

Shrewsbury U3A

Computer Skills Group

Agenda

1. Introduction
2. Then and now – a little bit of history
3. Factors affecting performance of your system
4. How can I find out what is causing my system to run slowly?
5. Resolving problems
6. Q & A

1.

Introduction

Steve Wormald

- Started as a Trainee Computer operator, age 17, straight from Art College
- 30 years with major IT suppliers & consultancies
- 15 years as a freelance IT Consultant / Interim Manager
- Specialist in Healthcare IT

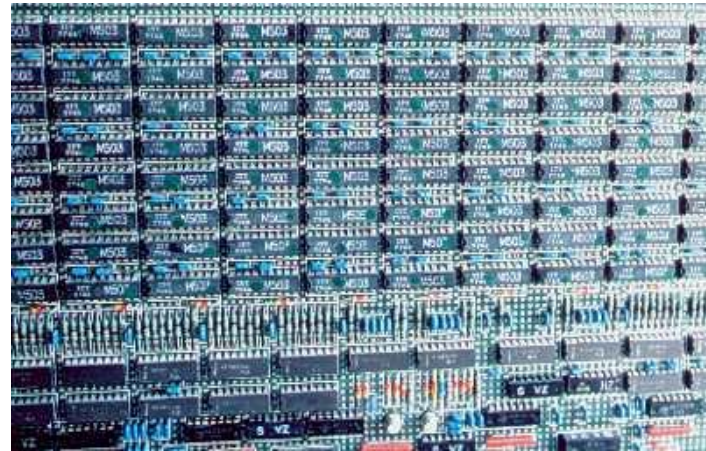
2.

Then and now – a little bit of history

A brief look at how IT has changed over the past 49 years from
mainframes to tablets

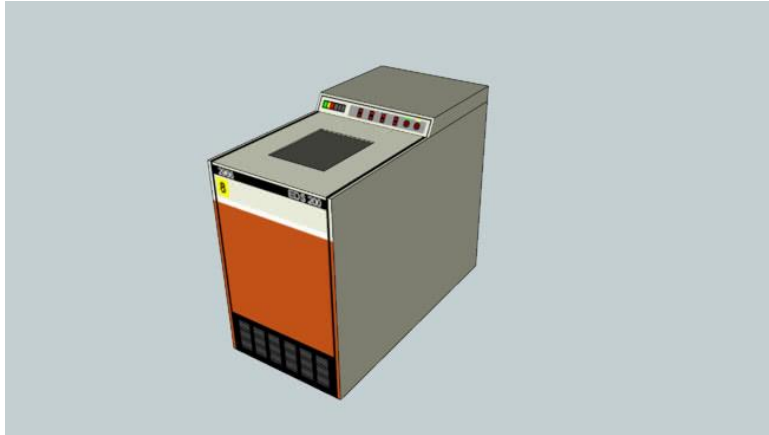
- A personal experience

ICL Bracknell – largest computer room in Europe



Then and now – disk / storage technology

EDS200 – 200,000,000
(200MB) maximum capacity



Today's disks & USB sticks ("thumbnail drives")
up to 4,000,000,000,000 (4TB) capacity



