ISE 22/23 - Práctica 4: Benchmarking y ajuste del sistema

Clara María Romero Lara

UNIVERSIDAD DE GRANADA

Ejercicio 1: Phoronix

> *Una vez que haya indagado sobre los benchmarks disponibles en Phoronix, seleccione como mínimo dos de ellos y proceda a ejecutarlos en Ubuntu y CentOS. Comente las diferencias.*

Instalación de Phoronix

Seguiremos estas instrucciones. Para instalar Phoronix vamos a necesitar wget y, como dependencia, PHP. Así que nos aseguraremos de instalarlas en ambas máquinas antes de seguir.

Luego, descargaremos con wget el paquete de Phoronix. Podemos comprobar que se ha instalado correctamente ejecutando el comando `phoronix-test-suite list-available-tests` , que lista los benchmark disponibles.

UbuntuServer

```
> wget https://phoronix-test-suite.com/releases/repo/pts.debian/files/phoronix-test-suite_10.8.4_all.deb
> sudo apt install ./phoronix-test-suite_10.8.4_all.deb
> phoronix-test-suite list-available-tests
```

```
Processing triggers for libc-bin (2.31-0ubuntu9.7) ...
Processing triggers for man-db (2.9.1-1) ...
Processing triggers for install-info (6.7.0.dfsg.2-5) ...
clararl@practicasise:~$ wget https://phoronix-test-suite.com/releases/repo/pts.debian/files/phoronix-test-suite_10.8.4_all.deb
--2023-01-13 03:11:58--  https://phoronix-test-suite.com/releases/repo/pts.debian/files/phoronix-test-suite_10.8.4_all.deb
Resolving phoronix-test-suite.com (phoronix-test-suite.com)... 192.211.48.82
Connecting to phoronix-test-suite.com (phoronix-test-suite.com)|192.211.48.82|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 2352160 (2.2M) [application/x-debian-package]
Saving to: 'phoronix-test-suite_10.8.4_all.deb'

phoronix-test-suite_10.8.4_all.de 100%[=====================================================================>]   2.24M  2.23MB/s    in 1.0s

2023-01-13 03:12:00 (2.23 MB/s) - 'phoronix-test-suite_10.8.4_all.deb' saved [2352160/2352160]

clararl@practicasise:~$ sudo apt install ./phoronix-test-suite_10.8.4_all.deb
Reading package lists... Done
Building dependency tree
Reading state information... Done
Note, selecting 'phoronix-test-suite' instead of './phoronix-test-suite_10.8.4_all.deb'
The following packages were automatically installed and are no longer required:
  fonts-dejavu fonts-dejavu-extra fping libmysqlclient21 libodbc1 libonig5 libopenipmi0 libsensors-config libsensors5 libsnmp-base
  libsnmp35 mysql-client php-bcmath php-ldap php-mbstring php-mysql php7.4-bcmath php7.4-ldap php7.4-mbstring php7.4-mysql snmpd
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  build-essential dpkg-dev fakeroot g++ g++-9 libalgorithm-diff-perl libalgorithm-diff-xs-perl libalgorithm-merge-perl libdpkg-perl
