

# Comp Arch Assign (2004728)

## Robert Jamieson

*by Robert Iwan Jamieson*

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## **Computer systems and components specification**

Computer Architecture and Operating systems (ACCA4022)

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## **Chapter 2 Introduction**

I have been tasked with building a computer for an elderly relative and a graduate. Both individuals have set out their own requirements or suggested requirements. The relative asks for a low budget desktop PC with a full size keyboard and a large monitor. It is suggested that they want a webcam, speakers and microphone to watch YouTube and communicate with their family via video conferencing.

The graduate asks for a high end PC capable of producing and editing 4K videos. The graduate suggests the GPU should have GPU acceleration and that the main CPU should be powerful. A Network Attached Storage (NAS) unit will be needed in order to store an initial 16TB of available storage, up to 56TB of available storage. It is mentioned that a RAID configuration is needed that is efficient, cost effective and has redundancy.

For both individuals I have therefore set out a shopping list of all the components/accessories required, the total cost and have justified my choices.

## Chapter 3 Scenario 1 - Low cost desktop PC

I have been tasked with researching for appropriate components and building a budget desktop PC for an elderly relative. I concluded that a £600 budget would be necessary since I do not only require PC components but also its accessories and a monitor. After reading the scenario and doing the necessary research I have found all of the necessary components for the budget PC scenario, as seen in the shopping list below. The justification for each of these items can be seen after the list.

### 3.1 Shopping list

| Name of product                                                             | Price   | Image of product                                                                                                                                |
|-----------------------------------------------------------------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| Central Processing Unit (CPU) - Intel Core i3-9100                          | £103.19 | <br><i>Figure 1: Intel Core i3 9100. Source: [1].</i>          |
| Motherboard - Gigabyte B365M DS3H Intel Socket 1151                         | £59.40  | <br><i>Figure 2: Gigabyte B365M. Source: [2].</i>              |
| Random Access Memory (RAM) - Corsair Vengeance LPX 8GB (2x4GB) DDR4-2400Mhz | £42.48  | <br><i>Figure 3: Corsair Vengeance LPX 8GB. Source: [3].</i> |
| Non-volatile main storage - Samsung 860 EVO Solid State Disk (SSD) - 500GB  | £59.99  | <br><i>Figure 4: Samsung 860 EVO SSD. Source: [4].</i>       |

|                                                                                                    |        |                                                                                                                                                  |
|----------------------------------------------------------------------------------------------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Case - Thermaltake Versa H17 Micro-ATX                                                             | £36.90 |  <p>Figure 5: Thermaltake Versa H17 Micro-ATX. Source: [5].</p> |
| Power supply (PSU) - Corsair RM 80 Plus Gold 450W Advanced Technology eXtended (ATX) Fully Modular | £87.99 |  <p>Figure 6: Corsair RM 80 Plus Gold 450W. Source: [6].</p>    |
| Monitor - AOC e2470SWH - 24 Inch 60Hz, TN, 5ms                                                     | £99.97 |  <p>Figure 7: AOC e2470SWH. Source: [7].</p>                    |
| Keyboard and mouse - LOGITECH MK120                                                                | £16.99 |  <p>Figure 8: LOGITECH MK120. Source: [8].</p>                 |
| Wireless Network Interface Card (NIC) - Ziyituod ZYT-AX200 PCIe                                    | £33.90 |  <p>Figure 9: Ziyituod ZYT-AX200 PCIe. Source: [9].</p>       |
| Webcam - Dericam                                                                                   | £21.99 |  <p>Figure 10: Dericam webcam. Source: [10].</p>              |

Total cost of system and accessories: £562.80 (including VAT).

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Additional information: The CPU chosen has integrated graphics and a CPU cooler included [1]. The motherboard has the appropriate ports for all accessories needed [2], as mentioned later on. The PSU has all the necessary cables, including a power cable [6]. The monitor also includes a power cable and other necessary cables [7]. The webcam has been chosen for the video calls and includes a built in mic [10]. A wireless NIC has been chosen for an internet connection [9].

### **3.2 Justification for each component/accessory**

Below I have justified why I have chosen the listed components/accessories for scenario 1.

