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File:           mcfTrace tool User Manual
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Description:    This document describes the use and features of mcfTrace.
                mcfTrace is a Pin tool developed to capture and record
                control-flow of multithreaded programs running under Pin.
                Each control flow instruction and exception is captured and its
                descriptor is recorded into a trace file.

Date:           Jan 17, 2013
Modification:   REV1      : Jan 17, 2013 - instructions with 62732 version of pin tool
                REV0      : July 10, 2013 - original
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1. Tool Setup (Compilation)

a) Requirements: Linux computer with Pin installed.
To learn more about Pin and to download the latest version visit
http://software.intel.com/en-us/articles/pin-a-dynamic-binary-instrumentation-tool.
Examples in this manual are prepared on a x86_64 quad core machine running CentOS 6.3 OS
with pin-2.12-62732.

b) Download source code files for mcfTrace:
mcfTrace.cpp
mcfTrace.h.
McfTraceAssist.h

c) Copy source code files into Pin directory
pin-2.12-62732-gcc.4.4.7-linux/source/tools/ManualExamples
d) create obj-intel64 directory in
pin-2.12-62732-gcc.4.4.7-linux/source/tools/ManualExamples
e) Add mcfTrace to the TEST_TOOL_ROOTS line in
pin-2.12-62732-gcc.4.4.7-linux/source/tools/ManualExamples/makefile.rules
f) Add -std=c++0x to the TOOL_CXXFLAGS_NOOPT line in
pin-2.12-62732-gcc.4.4.7-linux/source/tools/Config/makefile.unix.config

g) Build tool/tools

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b) mcfTrace tool switches

mcfTrace tool offers a rich set of switches to control instrumentation, capturing, and recording of control flow traces.

You can see the instrumentation options by running the following command.

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        Use the shortest name for the RTN. Names with version substrings are
        preferred over the same name without the substring.
-support_jit_api  [default 0]
        Enables the Jitted Functions Support
-unrestricted_rtn_size  [default 0]
        Use the unrestricted RTN size. When set the RTN size defined by the
        distance between RTN start to the beginning of next RTN.

Statistic switches

-profile  [default 0]
        print amount of memory dynamically allocated but not yet freed by the
        tool
-statistic  [default 0]
        print general statistics

General switches (available in pin and tool)

-slow_asserts  [default 0]
        Perform expensive sanity checks

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Recorded 249692 control transfer instructions.
        91347 ( %36.58 ) Conditional Direct Taken
        103267 ( %41.36 ) Conditional Direct Not Taken
        38616 ( %15.47 ) Unconditional Direct
        16462 ( %6.59 ) Unconditional Indirect
1,1153140,249692,194614,38616,16462
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[milenka@EB245-mhealth3 ManualExamples]$ pin -t obj-intel64/mcfTrace.so -a --
./Matrix_Multiplication_OpenMP 32
mcfTrace: Writing to text file: mcfTrace.out2014_1_18_9.25.36.txt
mcfTrace descriptor: tid, instruction address, target address, conditional or unconditional,
direct or indirect, outcome
mcfTrace: thread begin 0 16961
mcfTrace: thread begin 1 16969
mcfTrace: thread begin 2 16970
mcfTrace: thread begin 3 16971
163

# trace program, skip 3,000,000 instructions, then trace 1,000,000
 [milenka@EB245-mhealth3 ManualExamples]$ pin -t obj-intel64/mcfTrace.so -a -s 3000000 -l
1000000 -- ./Matrix_Multiplication_OpenMP 32
mcfTrace: Writing to text file: mcfTrace.out2014_1_18_9.26.15.txt
mcfTrace descriptor: tid, instruction address, target address, conditional or unconditional,
direct or indirect, outcome
mcfTrace: thread begin 0 16979
mcfTrace: thread begin 1 16987
mcfTrace: thread begin 2 16988
mcfTrace: thread begin 3 16989
188
mcfTrace: Detaching...

# inspect statistics
[milenka@EB245-mhealth3 ManualExamples]$ cat mcfTrace.out2014_1_18_9.26.15.Statistics
Instrumentation Time: 1537.01 ms
Number of Threads: 4
Traced 1000000 instructions
Skipped 3000000 instructions
Recorded 259997 control transfer instructions.
      121934 ( %46.90 ) Conditional Direct Taken
      124424 ( %47.86 ) Conditional Direct Not Taken
      7801 ( %3.00 ) Unconditional Direct
      5838 ( %2.25 ) Unconditional Indirect
4,999999,259997,246358,7801,5838

# inspect trace file
[milenka@EB245-mhealth3 ManualExamples]$ head mcfTrace.out2014_1_18_9.26.15.txt
1, 0x0000003685e09bbe, 0x0000003685e09be4, C, D, NT
1, 0x0000003685e09bc9, 0x0000003685e09bb8, C, D, T
2, 0x0000003685e09bbe, 0x0000003685e09be4, C, D, NT
1, 0x0000003685e09bbe, 0x0000003685e09be4, C, D, NT
3, 0x0000003685e09bbe, 0x0000003685e09be4, C, D, NT
1, 0x0000003685e09bc9, 0x0000003685e09bb8, C, D, T
2, 0x0000003685e09bc9, 0x0000003685e09bb8, C, D, T
3, 0x0000003685e09bc9, 0x0000003685e09bb8, C, D, T
2, 0x0000003685e09bbe, 0x0000003685e09be4, C, D, NT
1, 0x0000003685e09bbe, 0x0000003685e09be4, C, D, NT
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mcfTrace Descriptor encoding: ThreadID ( 1 byte ), Instruction address ( 8 bytes ), Branch
target ( 8 bytes ), Branch type and outcome ( 1 byte )
mcfTrace: thread begin 0 17072
Opening Input File:</home/milenka/parmibench-master/stringsearch/testdata/SearchString16.txt>
Input File Size is:<16526618>
Done Reading Input File!
Opening Pattern File:</home/milenka/parmibench-master/stringsearch/testdata/testpattern5.txt>
Done Reading Pattern File!
---***Case-sensitive Boyer-Moore-Horspool string search***---
mcfTrace: thread begin 1 17080
mcfTrace: thread begin 2 17081
mcfTrace: thread begin 3 17082
mcfTrace: thread begin 4 17083
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[milenka@EB245-mhealth3 ManualExamples]$ ls mcfTrace.out2014_1_18_9.34.1*
total 48995068
. . .
-rw-rw-r--. 1 milenka milenka 50000000058 Jan 17 16:51 mcfTrace.out2014_1_18_9.34.1.bin
-rw-rw-r--. 1 milenka milenka         387 Jan 17 16:51
mcfTrace.out2014_1_18_9.34.1.Statistics
. . .

[milenka@EB245-mhealth3 ManualExamples]$ head mcfTrace.out2014_1_18_9.34.1.Statistics
Instrumentation Time: 1.84118e+06 ms
Number of Threads: 5
Traced 9519991023 instructions
Skipped 0 instructions
Recorded 2777777781 control transfer instructions.
        1930338937 ( %69.49 ) Conditional Direct Taken
        847384088 ( %30.51 ) Conditional Direct Not Taken
        29171 ( %0.00 ) Unconditional Direct
        25585 ( %0.00 ) Unconditional Indirect
5,9519991022,2777777781,2777723025,29171,25585
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