Around £100



£10,000+



A few pounds

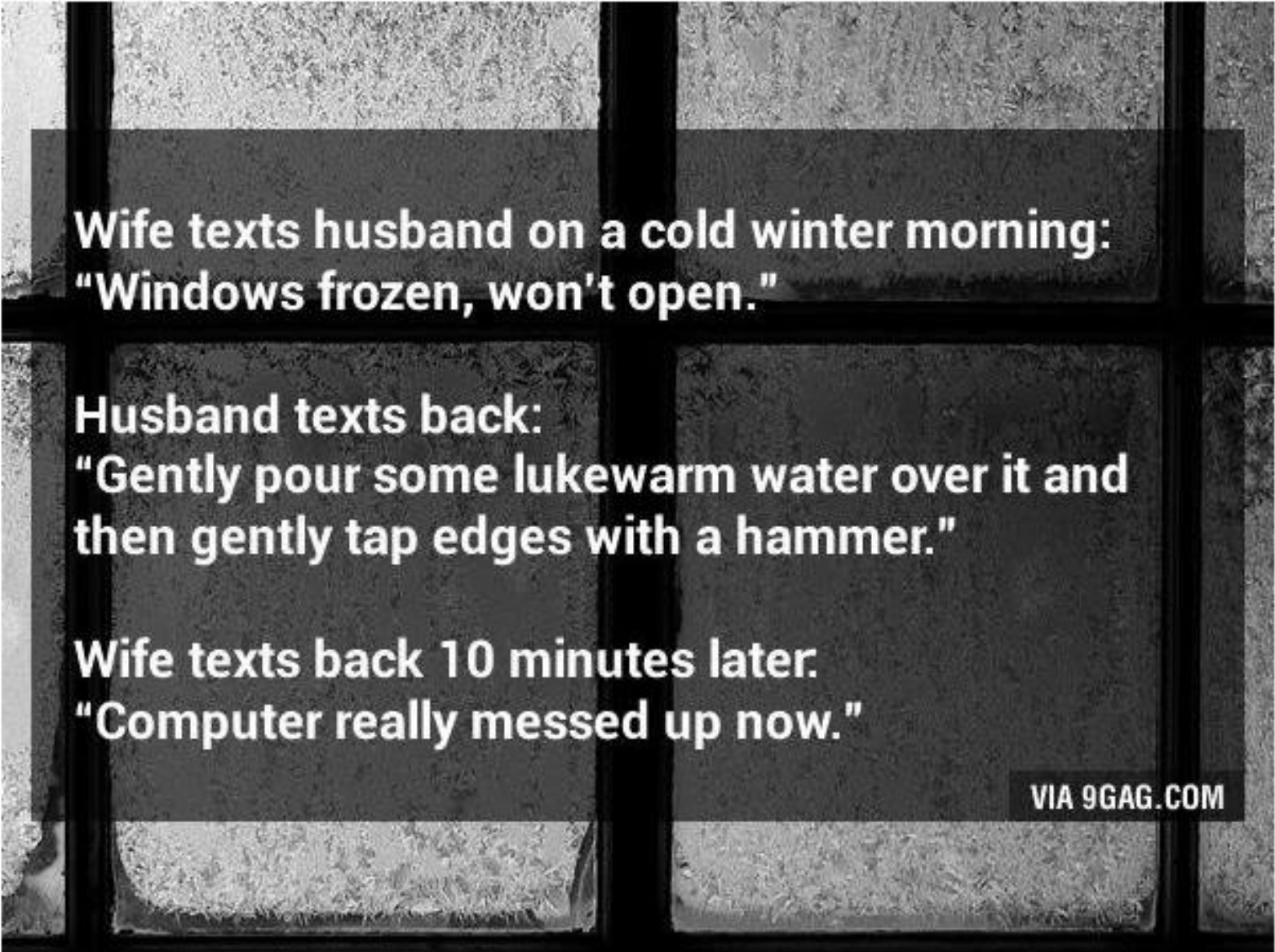
‘Virtual Storage’ / ‘Virtual Machines’

Concept first developed in the UK

- First implemented and commercially available on the Ferranti Argos 6000, used for process control and military applications (late 1960s)
- Allows operating systems and applications to run even though their size far exceeds the amount of main storage (“RAM”) available
 - *Operating system is split between RAM and high speed secondary storage (e.g. disk) and swaps “pages” between the 2 (“Paging”)*
- Each Virtual Machine is totally hidden and protected from other Virtual Machines running on the same system
- The Virtual Machine concept reached its design pinnacle when ICL developed the **VME** operating system on the **ICL 2900 Series** mainframes (launched October 1974)
- ***MS Windows uses a similar Virtual Machine architecture and uses Virtual Storage***
- *Widely regarded as the finest and most secure operating system ever developed, VME is still actively marketed by Fujitsu today – 44+ years after it was first launched!*

3.

Factors affecting
performance of your
system



**Wife texts husband on a cold winter morning:
"Windows frozen, won't open."**

**Husband texts back:
"Gently pour some lukewarm water over it and
then gently tap edges with a hammer."**

**Wife texts back 10 minutes later:
"Computer really messed up now."**

VIA 9GAG.COM

Factors affecting performance of your system

System performance can be affected by many factors:

- The amount of RAM installed
- The processor (Intel Celeron / Pentium / i3 / i5 / i7)
- The operating system version
- Number of concurrent processes / apps
- The TYPES of software / apps that you use
- Insufficient disk storage
- Fragmented disk storage
- Hardware faults

Factors affecting performance of your system - continued

- Devices you might have attached (camera, mouse, printer, scanner, etc)
- Software problems
- Anti-virus software / scans
- Software / operating systems updates
- Temporary Internet files / cache / cookies
- Type and speed of connection (cable or Wi-Fi)
- Your phone line / broadband speed
- ... other factors

QUESTION: Can I do anything to improve the performance of my system?

ANSWER: YES YOU CAN (....probably)

Factors affecting performance of your system

CPU & main memory (“RAM”)

- Laptops / pc's typically sold with 4Gb / 8Gb / 16Gb / 32Gb of RAM
- RAM is limited by:
 - The CPU in use
 - 32 bit CPU: Maximum RAM supported is 4Gb
 - 64 bit CPU: usually requires a MINIMUM of 4Gb
 - Available card slots on the Motherboard
 - Space in your system unit
- Upgrading RAM might entail more than simply slotting in another circuit board
- ***On i3 CPUs & upwards I recommend having AT LEAST 8Gb RAM***

Factors affecting performance of your system

Operating System

- MAC-OS: 1.6Gb
- 32-bit Windows10: 16Gb
- 64-bit Windows10: 20Gb
 - The Windows system is LARGER than the amount of RAM you probably have available
 - Windows10 64-bit: **3.2Gb MUST be “resident” in RAM**
 - **Question: If your device only has 4Gb RAM, what room is left for your apps to run in?**
 - Parts of it remain on the fixed disk or other high speed secondary storage
 - The System swaps the instructions and data it needs between the RAM and secondary storage area (“**paging**”)
 - System “Thinks” the part of RAM and the part of the disk area (“**paging area**”) it uses are the same thing (“**Virtual Storage**”)
 - Windows creates a **Virtual Machine** for each process
 - **Less paging => less disk I/O => better system performance**

4.