#### **3.2.1 Central Processing Unit (CPU)**

I have found that an Intel Core i3-9100 processor is best for the scenario. It costs £103.19 and is therefore one of the cheapest processors. It has a total of 4 cores and 4 threads. It also has a base clock speed of 3.6GHz [1], which is the main reason I decided against purchasing an Intel i5-9400 processor, despite the fact it has more cores. According to Nathan Kirsch, the Intel i3-9100 has “almost 25% higher” [11] base clock speed and should therefore have better performance in “lightly threaded applications” [11] and hence is great for surfing the web, emails and word processing programs.

The i3-9100 processor includes integrated graphics and a CPU fan for cooling [11]. I am therefore able to save costs as there is no need to purchase an extra CPU cooler or dedicated Graphics Card (GPU). A dedicated GPU simply isn't needed as the relative has not outlined any need for high performance.

#### **3.2.2 Motherboard**

When researching for an appropriate motherboard I made sure to find one that:

- Has a sufficient number of ports for the following accessories: keyboard, mouse and webcam.
- Supports 9<sup>th</sup> gen Intel processors (LGA 1151).
- Supports dual channel RAM (for better performance).
- Supports audio.

I was impressed by the MSI MPG Z390 for £99.99 [12], however after finding the Gigabyte B365M for just £59.40 [2], I went for that one instead despite both motherboards supporting all the necessary components and accessories. The elderly relative simply does not need all of the extra ports such as the extra USB ports the MSI MPG Z390 includes and hence is not worth the extra money.

The chosen motherboard is future proof as it allows 4 sticks of RAM and supports the latest DDR4 memory at a max capacity of 64GB [2].

#### **3.2.3 Random Access Memory (RAM)**

I initially thought about recommending the Rasalas 8GB DDR3L [13]. However, after researching the differences between DDR3 and DDR4 RAM [14] and the minimal price differences, I decided against it. I instead recommend the DDR4 supporting Corsair Vengeance LPX 8GB 2400MHz RAM [3] since it has numerous benefits and more modern motherboards support it.

DDR4 RAM outperforms DDR3 RAM in many categories, as seen below:

| DDR SDRAM Standard | Internal rate (MHz) | Bus clock (MHz) | Prefetch | Data rate (MT/s) | Transfer rate (GB/s) | Voltage (V) |
|--------------------|---------------------|-----------------|----------|------------------|----------------------|-------------|
| SDRAM              | 100-166             | 100-166         | 1n       | 100-166          | 0.8-1.3              | 3.3         |
| DDR                | 133-200             | 133-200         | 2n       | 266-400          | 2.1-3.2              | 2.5/2.6     |
| DDR2               | 133-200             | 266-400         | 4n       | 533-800          | 4.2-6.4              | 1.8         |
| DDR3               | 133-200             | 533-800         | 8n       | 1066-1600        | 8.5-14.9             | 1.35/1.5    |
| DDR4               | 133-200             | 1066-1600       | 8n       | 2133-3200        | 17-21.3              | 1.2         |

Figure 11: Table revealing speeds of SDRAM, DDR, DDR2, DDR3 and DDR4. Source: [14].

DDR4 supports a better data transfer rate, uses less voltage and supports superior clock speeds. As the price difference between the two mentioned RAMs above are minimal, the Corsair Vengeance is the better choice.

I specifically chose a dual memory configuration instead of a single memory configuration as it theoretically doubles the “memory bandwidth that is available” [15]. As the chosen motherboard supports dual memory and has a total of 4 RAM slots, there is still potential to add more RAM to the motherboard in the future if need be. The RAM costs: £42.48.

