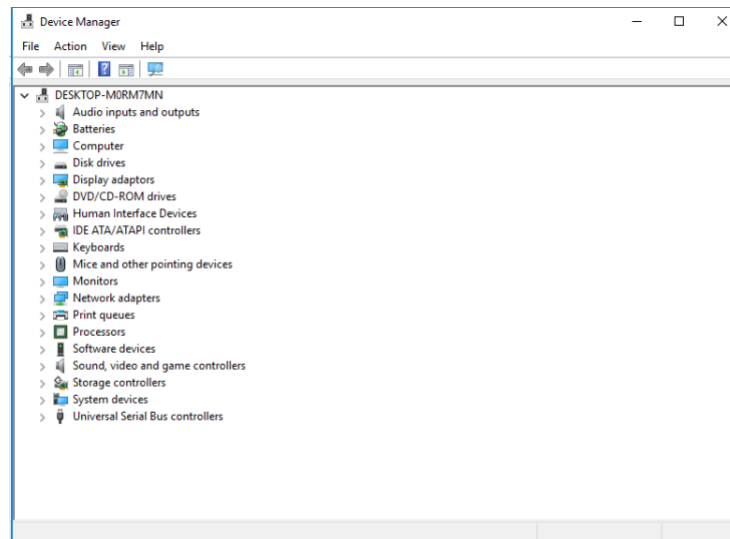# CASE STUDY ASSIGNMENT

I/O AND DISK MANAGEMENT

UTILITY #1: DEVICE MANAGER (I/O UTILITY)

Device Manager utility came from control panel as an applet, which allow the user to manage and view driver software installed, and device hardware settings connected to a particular computer.

Device Manager utility can be accessed as a standalone application through:

1. Control panel: under Hardware and Sound, Device and Printers section.
2. After right clicking the Start button, in top section of the selections.
3. "Properties" of right clicking "This PC", left side bar selection. or "System Properties", Hardware tab.

Or as an applet in Computer Management through:

1. After right clicking the "This PC", select Manage, inside "Computer Management" utility, under section "System Tools".
2. By using command, "devmgmt.msc" in Command Prompt.

Device Manager utility can allow user to see the hardware device installed on the computer. Each device will be listed according to their category. The small icon will help identify the type of device. If the device disabled/malfunctioned, user can will see it grey arrow, error code can be followed to understand the underlying problem. An alert icon if it is not working properly (Lenovo Support, 2016). Looking into the Properties of each device, user can update the driver or view the driver version. User can directly see which resources is being occupied by the device. For example, Memory Range, IRQ and I/O Range. We can see that the device each had allocated their location so that the data they read in have a place to be read out, for OS to translate to other programs. We also learnt that IRQ is an interrupt request, which is part of the resource, looking at the keyboard IRQ values(0x00000001) which means keyboard have really high priority multiple IRQ

request existed, keyboard will be prioritized (Computer Hope, 2019). Another interesting details is I/O range, the I/O range address is the bus between CPU and I/O devices controller, the address is stated in 16 bits or 4 Hexadecimal character, this allow the CPU to understand the status of the device and communicate with the device. On the hardware level, the CPU will activate the 16-bus wire according to the address. Modern hardware usually has Plug and Play capability, so user can worry less about setting up the I/O addresses (Brain Bell, 2016). Furthermore, user can choose to change the address and resource allocation in an event of conflict between devices. Besides looking at the information of the device, the user can also disable the device or ask OS to search for connected device (Fisher, Tim, 2018).

UTILITY #2: OPTIMIZE DRIVES (DISK UTILITY)
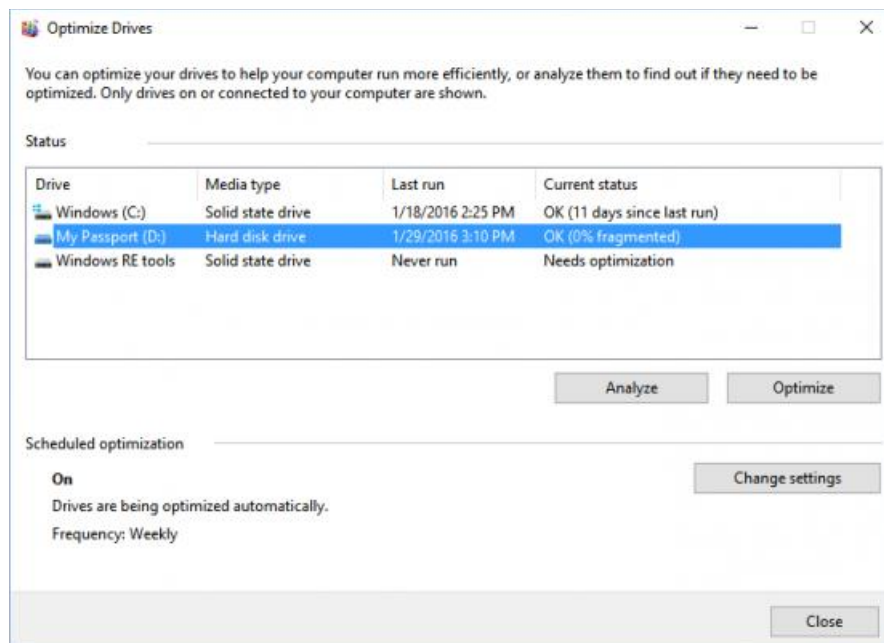
Optimize Drives utility also known as Microsoft Drive Optimizer, is a disk defragment utility intend to speed up disk drives by organizing files on the drives. Disk drives are supposed to help the computer operate more efficiently, but most of the current computer have Solid State Drives, (SSD) and defragmentation is not encouraged on SSD as it wear off the storage cycle of the disk, but traditional mechanical drives are supposed to be defragmented often to improve performance (Pinola, 2016). Optimize Drives aims to reduce head travel, so that files are arranged more adjacent to each other for faster access.