How can I find out what is
causing my system to run
slowly?

How can I find out what is causing my system to run slowly?

- On Windows systems, use ***Ctrl Alt Del***
- It should display a screen that looks like this:

Lock

Switch User

Sign Out

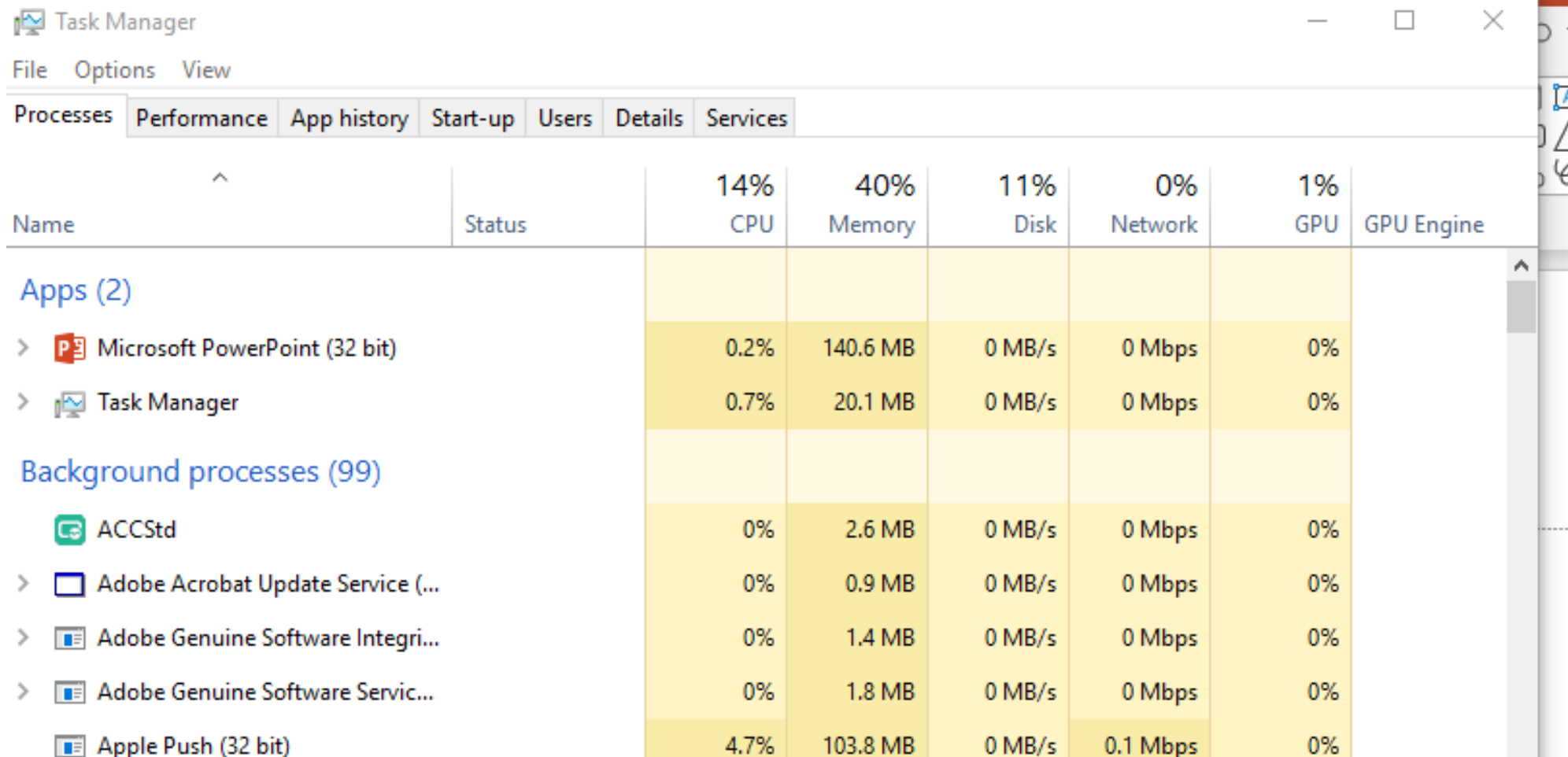
Task Manager

Cancel

- ***Click on 'Task Manager'***

Task Manager

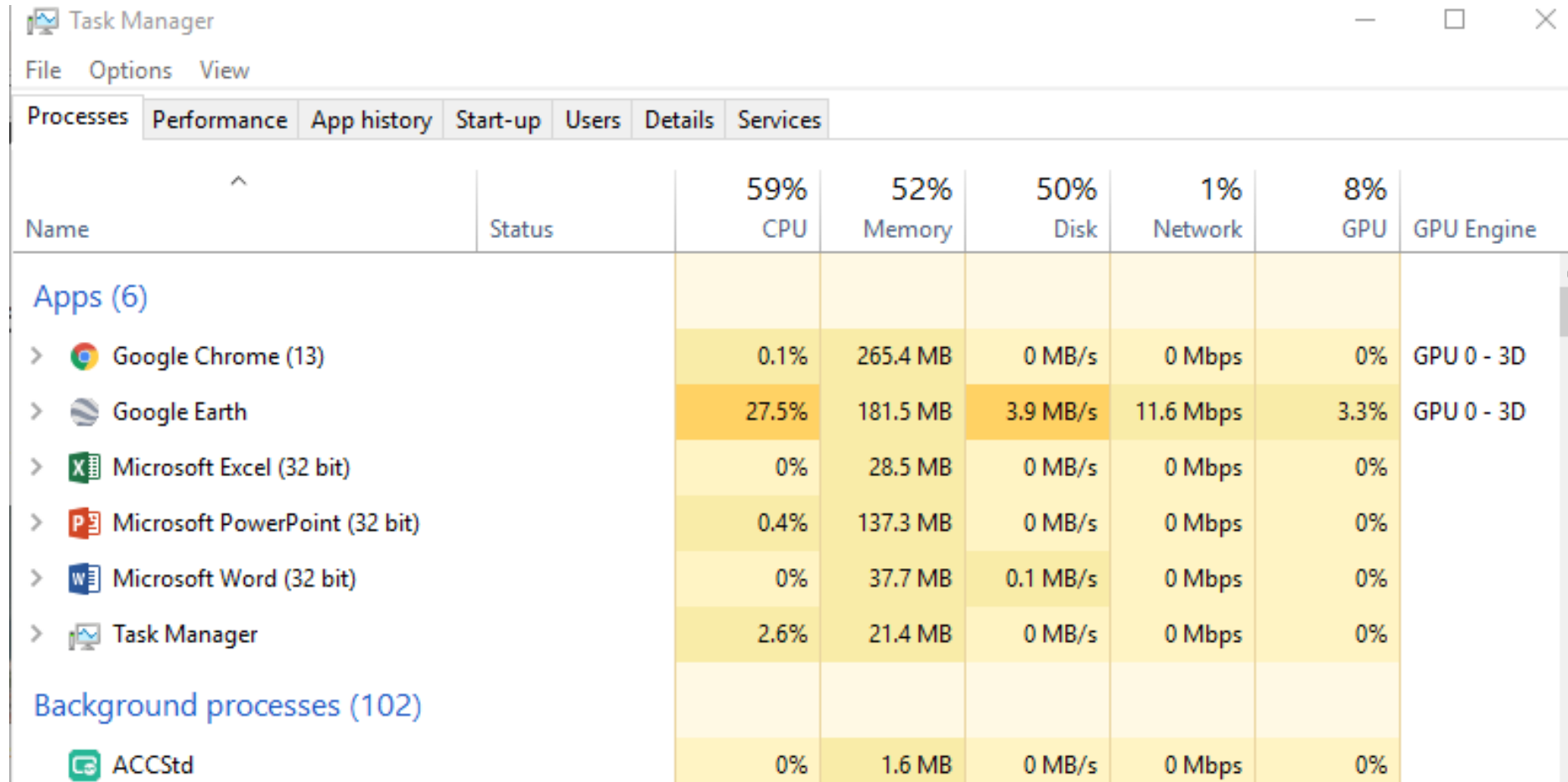
Task Manager will display a screen something like this:



The screenshot shows the Windows Task Manager application with the 'Performance' tab selected. The window title is 'Task Manager'. The menu bar includes 'File', 'Options', and 'View'. The tabs at the top are 'Processes', 'Performance', 'App history', 'Start-up', 'Users', 'Details', and 'Services'. The 'Performance' tab displays a summary of system resource usage: CPU at 14%, Memory at 40%, Disk at 11%, Network at 0%, GPU at 1%, and GPU Engine. Below this summary is a table of running processes, categorized into 'Apps (2)' and 'Background processes (99)'. The table columns are Name, Status, CPU, Memory, Disk, Network, GPU, and GPU Engine. The 'Apps' section lists Microsoft PowerPoint (32 bit) and Task Manager. The 'Background processes' section lists ACCStd, Adobe Acrobat Update Service, Adobe Genuine Software Integrity, Adobe Genuine Software Service, and Apple Push (32 bit).

