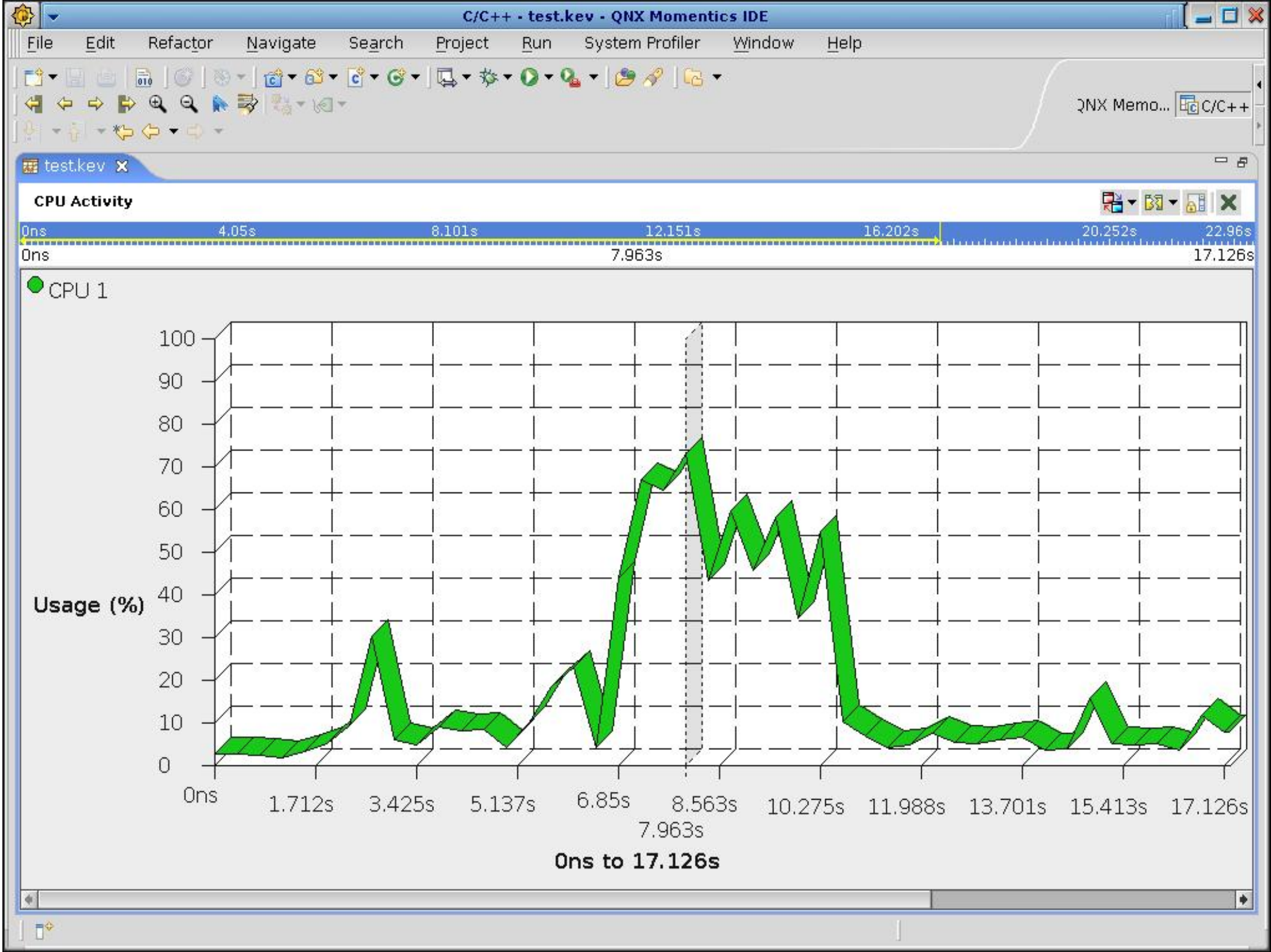
Total Log File Time:	22sec 960ms
CPUs:	1
User Time:	3sec 125ms
System Time:	19sec 834ms
Busy Time:	3sec 447ms
Idle Time:	19sec 513ms