  libfakeroot libfile-fcntllock-perl libstdc++-9-dev make
Suggested packages:
  debian-keyring g++-multilib g++-9-multilib gcc-9-doc bzr libstdc++-9-doc make-doc
The following NEW packages will be installed:
  build-essential dpkg-dev fakeroot g++ g++-9 libalgorithm-diff-perl libalgorithm-diff-xs-perl libalgorithm-merge-perl libdpkg-perl
  libfakeroot libfile-fcntllock-perl libstdc++-9-dev make phoronix-test-suite
0 upgraded, 14 newly installed, 0 to remove and 118 not upgraded.
Need to get 11.4 MB/13.8 MB of archives.
After this operation, 98.7 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
```

```
clararl@practicasise:~$  phoronix-test-suite list-available-tests


NOTICE: The following PHP extensions are OPTIONAL but recommended:

Bzip2     The bzcompress/bzip2 support can be used for greater file compression.
SQLite3   SQLite3 is required when running a Phoromatic server.
CURL      CURL is recommended for an enhanced download experience.

Updated OpenBenchmarking.org Repository Index
pts: 510 Distinct Tests, 2169 Test Versions, 56 Suites
Available Changes From 3 July 2022 To 13 January
Updated Test:   pts/ai-benchmark              AI Benchmark Alpha
Updated Test:   pts/aircrack-ng               Aircrack-ng
Updated Test:   pts/aom-av1                   AOM AV1
Updated Test:   pts/astcenc                   ASTC Encoder
Updated Test:   pts/avifenc                   libavif avifenc
Updated Test:   pts/batman-knight             Batman: Arkham Knight
Updated Test:   pts/blender                   Blender
Updated Test:   pts/blosc                     C-Blosc
Updated Test:   pts/brl-cad                   BRL-CAD
Updated Test:   pts/build-erlang              Timed Erlang/OTP Compilation
Updated Test:   pts/build-linux-kernel        Timed Linux Kernel Compilation
Updated Test:   pts/build-nodejs              Timed Node.js Compilation
Updated Test:   pts/build-php                 Timed PHP Compilation
New Test:       pts/build-python              Timed CPython Compilation
Updated Test:   pts/build-wasmer              Timed Wasmer Compilation
Updated Test:   pts/clickhouse                ClickHouse
Updated Test:   pts/cloudsuite-da             CloudSuite Data Analytics
Updated Test:   pts/cloudsuite-ga             CloudSuite Graph Analytics
Updated Test:   pts/cloudsuite-ma             CloudSuite In-Memory Analytics
Updated Test:   pts/cloudsuite-ms             CloudSuite Media Streaming
New Test:       pts/cockroach                 CockroachDB
Updated Test:   pts/compress-7zip             7-Zip Compression
Updated Test:   pts/couchdb                   Apache CouchDB
Updated Test:   pts/cpuminer-opt              Cpuminer-Opt
```