Name	Status	14% CPU	40% Memory	11% Disk	0% Network	1% GPU	GPU Engine
Apps (2)							
> Microsoft PowerPoint (32 bit)		0.2%	140.6 MB	0 MB/s	0 Mbps	0%	
> Task Manager		0.7%	20.1 MB	0 MB/s	0 Mbps	0%	
Background processes (99)							
ACCStd		0%	2.6 MB	0 MB/s	0 Mbps	0%	
> Adobe Acrobat Update Service (...)		0%	0.9 MB	0 MB/s	0 Mbps	0%	
> Adobe Genuine Software Integri...		0%	1.4 MB	0 MB/s	0 Mbps	0%	
> Adobe Genuine Software Servic...		0%	1.8 MB	0 MB/s	0 Mbps	0%	
Apple Push (32 bit)		4.7%	103.8 MB	0 MB/s	0.1 Mbps	0%	

Task Manager – 2: Impact of more apps running



The screenshot shows the Windows Task Manager Performance tab. At the top, a summary bar displays overall system usage: CPU at 59%, Memory at 52%, Disk at 50%, Network at 1%, and GPU at 8%. Below this, a table lists running applications and background processes with their individual resource usage. Google Earth is highlighted in orange, indicating it is the most resource-intensive application shown. The table includes columns for Name, Status, CPU, Memory, Disk, Network, GPU, and GPU Engine.