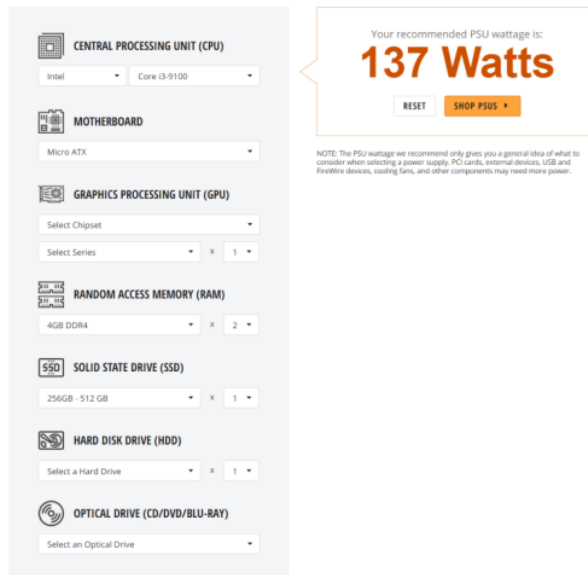
### 3.2.4 Non-volatile main storage

I was first looking to purchase a cheap £33.70 1TB Seagate BarraCuda hard drive [16], however came to the conclusion that the 500GB Samsung 860 EVO SSD [4] would provide sufficient storage and better performance for £59.99.

The SSD chosen has write speeds of up to 520MB/s and read speeds of up to 550MB/s [4] and will therefore make browsing the web, transferring files and loading programs like Skype much faster than the hard drive mentioned. The Seagate BarraCuda HDD has less than half of the read and write speed of the SSD, at a maximum speed of just 210MB/s [16].

### 3.2.5 Power supply (PSU)

To calculate the amount of wattage the PC may be using I decided to use the Newegg power supply calculator [17]. After entering the necessary components, it recommended a PSU supporting 137 watts, as seen below.



The image shows the Newegg PSU wattage calculator interface. On the left, there are dropdown menus for selecting components: Central Processing Unit (CPU) set to Intel Core i3-9100, Motherboard set to Micro ATX, Graphics Processing Unit (GPU) set to Select Chipset, Random Access Memory (RAM) set to 4GB DDR4 x 2, Solid State Drive (SSD) set to 256GB - 512 GB x 1, Hard Disk Drive (HDD) set to Select a Hard Drive x 1, and Optical Drive (CD/DVD/BLU-RAY) set to Select an Optical Drive. On the right, a callout box displays 'Your recommended PSU wattage is: 137 Watts' in large orange text, with 'RESET' and 'SHOP PSUS' buttons below it. A small note at the bottom of the callout box states: 'NOTE: The PSU wattage we recommend only gives you a general idea of what to consider when selecting a power supply. PCI cards, external devices, USB and FireWire devices, cooling fans, and other components may need more power.'

Figure 12: Newegg PSU wattage calculator. Source: [17].

After double checking this result on PC part picker and receiving a similar result [18], I decided to choose the Corsair RM450 (450W) PSU [6]. This is more than twice the estimated wattage from both sources, however is from a reliable brand and helps future proof the device. It costs £87.99.



Figure 13: PCPartPicker revealing the estimated wattage of the PC setup. Source: [18].

### 3.2.6 Case

When looking for a case I had to make sure to find a micro ATX supporting case. I therefore chose the Thermaltake Versa H17 that costs £36.90 [5], partly because it supports micro ATX motherboards but also because it's compact. It fits all the components in the shopping list within it and is still a compact case. It has the following dimensions (L\*W\*H): 39.6cm x 20.5cm x 43.7cm.

The case has an added benefit of including a 120mm pre-installed rear fan and will therefore also help keep temperatures down [5].

### 3.2.7 Wireless Network Interface Card (NIC)

As the relative wants to access the internet for numerous reasons, a wireless NIC is a good option as it is easy to install. The ZYT AX200 [9] provides “Up to 2402Mbps” [9] and will therefore support video conferencing skype calls with family abroad. This NIC is cheap, costing just £33.90.

### 3.2.8 Monitor (with built in speakers)

The relative has failing eyesight and therefore needs a large monitor. I therefore decided that a 24 inch monitor was the minimum however did not expect to purchase a larger monitor than that due to the small budget.

After some research I decided that the AOC e2470SWH 24 inch monitor [7] would be a good pick. It is competitively priced at just £99.97 and has high definition resolution (1920x1080) and crucially has built in speakers. The built in speakers are a great bonus so the relative can hear their family via skype and listen to YouTube videos and more. It means that dedicated external speakers are no longer necessary, hence saving costs.