Rocky

```
> wget https://phoronix-test-suite.com/releases/phoronix-test-suite-10.8.4.tar.gz
> tar -xf phoronix-test-suite-10.8.4.tar.gz
> cd phoronix-test-suite
> sudo ./install-sh
> phoronix-test-suite list-available-tests
```

```
[clararl@localhost ~]$ wget https://phoronix-test-suite.com/releases/phoronix-test-suite-10.8.4.tar.gz
--2023-01-13 04:44:06--  https://phoronix-test-suite.com/releases/phoronix-test-suite-10.8.4.tar.gz
Resolving phoronix-test-suite.com (phoronix-test-suite.com)... 192.211.48.82
Connecting to phoronix-test-suite.com (phoronix-test-suite.com)|192.211.48.82|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 4256978 (4.1M) [application/x-gzip]
Saving to: 'phoronix-test-suite-10.8.4.tar.gz'

phoronix-test-suite-10.8.4.tar.gz 100%[=====================================================================>]   4.06M  3.01MB/s    in 1.3s

2023-01-13 04:44:08 (3.01 MB/s) - 'phoronix-test-suite-10.8.4.tar.gz' saved [4256978/4256978]

[clararl@localhost ~]$ tar -xf phoronix-test-suite-10.8.4.tar.gz
[clararl@localhost ~]$ ./
.ansible/            .cache/              .local/              .ssh/                phoronix-test-suite/
[clararl@localhost ~]$ ls phoronix-test-suite
phoronix-test-suite/              phoronix-test-suite-10.8.4.tar.gz
[clararl@localhost ~]$ ls phoronix-test-suite
phoronix-test-suite/              phoronix-test-suite-10.8.4.tar.gz
[clararl@localhost ~]$ ls phoronix-test-suite/
AUTHORS  ChangeLog  SECURITY.md  documentation  install.bat    ob-cache            phoronix-test-suite.bat  release-highlights.md
COPYING  README.md  deploy       install-sh     install_macos  phoronix-test-suite  pts-core
[clararl@localhost ~]$ sudo ./phoronix-test-suite/install-sh
[sudo] password for clararl:

To install the Phoronix Test Suite you must first change directories to phoronix-test-suite/. For support visit: http://www.phoronix-te
st-suite.com/

[clararl@localhost ~]$ cd phoronix-test-suite
[clararl@localhost phoronix-test-suite]$ sudo ./install-sh
which: no xdg-mime in (/sbin:/bin:/usr/sbin:/usr/bin)

Phoronix Test Suite Installation Completed

Executable File: /usr/bin/phoronix-test-suite
Documentation: /usr/share/doc/phoronix-test-suite/
```

```
pts/apache                Apache HTTP Server                          System
pts/apache-siege          Apache Siege                                System
pts/appleseed             Appleseed                                   System
pts/arrayfire             ArrayFire                                   Processor
pts/askap                 ASKAP                                       System
pts/asmfish               asmFish                                     Processor
pts/astcenc               ASTC Encoder                                System
pts/avifenc               libavif avifenc                             Processor
pts/basemark              Basemark GPU                                System
pts/basis                 Basis Universal                             System
pts/blake2                BLAKE2                                      Processor
pts/blender               Blender                                     System
pts/blogbench             BlogBench                                   Disk
pts/blosc                 C-Blosc                                     Processor
pts/bork                  Bork File Encrypter                         Processor
pts/botan                 Botan                                       Processor
pts/brl-cad               BRL-CAD                                     System
pts/build-apache          Timed Apache Compilation                    Processor
pts/build-clash           Timed Clash Compilation                     Processor
pts/build-eigen           Timed Eigen Compilation                     Processor
pts/build-erlang          Timed Erlang/OTP Compilation                Processor
pts/build-ffmpeg          Timed FFmpeg Compilation                    Processor
pts/build-gcc             Timed GCC Compilation                       Processor
pts/build-gdb             Timed GDB GNU Debugger Compilation          Processor
pts/build-gem5            Timed Gem5 Compilation                      Processor
pts/build-godot           Timed Godot Game Engine Compilation         Processor
pts/build-imagemagick     Timed ImageMagick Compilation               Processor
pts/build-linux-kernel    Timed Linux Kernel Compilation              Processor
pts/build-llvm            Timed LLVM Compilation                      Processor
pts/build-mesa            Timed Mesa Compilation                      Processor
pts/build-mplayer         Timed MPlayer Compilation                   Processor
pts/build-nodejs          Timed Node.js Compilation                   Processor
pts/build-php             Timed PHP Compilation                       Processor
pts/build-python          Timed CPython Compilation                   Processor
pts/build-wasmer          Timed Wasmer Compilation                    Processor
pts/build2                Build2                                      Processor
```