		59%	52%	50%	1%	8%	
		CPU	Memory	Disk	Network	GPU	GPU Engine
Apps (6)							
>	Google Chrome (13)	0.1%	265.4 MB	0 MB/s	0 Mbps	0%	GPU 0 - 3D
>	Google Earth	27.5%	181.5 MB	3.9 MB/s	11.6 Mbps	3.3%	GPU 0 - 3D
>	Microsoft Excel (32 bit)	0%	28.5 MB	0 MB/s	0 Mbps	0%	
>	Microsoft PowerPoint (32 bit)	0.4%	137.3 MB	0 MB/s	0 Mbps	0%	
>	Microsoft Word (32 bit)	0%	37.7 MB	0.1 MB/s	0 Mbps	0%	
>	Task Manager	2.6%	21.4 MB	0 MB/s	0 Mbps	0%	
Background processes (102)							
	ACCStd	0%	1.6 MB	0 MB/s	0 Mbps	0%	

CPU was 14% Memory was 40% Disk was 11% Network was 0% GPU was 1%
NOTE how Google Earth is highlighted, as it is using the most system resources

Task Manager - 3

What the headings mean

- **CPU:** How much of the processing capacity of the Central Processor Unit is currently being used
- **Memory:** How much of the available RAM is currently being used
- **Disk:**
 - This ***DOES NOT*** mean how much disk capacity is being used
 - There is a physical limit on how much data can be handled across the Input/Output ('I/O') interface
 - This figure represents how much data is being passed through the disk I/O Interface
- **Network:** How much of the I/O capacity of your devices network interface is being used (again, this has a finite limit)
- **GPU:** How much of the processing capacity of the Graphics Processor Unit is currently being used

Task Manager - 4

So, what can you do?

If you are concerned about your system performance:

- * leave the Task Manager window open, minimise it and move it to somewhere on your screen 'out of the way'*
- If ANY of the readings regularly says '95%' or more, then that is where the problem is*
- * That is the area which will require further investigation and/or remedial action*

5.

Resolving problems

Resolving problems -1: CPU and RAM

If CPU or Memory *regularly* says 95% or more:

- You may have too many apps running
OR
 - One of the apps is too large for your system to run satisfactorily
OR
 - There is a problem elsewhere in your system
- * ***Close any apps that you are not actively using***
 - * ***Close any Browser Sessions you are not actively using!***
 - * ***Check the Task Manager window for what effect that has had (if any)***

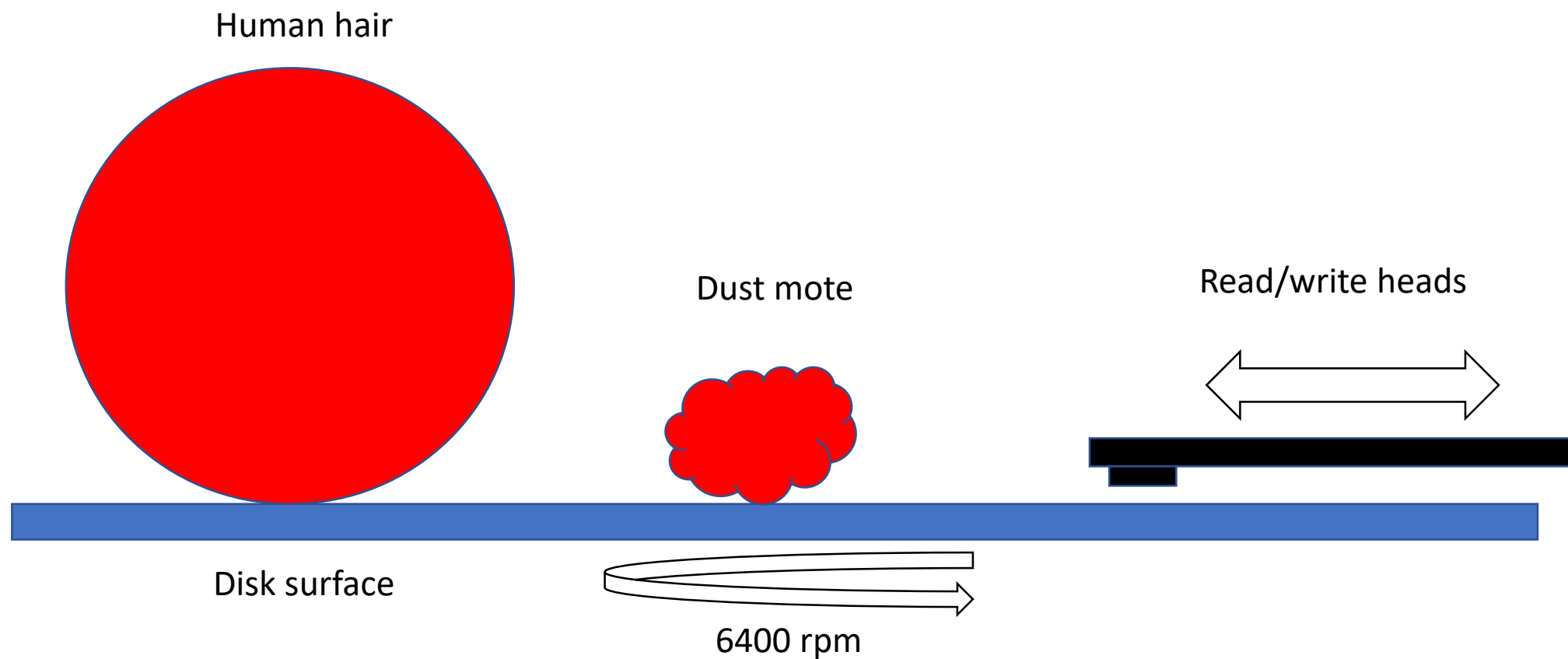
Factors affecting performance of your system