### 3.2.9 Accessories

- **Keyboard and mouse** - The relative mentioned that they want a full size keyboard and hence I found a basic budget keyboard with the NUM keys included [8]. The keyboard is part of a bundle including a mouse. This keyboard and mouse bundle is the LOGITECH MK120 and costs a total of £16.99 [8].
- **Webcam (with built-in mic)** - As the relative wants to video conference with their family I have made sure to include a 1080p budget webcam from the company Dericam [10]. It costs £21.99 and simply plugs into one of the spare USB ports from the motherboard [2]. It includes a built-in mic and will therefore allow the relative to communicate with their family.

## Chapter 4 Scenario 2 – High end PC (£2500~)

I have been tasked with researching the appropriate components for a high end PC for a video editing enthusiast. The justification for each component can be seen below the completed shopping list.

### 4.1 Shopping list

| Name of product                                                                       | Price   | Image of product                                                                                                                                                      |
|---------------------------------------------------------------------------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Central Processing Unit (CPU) - AMD Ryzen 9 5900X                                     | £630    | <br><i>Figure 14: AMD Ryzen 9 5900X. Source: [19].</i>                               |
| CPU Cooler - Noctua NH-D15                                                            | £99.98  | <br><i>Figure 15: Noctua NH-D15. Source: [20].</i>                                   |
| Motherboard - ASUS ROG Strix X570-E                                                   | £293.00 | <br><i>Figure 16: ASUS ROG Strix X570-E. Source: [21].</i>                          |
| RAM - Corsair Vengeance LPX Black 64GB 3200MHz DDR4 Dual Channel Memory Kit (2X 32GB) | £339.99 | <br><i>Figure 17: Corsair Vengeance LPX Black 64GB 3200MHz DDR4. Source: [22].</i> |
| Non-volatile storage - Sabrent Rocket Q 2TB NVMe                                      | £209.99 | <br><i>Figure 18: Sabrent Rocket Q 2TB NVMe. Source: [23].</i>                     |

|                                                      |         |                                                                                                                                                          |
|------------------------------------------------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Graphics card - NVIDIA<br>GEFORCE RTX 3070           | £469    |  <p>Figure 19: NVIDIA GEFORCE RTX 3070. Source: [24].</p>               |
| Power supply - Corsair<br>RM750x                     | £115    |  <p>Figure 20: Corsair RM750x. Source: [25].</p>                        |
| Case - Cooler Master<br>MasterBox MB520              | £56.06  |  <p>Figure 21: Cooler Master MasterBox MB520. Source: [26].</p>         |
| Monitor - LG UHD<br>24UD58 24 Inch Monitor<br>4K IPS | £260.40 |  <p>Figure 22: LG UHD 24UD58 24 Inch Monitor 4K IPS. Source: [27].</p> |
| Keyboard and mouse -<br>LOGITECH MK120               | £16.99  |  <p>Figure 23: LOGITECH MK120. Source: [8].</p>                       |
| Card reader - InVaFoCo<br>UHS-II SD 4.0              | £16.99  |  <p>Figure 24: InVaFoCo UHS-II SD 4.0. Source: [28].</p>              |

|                                                   |       |                                                                                                                                                      |
|---------------------------------------------------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ethernet cable -<br>UGREEN (3m) Ethernet<br>Cable | £9.99 | <br><i>Figure 25: UGREEN (3m) Ethernet Cable.<br/>Source: [29].</i> |
|---------------------------------------------------|-------|------------------------------------------------------------------------------------------------------------------------------------------------------|

Total cost of the system and its accessories: £2516.40 (including VAT).

Additional information: The PSU has all the necessary cables, including a power cable. The motherboard has the appropriate ports for all accessories needed – as mentioned later on.

## 4.2 Justification for each component/accessory

Below I have justified why I have chosen the listed components/accessories for scenario 2.