Ejecución benchmark 1: CacheBench

CacheBench es el benchmark más descargado de Phoronix. Es un test para medir el ancho de banda de la memoria caché.

```
> phoronix-test-suite benchmark cachebench
```

```
      :               VMware SVGA II
  Vulkan:             1.1.182
  Screen:             2048x2048

        :             Oracle VirtualBox v1.2
  BIOS Version:       VirtualBox
  Chipset:            Intel 440FX 82441FX PMC
  Audio:              Intel 82801AA AC 97 Audio
  Network:            2 x Intel 82540EM

    :                 1024MB

   :                  2 x 11GB VBOX HDD + 16GB VBOX HDD
  File-System:        ext4
  Mount Options:      relatime rw
  Disk Scheduler:     MQ-DEADLINE
  Disk Details:       Block Size: 4096

             :        Ubuntu 20.04
  Kernel:             5.4.0-136-generic (x86_64)
  Compiler:           GCC 9.4.0
  System Layer:       Oracle VMware
  Security:           itlb_multihit: KVM: Vulnerable
                      + l1tf: Mitigation of PTE Inversion
                      + mds: Mitigation of Clear buffers; SMT Host state unknown
                      + meltdown: Mitigation of PTI
                      + mmio_stale_data: Mitigation of Clear buffers; SMT Host state unknown
                      + retbleed: Vulnerable
                      + spec_store_bypass: Vulnerable
                      + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization
                      + spectre_v2: Mitigation of Retpolines STIBP: disabled RSB filling PBRSB-eIBRS: Not affected
                      + srbds: Unknown: Dependent on hypervisor status
                      + tsx_async_abort: Not affected

  Would you like to save these test results (Y/n):
```

```
If desired, enter a new description below to better describe this result set / system configuration under test.
Press ENTER to proceed without changes.

Current Description: Oracle VMware testing on Ubuntu 20.04 via the Phoronix Test Suite.

New Description:

CacheBench:
    pts/cachebench-1.1.2 [Test: Read]
    Test 1 of 1
    Estimated Trial Run Count:    3
    Estimated Time To Completion: 7 Minutes [04:40 UTC]
        Started Run 1 @ 04:34:02
        Started Run 2 @ 04:36:11
        Started Run 3 @ 04:38:20

    Test: Read:
        2826.089081
        2828.187204
        2805.781936

    Average: 2820.019407 MB/s
    Minimum: 2681.6
    Maximum: 2850.01
    Deviation: 0.44%

    Comparison of 5,327 OpenBenchmarking.org samples since 26 February 2011; median result: 2660 MB/s. Box plot of samples:
    [            ├──────────##*###*#*!*#*###──────────────────────────────*─────*──────────*──────────────────*-*──────┤     ]
                                        ^ This Result (58th Percentile): 2820
                AMD Ryzen 5 1600: 2720 ^     2 x Intel Xeon E5-2643 v3: 5641 ^                  AMD EPYC 7413: 8914 ^
                                    ^ Intel Core i5-6500T: 2563                  Rockchip ARMv8 Cortex-A76: 8823 ^
                                ^ AMD Ryzen Embedded V1605B: 2419      Intel Xeon W-2123: 7282 ^
                            ^ AMD EPYC 3255: 2121         Intel Atom C2750: 6149 ^

    Do you want to view the text results of the testing (Y/n): 
```

```
        2828.187204
        2805.781936

    Average: 2820.019407 MB/s
    Minimum: 2681.6
    Maximum: 2850.01
    Deviation: 0.44%

    Comparison of 5,327 OpenBenchmarking.org samples since 26 February 2011; median result: 2660 MB/s. Box plot of samples:
    [            ├──────────##*###*#*!*#*###──────────────────────────────*─────*──────────*──────────────────*-*──────┤     ]
                                        ^ This Result (58th Percentile): 2820
                AMD Ryzen 5 1600: 2720 ^     2 x Intel Xeon E5-2643 v3: 5641 ^                  AMD EPYC 7413: 8914 ^
                                    ^ Intel Core i5-6500T: 2563                  Rockchip ARMv8 Cortex-A76: 8823 ^
                                ^ AMD Ryzen Embedded V1605B: 2419      Intel Xeon W-2123: 7282 ^
                            ^ AMD EPYC 3255: 2121         Intel Atom C2750: 6149 ^

    Do you want to view the text results of the testing (Y/n):
resultadocachebench2
Oracle VMware testing on Ubuntu 20.04 via the Phoronix Test Suite.


rrun1:

       Processor: Intel Core i5-8250U (1 Core), Motherboard: Oracle VirtualBox v1.2, Chipset: Intel 440FX 82441FX PMC, Memory: 1024MB,
 Disk: 2 x 11GB VBOX HDD + 16GB VBOX HDD, Graphics: VMware SVGA II, Audio: Intel 82801AA AC 97 Audio, Network: 2 x Intel 82540EM

       OS: Ubuntu 20.04, Kernel: 5.4.0-136-generic (x86_64), Vulkan: 1.1.182, Compiler: GCC 9.4.0, File-System: ext4, Screen Resolutio
n: 2048×2048, System Layer: Oracle VMware


    CacheBench
    Test: Read
    MB/s > Higher Is Better
    rrun1 . 2820.02 ├──────────────────────────────────────────────────────────────────────────────────────────────────────────────────┤

    Would you like to upload the results to OpenBenchmarking.org (y/n): 
```