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Optimize Drives utility can be accessed through:

1. "Run", by keying in "dfrgui" in "Run".
2. Start Menu under Windows Administrative Tools, named as "Defragment and Optimize Drives".
3. "Properties" of right clicking the hard drive in File Explorer under tools.
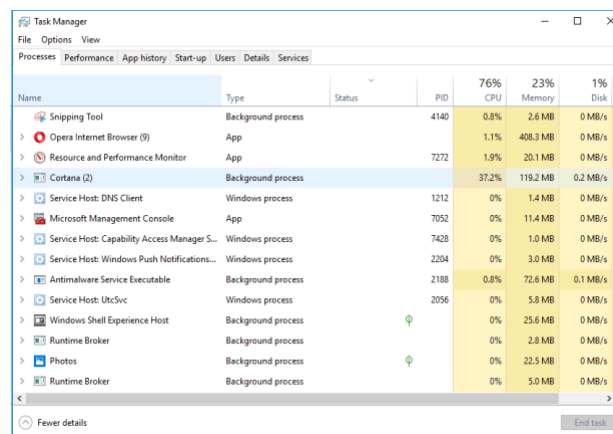4. Control panel: under System and Security, Administrative Tools section

Optimize Drives utility can allow user to see the available secondary drives connected on the computer. User can see the name of the drive its media type, the time which it was last defragmented and the current status of defragmentation. The current status is dynamic in terms of its presentation, user can also see the state of fragmentation of the drive-in percentage under current status, if the drive needs to be optimized the "Needs optimization" will be shown under current status. The state of scheduled defragmentation will also be shown at the bottom part of the program.

Conducting the defragmentation is fairly straightforward, user can select the drive that they want to defragment and click optimize to start defragmentation. User can also click analyze to check the fragmentation percentage of the particular drive. If the drive is at 10% fragmented, it should be optimized, anything under, the recommended fragmentation is 5%. Besides that, user can schedule optimization that will run automatically to defragment the disk.

From here we can see that windows are using dynamic allocation for its file system, because of the need to defragment the drives so that files can be place contiguously. A little more information is that Microsoft have been using NTFS(New Technology File System) as their default file system, instead of a allocation table, NTFS uses a B-tree, which improve the look up time.

PROCESS MANAGEMENT

UTILITY #1: TASK MANAGER

The Task Manager utility allow the user to see running process of a computer, as well as the resource that the process is currently occupying. Task manager also provide a more sophisticated GUI approach when compare to other Unix/Unix Like system.

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Task Manager utility can be accessed as an application through:

1. Ctrl + Alt + Delete and the last selection.
2. After right clicking the Start button or Taskbar, in middle section of the selections.
3. "Run", by keying in "taskmgr" in "Run".

There are 7 tabs in Task Manager:

| Tabs	Description
Processes	Shows all running processes, including their name, type, status, pid, usage of CPU, memory, disk and network.
Performance	Graphical visualisation of the details CPU, Memory, Disk, Network usage.
App history	Windows apps history and their details.
Start-up	To configure process that will start-up when the computer is turned on. (only on Windows 10)
Users	Tracking signed in users and their running programs. (only on Windows 10)
Details	As an supplement from processes, this give user more detail view of processes that are running.
Services	Shows all Windows Services for management.

Adapted from (Fisher, 2019).

We are mostly interested in the Processes tab, in this tab user can see exactly how many percentage usage of resources by the program. Most users will use this tab to end unintended processes. Malicious process can also be searched online directly by right clicking the programs. Another tab that provide detail information are the Details tab. In this tab user can see if the processes is running or stopped, who activated the process and the description of the process. One intresting feature that is noticed is that System Idle Process is actually a process itself, this process measures the idle capacity of other processes (Mo, 2018).

Another thing to take note is that System Interrupts actually have no process id(pid), this is because the system interrupts is not a process, it is rather a label to see all the other hardware interrupts, if at any given point the system interrupts in incredibly high, it might be due to drivers of the hardware (Arrows, 2018).