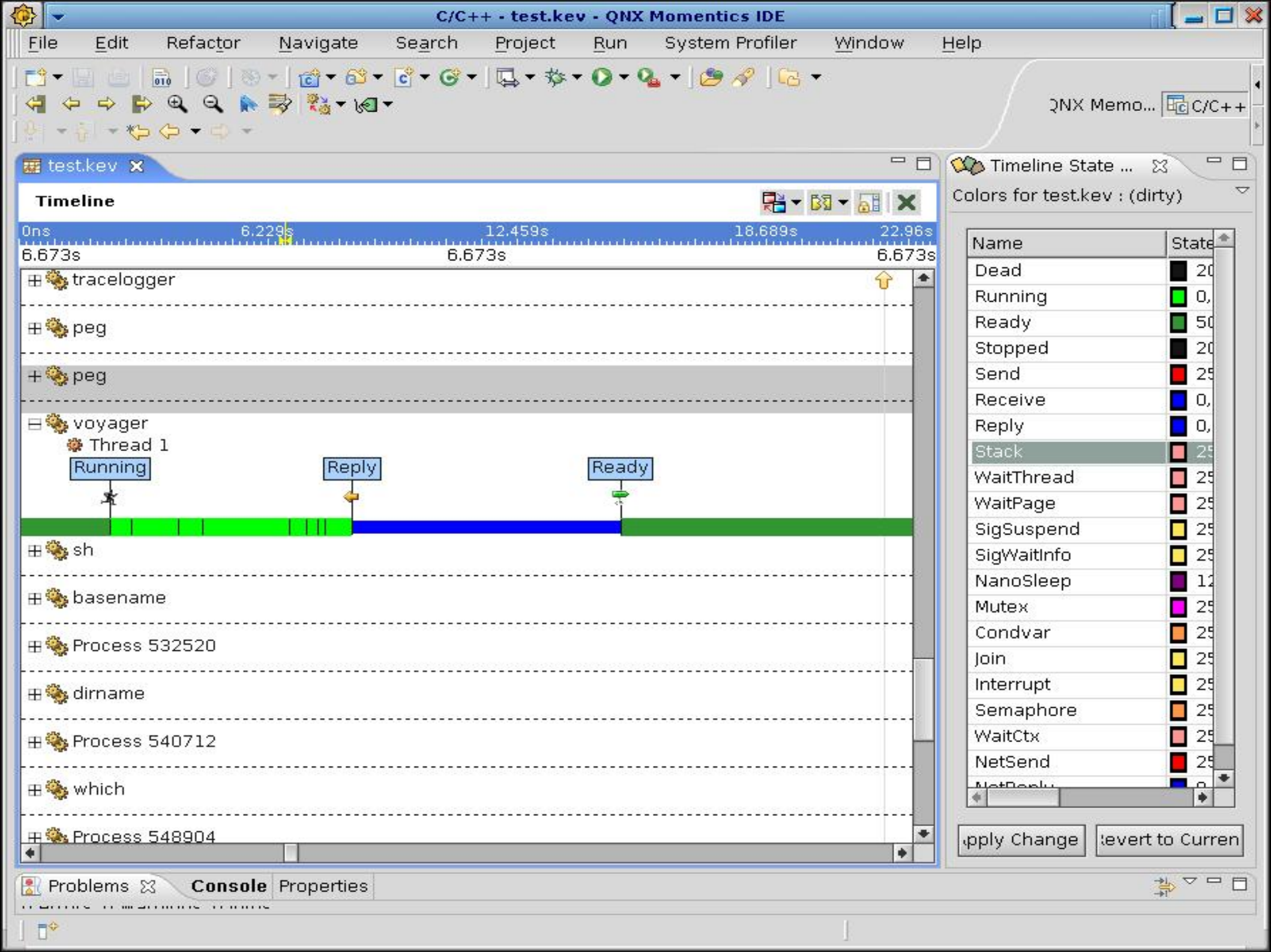
Process & Thread Activity

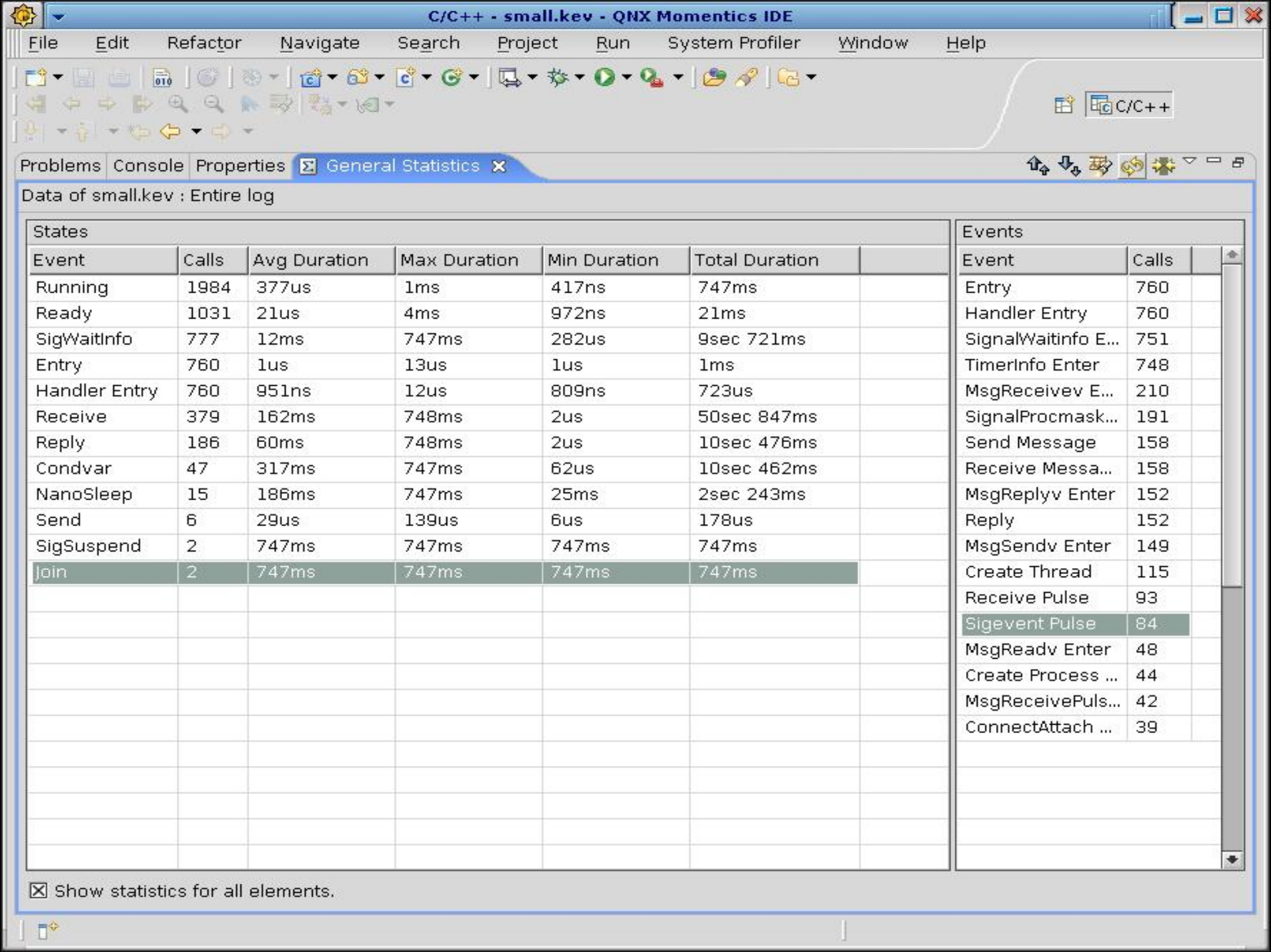
Event Count *CPU 1 Usage*



Process Name	Running Ti...	Ready Ti...	Blocked Ti...	Num Kernel Calls	Num Mess...
procnto-instr	21sec 714...	3sec 52...	3min 1sec	27787	10455
devb-eide	521ms	743ms	3min 51sec	38132	11001
io-graphics	162ms	19ms	1min 8sec	5266	1887
mozserver	139ms	117ms	1min 10sec	4836	4250
Photon	115ms	132ms	22sec 712...	28734	4215