Ejecución benchmark 2: Sudoku

El test Sudoku mide el tiempo que tarda el sistema en resolver 100 sudokus.

```
> phoronix-test-suite benchmark 2212056-NE-SUDOKUTES70
```

```
    Cache Size:            6 MB
    Core Family:           Kaby/Coffee/Whiskey Lake

          :                VMware SVGA II
    Vulkan:                1.1.182
    Screen:                2048×2048

             :             Oracle VirtualBox v1.2
    BIOS Version:          VirtualBox
    Chipset:               Intel 440FX 82441FX PMC
    Audio:                 Intel 82801AA AC 97 Audio
    Network:               2 x Intel 82540EM

        :                  1024MB

      :                    2 x 11GB VBOX HDD + 16GB VBOX HDD
    File-System:           ext4
    Mount Options:         relatime rw
    Disk Scheduler:        MQ-DEADLINE
    Disk Details:          Block Size: 4096

                  :        Ubuntu 20.04
    Kernel:                5.4.0-136-generic (x86_64)
    Compiler:              GCC 9.4.0
    System Layer:          Oracle VMware
    Security:              itlb_multihit: KVM: Vulnerable
                           + l1tf: Mitigation of PTE Inversion
                           + mds: Mitigation of Clear buffers; SMT Host state unknown
                           + meltdown: Mitigation of PTI
                           + mmio_stale_data: Mitigation of Clear buffers; SMT Host state unknown
                           + retbleed: Vulnerable
                           + spec_store_bypass: Vulnerable
                           + spectre_v1: Mitigation of usercopy/swapgs barriers and __user pointer sanitization
                           + spectre_v2: Mitigation of Retpolines STIBP: disabled RSB filling PBRSB-eIBRS: Not affected
                           + srbds: Unknown: Dependent on hypervisor status
                           + tsx_async_abort: Not affected
```

```
        Started Run 1 @ 04:20:31
        Started Run 2 @ 04:21:04
        Started Run 3 @ 04:21:38
        Started Run 4 @ 04:22:13 *
        Started Run 5 @ 04:22:47 *
        Started Run 6 @ 04:23:20 *
        Started Run 7 @ 04:23:53 *

    Total Time:
        29.024
        29.236
        30.894
        30.097
        29.035
        29.297
        29.03

    Average: 29.516 Seconds
    Deviation: 2.42%
    Samples: 7

    Seconds < Lower Is Better
    sudoku1 ..... 29.52 |=========================================================================================
    sudoku test . 22.42 |======================================================================

    Comparison of 6,457 OpenBenchmarking.org samples since 26 February 2011; median result: 29.59 Seconds. Box plot of samples:
    [                *      *    *        |----------------------*-*-------------------------------*-----------######!*##*##-*|* * ]
                                                                                  This Result (50th Percentile): 29.516 ^
                     ^ ARMv7 rev 0: 236          AMD C-60 APU: 138 ^        2 x AMD Opteron 6380: 70 ^  sudoku test: 22.416 ^
                                                ARMv7 rev 4: 143 ^                                       Intel Core i9-12900H: 6.946 ^
                ARMv7 rev 2: 212 ^                                                                       Intel Core i7-7700K: 9.51 ^
                           ^ Intel Atom Z530: 221                                                     Intel Core i7-5557U: 13.59 ^

    Do you want to view the text results of the testing (Y/n):
```

```
    Seconds < Lower Is Better
    sudoku1 ..... 29.52 ├═══════════════════════════════════════════════════════════════════════════════════════════════════════════════════════
    sudoku test . 22.42 ├═══════════════════════════════════════════════════════════════════════════════

    Comparison of 6,457 OpenBenchmarking.org samples since 26 February 2011; median result: 29.59 Seconds. Box plot of samples:
    [               *      *    *        ├──────────────────────*-*──────────────────────────────*──────────#####!*###*#-*|* * ]
                                                                                    This Result (50th Percentile): 29.516 ^
                     ^ ARMv7 rev 0: 236           AMD C-60 APU: 138 ^       2 x AMD Opteron 6380: 70 ^  sudoku test: 22.416 ^
                                                 ARMv7 rev 4: 143 ^                                      Intel Core i9-12900H: 6.946 ^
                ARMv7 rev 2: 212 ^                                                                       Intel Core i7-7700K: 9.51 ^
                             ^ Intel Atom Z530: 221                                                   Intel Core i7-5557U: 13.59 ^

    Do you want to view the text results of the testing (Y/n): y
sudoku test
Oracle VMware testing on Ubuntu 20.04 via the Phoronix Test Suite.


sudoku test:

       Processor: AMD Ryzen 7 4800HS (1 Core), Motherboard: Oracle VirtualBox v1.2, Chipset: Intel 440FX 82441FX PMC, Memory: 1024MB,
Disk: 9GB VBOX HDD, Graphics: VMware SVGA II, Audio: Intel 82801AA AC 97 Audio, Network: 2 x Intel 82540EM

       OS: CentOS Linux 7, Kernel: 3.10.0-1160.80.1.el7.x86_64 (x86_64), Compiler: GCC 4.8.5 20150623, File-System: xfs, Screen Resolu
tion: 2048×2048, System Layer: KVM VMware

sudoku1:

       Processor: Intel Core i5-8250U (1 Core), Motherboard: Oracle VirtualBox v1.2, Chipset: Intel 440FX 82441FX PMC, Memory: 1024MB,
 Disk: 2 x 11GB VBOX HDD + 16GB VBOX HDD, Graphics: VMware SVGA II, Audio: Intel 82801AA AC 97 Audio, Network: 2 x Intel 82540EM

       OS: Ubuntu 20.04, Kernel: 5.4.0-136-generic (x86_64), Vulkan: 1.1.182, Compiler: GCC 9.4.0, File-System: ext4, Screen Resolutio
n: 2048×2048, System Layer: Oracle VMware


    Sudokut 0.4
    Total Time
```