Your disk drive

The slowest part of your machine is your disk drive!

- A disk drive is electro-mechanical (it has moving parts)
- Apart from the cooling fans, it is the part of your system most likely to break down
- *There ARE things you can (and SHOULD) do to prevent or minimise problems*

Disk Drive Read/Write heads



Impact of having a “fragmented disk”

- The surface of a disk is a series of concentric rings. Each ring is called a ‘cylinder’
- Data is written in ‘blocks’ using a “read/write head” – an electromechanical device that “flies” on a cushion of air a microscopic distance above the surface
- The disk has to spin 1 complete circle to enable the read/write head to access each block it needs within that cylinder (albeit at 6,400 rpm!) – this delay is called ‘latency’
- Every time the read/write head needs to access data blocks in different cylinders it has to physically move
- ***Compared with the speed of the CPU and RAM, each read/write head movement takes an eternity!***
- The more a disk is fragmented, the more the read/write head has to move – in the meantime the CPU is waiting for the data to arrive and system performance is degraded

How does a disk become 'fragmented'?

- *'Deleting' a file does NOT physically erase it from the disk surface*
 - It simply removes the file details from the File Index
 - These typically appear with a ~ at the start of the file name
- *Windows, plus many apps, generate all manner of "temporary" files*
 - Workspace files / Cookies / 'temporary internet files' / Windows Update files / Etc..
- *Your disk drive very quickly becomes littered with these things*
- ***YOU need to DO SOMETHING to actually erase 'deleted' or 'temporary' files from the surface of the disk, freeing up that disk space***
- **Windows Defender Security Centre** and some 3rd party "security" packages (such as Norton, McAfee, AVG) have a "**shredder**" function to do this

Resolving problems -2: Disk

If 'Disk' regularly says '95% or more:'

- You might have too many apps running; OR
- Your anti-virus software may be doing a system scan; OR
- A software update might be in progress
- *Anti-virus scan WILL affect system performance, as it checks EVERY process and possibly EVERY file on the disk.*
- * ***Be patient! Let it complete the scan***
- * ***Close any apps and browser sessions that you are not actively using***
- If 'Disk' STILL regularly says '95%'+, then either...
- *Your disk is badly fragmented; OR You MIGHT have a disk drive problem*

Fragmented disk

Disk Surface

	</						

Resolving potential disk drive problems

- * ***Run 'defrag' at least weekly to clean up ('defragment') your disk drive***
- *If 'Disk' is still regularly showing '95%'+ even after running defrag, and you have closed all unnecessary apps, then this could indicate a hardware problem*
- * ***Run 'scandisk' to check whether the surface of the disk drive has been damaged***
- In SOME circumstance scandisk MIGHT be able to resolve the problem. If not, it will tell you that there is a problem which it could not resolve; AND
 - ***It is likely your disk might fail sometime soon!***
 - * ***URGENTLY backup all files you want to keep onto an external drive, a memory stick, CDs, DVDs or 'The Cloud'***
 - * ***Replace your disk with a new disk drive (or a Solid State Disk) at the earliest opportunity***

After running 'defrag'

[illegible]

Windows Utilities you can use to maintain your disk (“Housekeeping”)

If you turn on storage sense, Windows will automatically free up space by getting rid of files you don't need, like temporary files and items in the Recycle Bin.

1. Select the **Start**  button, and then select **Settings**  > **System**  > **Storage** .
2. Turn on **Storage sense**.
3. To choose which files you want Storage sense to delete automatically, select **Change how we free up space automatically**, then select or deselect the check boxes for options under **Temporary Files**, **Locally available cloud content**, and **Free up space now**.

^ [Free up space with Disk Cleanup](#)

If your system doesn't have storage sense, you can use the Disk Cleanup tool to delete temporary files and system files from your device.