C/C++ - test.kev - QNX Momentics IDE
File Edit Refactor Navigate Search Project Run System Profiler Window Help
QNX Memo... C/C++
test.kev
CPU Activity
0ns 4.05s 8.101s 12.151s 16.202s 20.252s 22.96s
0ns 7.963s 17.126s
CPU 1
Usage (%)
100 90 80 70 60 50 40 30 20 10 0
0ns 1.712s 3.425s 5.137s 6.85s 8.563s 10.275s 11.988s 13.701s 15.413s 17.126s
7.963s
0ns to 17.126s


C/C++ - test.kev - QNX Momentics IDE
File Edit Refactor Navigate Search Project Run System Profiler Window Help
test.kev
Timeline
0ns 6.229s 12.459s 18.689s 22.96s
6.673s 6.673s 6.673s
tracelogger
peg
peg
voyager
Thread 1
Running
Reply
Ready
sh
basename
Process 532520
dirname
Process 540712
which
Process 548904
Timeline State ...
Colors for test.kev : (dirty)
Name
State
Dead
Running
Ready
Stopped
Send
Receive
Reply
Stack
WaitThread
WaitPage
SigSuspend
SigWaitInfo
NanoSleep
Mutex
Condvar
Join
Interrupt
Semaphore
WaitCtx
NetSend
pply Change
evert to Curren
Problems
Console
Properties


C/C++ - small.kev - QNX Momentics IDE
File Edit Refactor Navigate Search Project Run System Profiler Window Help
C/C++
Problems Console Properties General Statistics
Data of small.kev : Entire log
States
Event | Calls | Avg Duration | Max Duration | Min Duration | Total Duration
Running | 1984 | 377us | 1ms | 417ns | 747ms
Ready | 1031 | 21us | 4ms | 972ns | 21ms
SigWaitInfo | 777 | 12ms | 747ms | 282us | 9sec 721ms
Entry | 760 | 1us | 13us | 1us | 1ms
Handler Entry | 760 | 951ns | 12us | 809ns | 723us
Receive | 379 | 162ms | 748ms | 2us | 50sec 847ms
Reply | 186 | 60ms | 748ms | 2us | 10sec 476ms
Condvar | 47 | 317ms | 747ms | 62us | 10sec 462ms
NanoSleep | 15 | 186ms | 747ms | 25ms | 2sec 243ms
Send | 6 | 29us | 139us | 6us | 178us
SigSuspend | 2 | 747ms | 747ms | 747ms | 747ms
Join | 2 | 747ms | 747ms | 747ms | 747ms
Events
Event | Calls
Entry | 760
Handler Entry | 760
SignalWaitinfo E... | 751
TimerInfo Enter | 748
MsgReceivev E... | 210
SignalProcmask... | 191
Send Message | 158
Receive Messa... | 158
MsgReplyv Enter | 152
Reply | 152
MsgSendv Enter | 149
Create Thread | 115
Receive Pulse | 93
Sigevent Pulse | 84
MsgReadv Enter | 48
Create Process ... | 44
MsgReceivePuls... | 42
ConnectAttach ... | 39
Show statistics for all elements.

Application Profiling

- Statistical Profiling
  - Sampling.
  - No recompilation.
  - Attach dynamically.
  - Not totally accurate.
- Instrumented Profiling
  - Recompile.
  - caller-callee information.
  - More intrusive.

QNX Application Profiler - program.c - QNX Momentics IDE

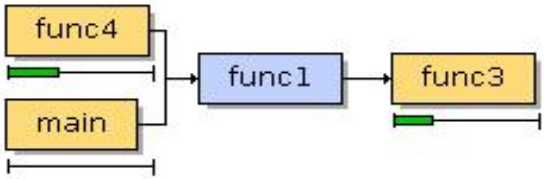
File Edit Refactor Navigate Search Project Run Window Help

