Colin Morris-Moncada

Professor Sanders

Operating Systems

January 30, 2021

HW #1

1. System Properties and OS Information
   1. What operating system(s) are you running? CPU chip information, and physical memory information.
      1. Operating System: Microsoft Windows 10 Pro
         1. Version: 10.0.19042 ***AND*** 20H2
         2. OS Build: 19042.746
         3. Experience: Windows Feature Experience Pack 120.2212.551.0
         4. Bit: 64-bit operating system, x64-based processor
      2. Operating System: Ubuntu Focal Fossa
         1. Version 20.04 LTS
         2. GNOME Version: 3.36.8
         3. Windowing System: X11
         4. Bit: 64-bit operating system, x64-based processor
   2. CPU Chip, CPU cores in chip, what levels of cache does it have and how much of each?
      1. CPU Chip: Intel(R) Core (TM) i7-6820HQ CPU @ 2.70GHz 2.71 GHz
      2. CPU Cores: 4 Core(s), 8 Logical Processor(s)
      3. GPU: Intel HD Graphics 530
      4. RAM: 24.0 GB (23.8 GB usable)
      5. Cache: 8MB
         1. L1 Data Cache
            1. 4 x 32 KBytes, 8-way set associative, 64-byte line size
         2. L1 Instructions Cache
            1. 4 x 32 KBytes, 8-way set associative, 64-byte line size
         3. L2 Cache
            1. 4 x 256 KBytes, 4-way set associative, 64-byte line size
         4. L3 Cache
            1. 8192 KBytes, 16-way set associative, 64-byte line size
2. What do you, as a user, perceive as “quality” of an operating system – what makes one good or bad? Describe a time that you had an impression of the quality of the OS that you were using –either good or bad – and why? Is there any way to measure the effect that you were observing?
   1. To me as a user of an operating system I perceive “quality” to mean easy to use and efficient with regards to hardware.
   2. Bad operating systems can tend to be cluttered with too many icons or menus, leading to confusion on how to navigate through windows. Non-Compatibility with hardware can create a barrier between the user and the product. A slow or “bloated” operating system can lead to a poor user experience. The slowness could be caused by the OS not utilizing the hardware or the OS itself can be large with extra features (bloatware). Therefore, good operating systems will do the opposite of everything listed above meaning they are easy to use, compatible with lots of hardware, and show a seamless experience in the tasks done by the user.
   3. Windows 10 updates are always in the way, constantly asking to update and sometimes at the worst times. In recent days, the user can turn off auto update, but it still feels in my opinion as if the OS is nagging the user to update every x number of days. Contrast this to an OS such as Ubuntu or lots of other Linux distributions where updates are mostly initiated by the user and a password is asked by default for any updates to the system. This approach follows what a good operating system is in my answer above by being easy to use and non-distracting to the overall user experience. Overall user-experience could potentially be recorded by giving surveys to a sample of computer users with questions and pictures of different model operating systems.
3. Consider the memory hierarchy shown in lecture 1 and discussed in class. Build a table showing, for each level of the five levels of the hierarchy, the following characteristics: - a couple of specific examples (so, for the lowest level of off-line storage, one example is "the cloud"), the typical amount available in a modern personal computer, the typical cost per byte, and the typical speed.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Level 1  (**top** and expensive) | Level 2 | Level 3  (fast and relatively cheap) | Level 4a | Level 4b | Level 5  (**bottom** and cheap) |
| Specific examples at this level | Registers | Cache, micro-operations, instruction and data caches along with shared cache | Main memory (RAM)  Also called Primary Storage | Solid state disk  Also called Secondary Storage | Magnetic disk  Also called Secondary Storage | Off-line storage, magnetic tape, the cloud |
| Typical amount available in modern personal computer | <1 KB  Usually, a few thousand bytes in size | <16 MB | <64 GB | <1 TB | <10 TB | < 15 TB |
| Typical cost per byte (gb) |  | ~ $5000/gb | ~$10/gb | ~$0.10/gb | ~ $0.033/gb | ~ $0.02 /gb |
| Typical speed (amount of time required to read a value and, if different, to write a value)  In nanoseconds or milliseconds | 0.25 – 0.5 ns | 0.5 – 25 ns | 80 – 250 ns | 25,000 – 50,000 ns | 5,000,000 ns  5 – 20 ms | ~ < 10ms |