1. Select the **Start**  button, type **disk cleanup**, then select **Disk Cleanup** from the list of results.
2. Select the check box next to the type of files you want to delete. (To view a description of each type of file, select the name.) By default, **Downloaded Program Files**, **Temporary Internet Files**, and **Thumbnails** are selected.
3. To free up even more space, select **Clean up system files**, and then select the type of system files you want to delete.

Running Disk Clean-up

The screenshot shows the Windows Task Manager window with the 'Performance' tab selected. The 'Disk' usage is highlighted in red at 96%. A 'Disk Clean-up' utility window is overlaid on the Task Manager, indicating it is cleaning up drive Acer (C:). The utility window shows a progress bar and a 'Cancel' button. The Task Manager window also shows a list of applications and background processes.

Name	Status	9% CPU	38% Memory	96% Disk	0% Network	2% GPU	GPU Engine
Apps (4)							
> Disk Space Clean-up Manager f...		0%	8.3 MB	0 MB/s	0 Mbps	0%	
> Skype (32 bit)				0 MB/s	0 Mbps	0%	
> Task Manager				0 MB/s	0 Mbps	0%	
> Windows Explorer				0 MB/s	0 Mbps	0%	
Background processes							
ACCStd				0.1 MB/s	0 Mbps	0%	
> Adobe Acrobat Update Service (...)		0%	0.9 MB	0 MB/s	0 Mbps	0%	

Disk Clean-up

The Disk Clean-up utility is cleaning up unnecessary files on your machine.

Cleaning up drive Acer (C:).

Cleaning: Windows Update Clean-up

Cancel

Resolving problems - 3

If 'Network' regularly reads '100%' (which is **highly unlikely)**

- You may have too many apps all trying to communicate with your external network (typically your broadband) concurrently

**** Close any 'online' apps and/or internet browser sessions that you are not actively using!***

- Your system communicates with your router (BT Home Hub, etc) via a Network Interface Card, or Communications Controller (a specialized microchip)
 - It can usually handle a data transfer rate of up to 1Gigabit (1Gb – 1 Billion Bits) per second
 - Connection via Lan cable is up to 17x faster than Wi-Fi

Resolving problems - 4

If 'GPU' *regularly* reads '100%'

- This would indicate that
 - *Too many apps using extensive graphics (e.g. a movie, a 3D graphics app or a modern game), competing for the available graphics processing capacity of your GPU or graphics card*
 - *Close any graphics-based apps that you are not actively using!*

OR

- *You are trying to run an app which is beyond the capability of your particular system to satisfactorily process*
 - *Check the System Specification for the graphics-based app(s) you are trying to use, to see if it can be run on your system*
 - *You MIGHT need to install a separate Graphics Card (e.g. Nvidia Gforce)*

Resolving problems - 5

- Some laptop / pc suppliers (notably Acer, HP) provide diagnostic tools either online or as a desktop app, pre-installed on your system
- Some other suppliers provide 'online support' via their Help Desk
 - **(NOTE: You MIGHT be charged for this service – ask them first!)**
- *Running these tools will analyse your system and will identify any current issues*
- The tools **may** try to resolve the issue for you
 - If not, the tools will give you advice or instructions as to what to do next
- *Windows10 itself has a 'troubleshooter' function, which you should also try*

Resolving Issues – 6

My system is less than 2 years old and yet I am having problems with it...what should I do?

- **DO NOT be misled by the “1 years manufacturers guarantee” that you will have been told is part of your deal!**
- Under EU (and UK) Consumer laws, any device you purchase is ‘under warranty’ for **2 years** from the date you purchased it
 - *During Year 1, contact the company you bought the device from*
 - *During Year 2, contact the manufacturer*
- **By Law the supplier (during Year 1) or the manufacturer (during Year 2) MUST either replace or repair the device free of charge **UNLESS there is evidence that you have mis-used or damaged the device****

NOTE 1: This ONLY applies to devices bought ‘from new’.

NOTE 2: Hardware faults on Apple iPads cannot be fixed – the device will need to be replaced

Resolving problems - 7

If you have tried everything else but still have problems

**** Consider re-installing your operating system***

- On some systems, 2 copies of Windows will have been pre-installed on your device
- *In this case you can reinstall Windows using facilities available in Control Panel / System & Security OR (in Windows10) in System Settings*

**** It is ALWAYS advisable to create your own System Recovery backup***

- You will need an **unused** Memory Stick (IDEALLY with 32Gb capacity, *certainly not less than 16Gb*)
 - *Follow the instructions in Control Panel OR System Settings to create your recovery backup device (memory stick)*

**** BEFORE STARTING the re-installation process, ensure you have taken a backup copy of all folders and files that you want to keep***

**** NOTE: After re-installing your operating system, you will have to re-install ALL apps that you want to use, as all existing apps will have been overwritten and therefore lost.***

Resolving problems – 8: Wi-Fi

If you are still having system performance issues, particularly when ‘online’