Sampling Information | Call Information

Call Pairs

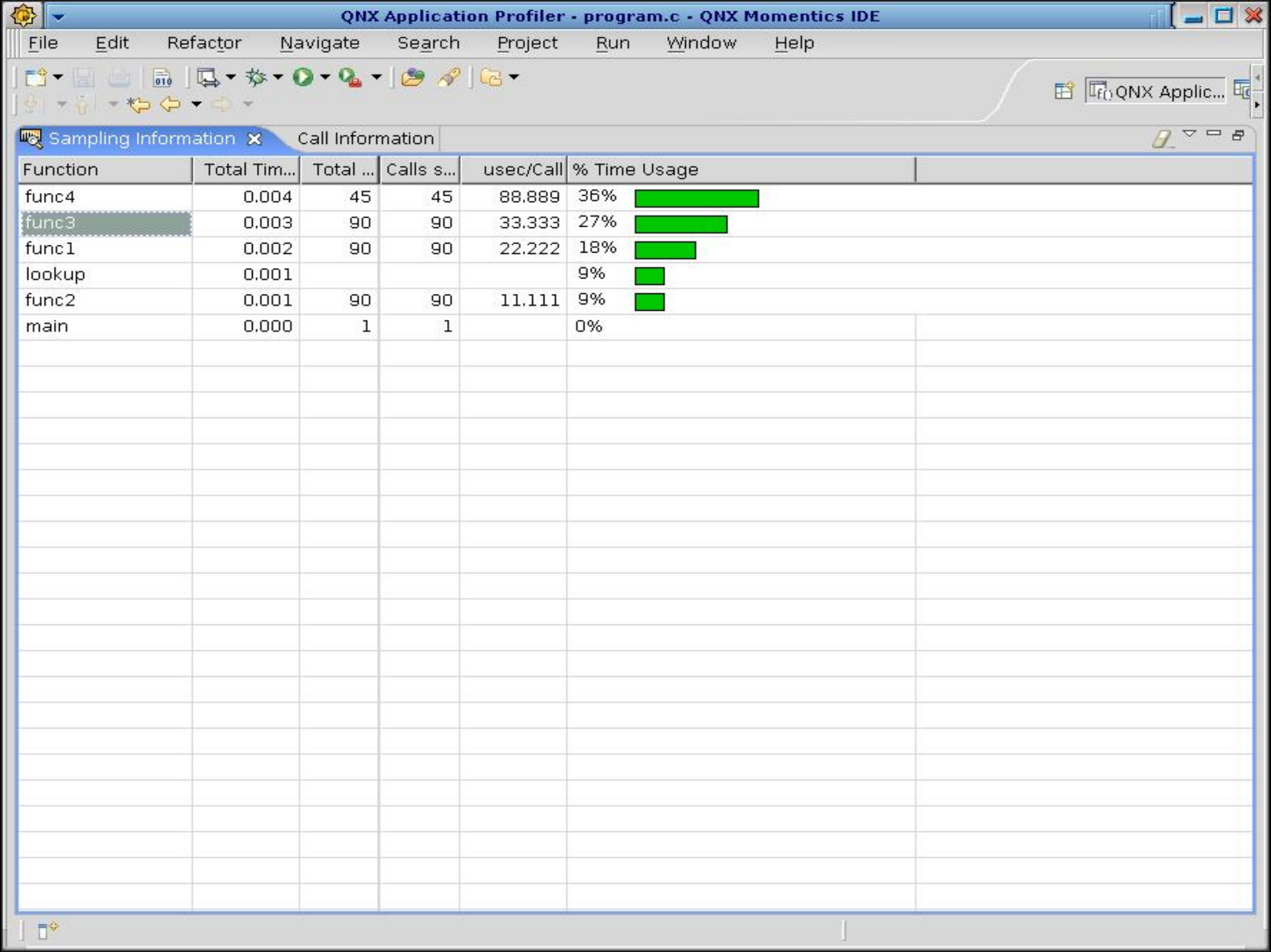
Function	Called From	Call Pair ...
func3	func1	90
func2	func3	90
func1	func4	45
func4	main	45
func1	main	45
main	_start	1

Call Graph



Call Pair Details

Caller	Call Count	Called	Called Co...
func4	45	func3	90
main	45		


QNX Application Profiler - program.c - QNX Momentics IDE
File Edit Refactor Navigate Search Project Run Window Help
QNX Applic...
Sampling Information
Call Information
Function Total Tim... Total ... Calls s... usec/Call % Time Usage
func4 0.004 45 45 88.889 36%
func3 0.003 90 90 33.333 27%
func1 0.002 90 90 22.222 18%
lookup 0.001 9%
func2 0.001 90 90 11.111 9%
main 0.000 1 1 0%