In the Task Manager, user can end a processes or the whole process tree in the processes tab, this will be useful to kill malicious programs or unresponsive programs. Sorting by the CPU, Memory, Disk and Network can allow the user to see even more detail which program is taking up which resources. In the Details tab, user can set the priority of the process, as discussed in the lectures, the higher process should be placed into the higher queue of the in the ready state this allow process to be queued first compare to other processes. We can also set the affinity of the program, which allow the particular program to only take up one or few of the processor instead of the whole processor. This gives us fine detail to control the processor allocation for the task we need, if the computer is a multi-processor system (Brooks, 2006).

UTILITY #2: RESOURCE MONITOR
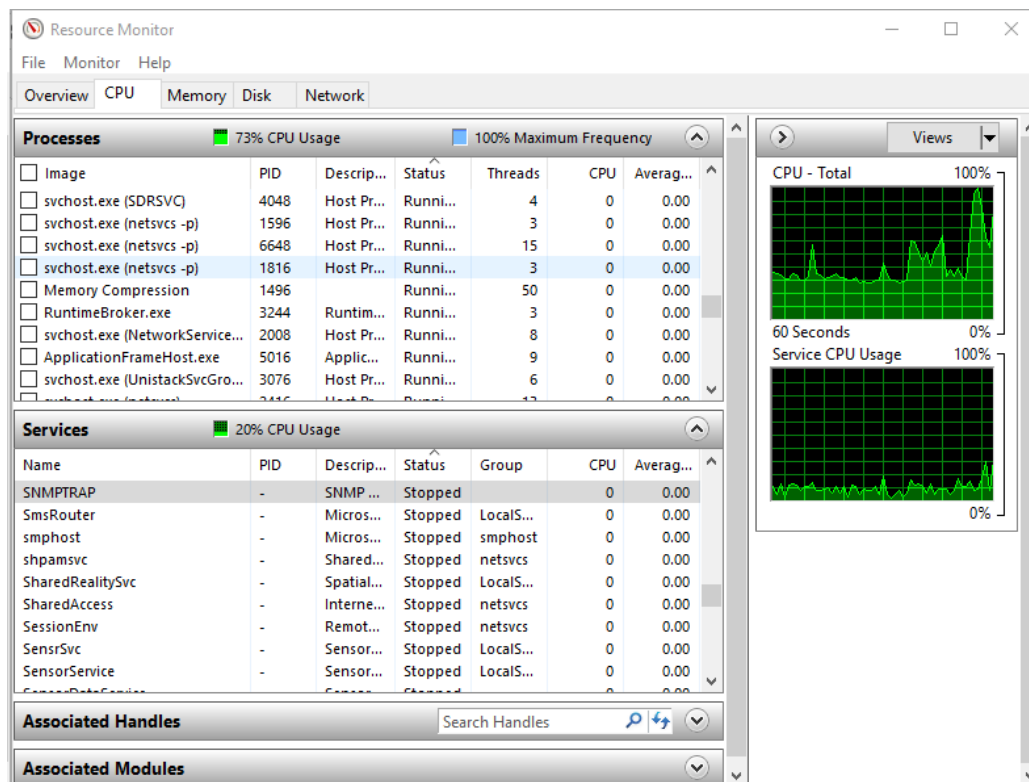
Resource Monitor utility show information the use of resources, hardware or software in real time. Resource Monitor is similar to task manger, but instead of focusing on processes only, resource monitor also allows us to see even more details of a particular process.

Resource Monitor utility can be accessed as an application through:

1. Bottom of Performance tab in Task Manager.
2. Start Menu under Windows Administrative Tools.
3. "Run", by keying in "resmon" in "Run".
4. Using "resmon" command in Command Prompt.

There are 5 tabs in Resource Monitor:

Tabs	Description
Overview	Shows all usage of CPU, memory, disk and network and the program using them.
CPU	Show the number of threads, CPU percentage, and average consumption. Also have sections for services of the selected process or associated handlers, and modules.
Memory	Showing the amount of Virtual and physical memory by each process
Disk	Show the process of disk activity.
Network	Show the network activity of processes, its addresses send and receive bytes. Also the ports that are listening or sending requests.

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We are most interested in the CPU tab, here we can see even more information of the process, how many threads this process have created, its CPU usage, and its PID. We can sort the processes by cpu usage to observe the process. We can also tick the process to see more resources used by the process. Processes require files, registry key, mutant(mutex) and also semaphores, we can see exactly the details of the location/the names of the resource that this process is holding, this will be helpful for us to detect deadlock or starvation if it happens, since Windows NT system does not provide a solution for these problems. Associated Modules can let us know which module this process needed too. Besides seeing the information of the processes, we can also end process or process tree as if we can in task manager. We can even end processes which is held the handles, to free up specific resources.

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