- This is likely to be due to factors outside your device
- *Is your device connected to your broadband router / hub using a cable or via a Wi-Fi connection?*
- ***If you can, try connecting to your router / hub via an Ethernet cable***
 - *Cable connection is up to 17x faster than via Wi-Fi (theoretically up to 1Gbits/sec)*
- If you are using your device in a different room, are there any solid walls or fireplaces between your current location and your router / hub?
 - ***Wi-Fi signals cannot transmit properly through solid walls or certain other solid objects***
- ***Consider buying a Wi-Fi Extender (i.e. a “booster”) from your router/hub supplier and/or try moving your router/hub to a different location***

Resolving problems – 9: Broadband

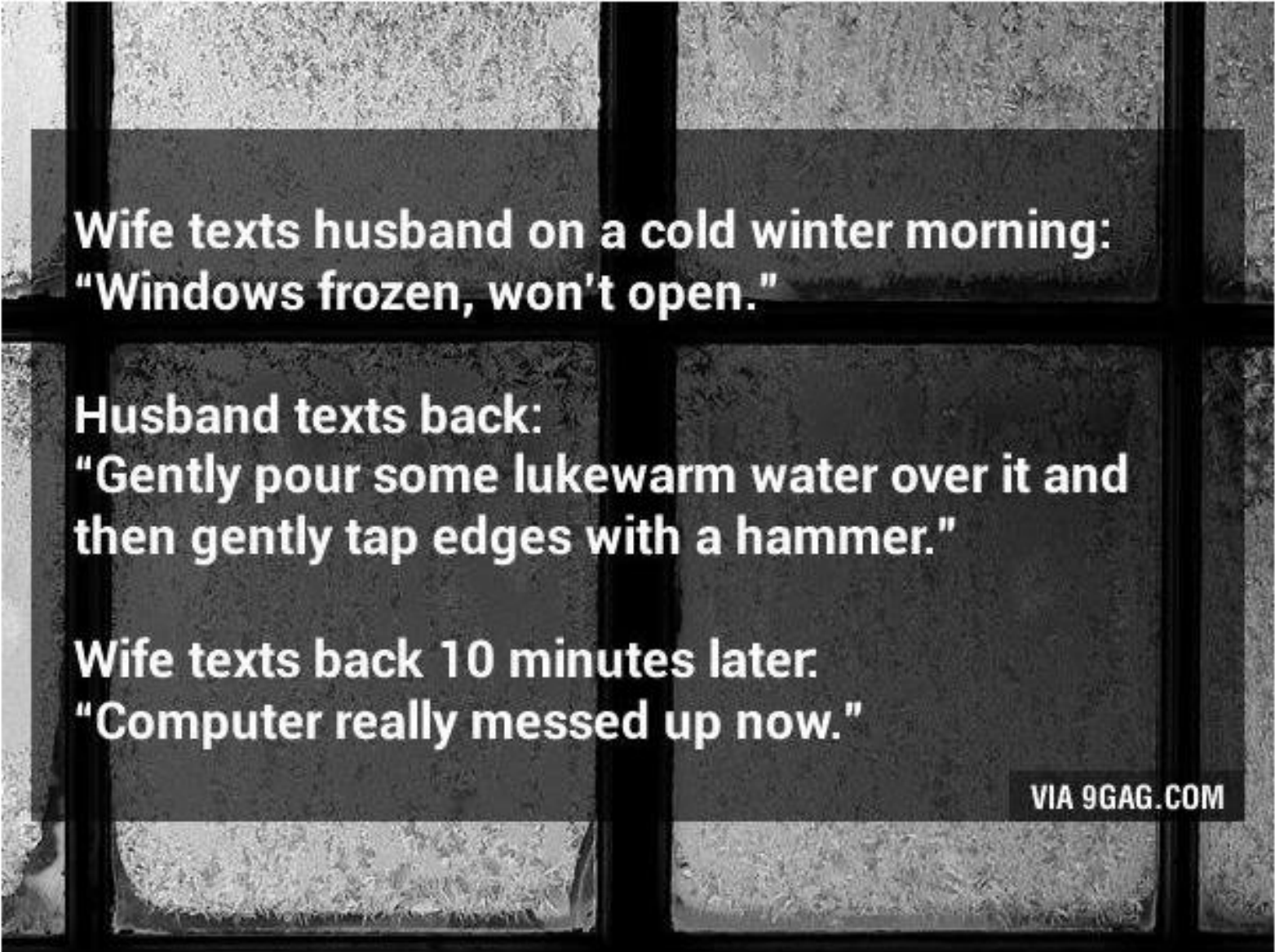
- Over time, your broadband connection can become “clogged up”

**** Turn off and disconnect your Router / Hub for at least 1 minute
ONCE PER MONTH***

- Your broadband provider can advise you about sites or software with which to test your broadband speed

**** If you regularly experience broadband issues, ask your suppliers technical support to carry out a LEVEL 3 DIAGNOSTIC TEST of your connection*** (they normally only perform a Level 1 test)

- ***ONLY a Level 3 Test will test EACH of the 64 channels which make up your broadband fibre***



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VIA 9GAG.COM



5.

Q&A