Batna 2 university   Mathematics and computer science faculty
Common core in mathematics and computer department   Computer Engineer 1st year 2024-2025

Computer Architecture

Practical series 2: Getting to know your Linux computer

There are several ways to retrieve information under Linux, via command-line utilities or simple shell commands:

```
lshw (list hardware)

dmidecode decode a table DMI (Desktop Management Interface)

lscpu (list cpu)

cat /proc/cpuinfo (microprocessor information)

lstopo of the package hwloc
```

For example, to obtain information about the microprocessor, you can use the **lscpu** command or, equivalently, the **lshw** command with the following arguments:

```
sudo lshw -C processor
```

We obtain the name of the microprocessor, its maximum operating frequency (capacity) and the various technologies implemented (functionalities), such as **avx2**, **bmi2** and **popcnt** for those that will interest us later. We also find the number of cores (cores=6) and threads (threads=12).

The utility inxi:

An interesting little Linux utility is **inxi**. It allows you to display the main configuration information of a machine in the terminal. For example, to obtain all information relating to a machine, enter the command:

```
sudo apt install inxi

inxi -F -c 18
```

The -F option stands for full and the -c option allows you to choose a coloring mode.

The utility lstopo:

To use **lstopo** you need to install the **hwloc** package under Ubuntu :

```
sudo apt install hwloc
```

Then use the **lstopo** or **lstopo-no-graphics** command as follows:

```
lstopo

lstopo --no-io file.png

lstopo-no-graphics -.ascii --no-io
```

The first command (line 1) opens a window showing the processor topology with core information, cache organization and the input/output interface section. This last part can be suppressed using the -no-io option. Finally, line 3 displays information in ASCII format in a terminal.

The mainboard:

The **DMI software framework** for Desktop Management Interface provides a standard for managing and tracking component changes on a computer.

The **dmidecode utility** reads DMI information from the computer and displays it in binary or human-readable text format. To obtain information on the motherboard, use the following command:

```
sudo dmidecode -t baseboard
```

the memory:

Similarly, to obtain information about the memory subsystem, simply use **dmidecode** :

```
sudo dmidecode -t memory
```

You can also use the **lshw** command to obtain a summary of the various memories:

```
sudo lshw -short -C memory
```

This information can be obtained by installing **i2c-tools** :

The utility CPU-X:

Finally, we now have a tool called **CPU-X**, which is the equivalent of **CPU-Z**. On the software's website, you'll find Linux packages for Debian, OpenSUSE and Ubuntu. CPU-X version 4.0 supports Ubuntu versions 16.04, 18.04, 19.04, 19.10 and 20.04.

To install **CPU-X**, simply download the Ubuntu archive from the software's website, then run the following commands:

```
mkdir install
cd install
mv ~/Téléchargements/CPU-X_v4.0.1_Ubuntu.tar.gz .
tar -xzf CPU-X_v4.0.1_Ubuntu.tar.gz
cd xUbuntu_20.04
sudo dpkg -i libcpuid15_0.5.0_amd64.deb cpuidtool_0.5.0_amd64.deb cpu-x_4.0.1_amd64.deb
cpu-x
```

You can also obtain the information in the terminal by using the command line option **-ncurses** :

```
cpu-x –ncurses
```

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Tests utility:

Phoronix:

Phoronix is a software package that lets you install and run a comprehensive series of benchmarks.

```
sudo apt-get install phoronix-test-suite

phoronix-test-suite list-available-tests
```

The first command installs the **Phoronix** software and the second lists the available tests. There are over 300 in version 5.2.1. We can then install the tests we're interested in, such as the n queens test:

```
phoronix-test-suite install n-queens

phoronix-test-suite run n-queens
```

The program requests an identifier for the test to be performed, which can be used later to display the results:

```
phoronix-test-suite info n-queens-results

phoronix-test-suite result-file-to-csv n-queens-results

...
"N-Queens - Elapsed Time",16.13
```

Sysbench:

```
sudo apt-get install sysbench
```

To test the CPU, we run the appropriate test which calculates decimals of:

```
sysbench cpu --cpu-max-prime=20000 run

sysbench 1.0.11 (using system LuaJIT 2.1.0-beta3)
```

Geekbench:

Geekbench is a test suite available for Windows, Linux and MacOS, which evaluates the computing power of both single-core and multi-core microprocessors. Version 4 compares test scores against a reference microprocessor, an Intel Core i7-6600U running at 2.6 GHz. Version 5 uses an Intel Core i3-8100.

The tests are related to integer calculations, real calculations, cryptography and memory access. To run the tests, simply download an archive from the **Geekbench** site, unzip it and run the two test programs in 32-bit and 64-bit versions.

```
tar -xvzf ~/Downloads/Geekbench-4.3.4-Linux.tar.gz

cd Geekbench-4.3.4-Linux
```