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File:           mcfTRaptor tool User Manual
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Description:    This document describes the use and features of mcfTRaptor.
                mcfTRaptor 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:           July 10, 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 mcfTRaptor:
mcfTRaptor.cpp
mcfTRaptor.h.
mcfTRaptorAssist.h
mcfTRaptorPrivateAnalysis.h
mcfTRaptorSharedAnalysis.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 mcfTRaptor 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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pin -t obj-intel64/mcfTRaptor.so -- executable args

b) mcfTRaptor tool switches
mcfTRaptor 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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-discard_line_info_all  [default 0]
        Discard line information for all modules.
-dwarf_file
        Point pin to a different file for debug information. Syntax:
        app_executable:<path_to_different_fileExaple (OS X): -dwarf_file
        get_source_app:get_s
        ource_app.dSYM/Contents/Resources/DWARF/get_source_app

Symbols controls

-short_name  [default 0]
        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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        Mispredicted target for indirect unconditional branches: Descriptor Type (1 Byte),
Thread ID (1 Byte), bCnt (4 Bytes), T (1 Bytes), Target Address (8 Bytes)
        Exceptions: Descriptor Type (1 Byte), Thread ID (1 Byte), bCnt (4 Bytes), iCnt (4
Bytes), Target Address (8 Bytes)
mcfTRaptor: Private TRaptor thread begin 0 9505
. . .
inscount2.cpp             mcfTRaptor.out2014_1_17_20.11.55.bin  thread_unix.c

[milenka@EB245-mhealth3 ManualExamples]$ ls
. . .
inscount2.cpp             mcfTRaptor.out2014_1_17_20.11.55.bin         temp
inscount_tls.cpp          mcfTRaptor.out2014_1_17_20.11.55.Statistics  thread_unix.c

[milenka@EB245-mhealth3 ManualExamples]$ $cat mcfTRaptor.out2014_1_17_20.11.55.Statistics
mcfTRaptor: Instrumentation Time 1703.05 ms
mcfTRaptor: Skipped 0 instructions
mcfTRaptor: Recorded 170400 direct conditional branches, indirect unconditional branches, and
exceptions
155944 conditional direct branches
        137609 ( %88.24 ) outcomes predicted
        18335 ( %11.76 ) outcomes mispredicted
14456 unconditional indirect branches
        13126 ( %90.80 ) targets predicted
        1330 ( %9.20 ) targets mispredicted
0 exceptions
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0, 2
0, 2
0, 14
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        Mispredicted outcomes for direct conditional branches: Thread ID, bCnt
        Mispredicted targets for indirect unconditional branches: Thread ID, bCnt, T, Target
Address
        Exceptions: Thread ID, bCnt, iCnt, Target Address
mcfTRaptor: Private TRaptor thread begin 0 9666
mcfTRaptor: Private TRaptor thread begin 1 9674
mcfTRaptor: Private TRaptor thread begin 2 9675
mcfTRaptor: Private TRaptor thread begin 3 9676
mcfTRaptor: Private TRaptor thread begin 4 9677
mcfTRaptor: Private TRaptor thread begin 5 9678
mcfTRaptor: Private TRaptor thread begin 6 9679
mcfTRaptor: Private TRaptor thread begin 7 9680
314
mcfTRaptor: Detaching...

# inspect Statistics file
[milenka@EB245-mhealth3 ManualExamples]$ head mcfTRaptor.out2014_1_17_20.25.47.Statistics
mcfTRaptor: Instrumentation Time 2059.93 ms
mcfTRaptor: Skipped 3000000 instructions
mcfTRaptor: Recorded 278460 direct conditional branches, indirect unconditional branches, and
exceptions
277176 conditional direct branches
        275690 ( %99.46 ) outcomes predicted
        1486 ( %0.54 ) outcomes mispredicted
1284 unconditional indirect branches
        1263 ( %98.36 ) targets predicted
        21 ( %1.64 ) targets mispredicted
0 exceptions

# inspect trace file
[milenka@EB245-mhealth3 ManualExamples]$ head mcfTRaptor.out2014_1_17_20.25.47.txt
2, 1
6, 1
1, 1
4, 2
2, 2
3, 2
5, 2
6, 2
2, 1
3, 2
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mcfTRaptor: Private TRaptor thread begin 0 19727
Opening Input File:</home/opt/parmibench-master/stringsearch/testdata/SearchString16.txt>
Input File Size is:<16526618>
Done Reading Input File!
Opening Pattern File:</home/opt/parmibench-master/stringsearch/testdata/testpattern5.txt>
Done Reading Pattern File!
---***Case-sensitive Boyer-Moore-Horspool string search***---
mcfTRaptor: Private TRaptor thread begin 1 19735
mcfTRaptor: Private TRaptor thread begin 2 19736
mcfTRaptor: Private TRaptor thread begin 3 19737
mcfTRaptor: Private TRaptor thread begin 4 19738

[milenka@EB245-mhealth3 ManualExamples]$ ls -lah
total 526M
. . .
-rw-rw-r--.  1 akt0001 akt0001 203M Jan 18 15:13 mcfTRaptor.out2014_1_18_14.28.15.bin
-rw-rw-r--.  1 akt0001 akt0001  442 Jan 18 15:13 mcfTRaptor.out2014_1_18_14.28.15.Statistics
. . .

[milenka@EB245-mhealth3 ManualExamples]$ cat mcfTRaptor.out2014_1_18_14.28.15.Statistics
mcfTRaptor: Instrumentation Time 2.72592e+06 ms
mcfTRaptor: Skipped 0 instructions
mcfTRaptor: Recorded 2993808012 direct conditional branches, indirect unconditional branches,
and exceptions
2993780165 conditional direct branches
        2951262433 ( %98.58 ) outcomes predicted
        42517732 ( %1.42 ) outcomes mispredicted
27847 unconditional indirect branches
        26837 ( %96.37 ) targets predicted
        1010 ( %3.63 ) targets mispredicted
0 exceptions
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