### 4.2.1 Central Processing Unit (CPU) and its cooler

Considering the graduate needs to produce and edit 4K video content, I have referred off of the video editing software Premiere Pro's recommended specifications [30]. It states that the recommended CPU is an "Intel® 7th Gen or newer CPU – or AMD Ryzen™ 3000 Series or newer CPU" [30]. Due to the large budget and demanding 4K footage I decided it was appropriate to get the very latest high end CPU. Thus, after some research I soon found that generally, AMD's Ryzen 5000 series outperforms "similarly-priced Intel CPUs by 12-20%" [31].

Noteably, "Compared to the Intel Core i9 10900X, the new Ryzen 9 5900X is 20% faster" [31]. As they are both similarly priced and there is a huge 20% performance difference, the Ryzen 9 5900X was the easy choice. I considered the Ryzen 9 5950X, however soon found out it is much more expensive [32] for a negligible overall performance gain in the video editing software Premiere Pro, as seen in the chart:

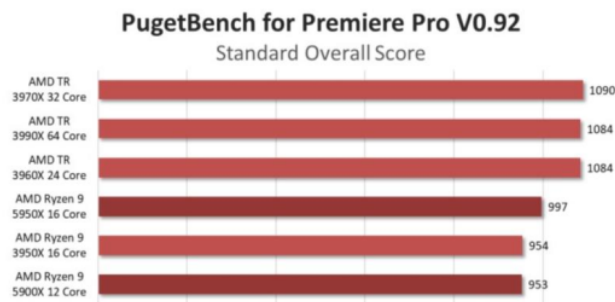


Figure 26: Section of a chart revealing performance of high end CPUs in relation to Premiere Pro. Source: [31].

The Ryzen 5900X boasts 64MB cache, a base processor speed of 3.7GHz and a turbo speed of 4.9GHz [19]. Despite its cost of £630, it has 12 cores and 24 threads [19] and according to Adobe "Premiere Pro runs at 93-98% efficiency with 8 cores" [33]. The graduate will therefore have no performance issues with Premiere Pro and may even have power to spare to work on other applications if need be.

As video editing is extremely demanding, I have included the CPU cooler Noctua NH-D15 [20] to the shopping list. The premium cooler costs £99.98 but will prevent the CPU from overheating even at maximum loads and according to Jon from PremiumBuilds, it is the "Best Air Cooler for Ryzen 9 5900X" [34].

#### 4.2.2 Motherboard

When researching for an appropriate motherboard I made sure to find one that:

- Has sufficient ports for the following accessories: Keyboard, mouse, headphones, speakers.
- Includes a SPDIF port for a surround sound monitoring system
- Includes an ethernet port with gigabit level data transfer speeds.
- Supports DDR4 and dual channel RAM (for better performance).
- Supports audio
- Supports Ryzen 5000 series processors (AM4 socket).
- Supports Non-Volatile Memory Express (NVMe) SSD storage.

Due to the ports required and the latest and greatest components necessary, the motherboard has to have a lot to offer. I therefore added to the list the ASUS ROG Strix X570-E [21] as it fulfils all of the requirements and compatibility concerns [35] listed above. It also leaves room for any possible future upgrades since it supports 4 slots of RAM at a maximum capacity of 128GB. It costs £293.

#### 4.2.3 Random Access Memory (RAM)

Adobe recommends “32 GB for 4K media or higher” [30] of RAM for Premiere Pro. This gave me a rough guideline on the amount of RAM needed to comfortably edit videos at 4K. However, after researching further I found a table from Puget Systems [36] suggesting that 64GB is the minimum for 4K video editing in Premiere Pro, as seen below:

| Footage Resolution   | 1080p | 4K   | 6K/8K+ |
|----------------------|-------|------|--------|
| Minimum RAM capacity | 32GB  | 64GB | 128GB  |

Figure 27: Table suggesting the amount of RAM needed for Premiere Pro. Source: [36].

I have therefore chosen the Corsair Vengeance dual channel LPX 64 GB (2x32 GB) DDR4 RAM [22] with a top speed of 3200MHz. It costs £339.99. I have explained earlier for the first scenario the advantages for dual channel and DDR4 over DDR3.

As the motherboard has 4 slots for RAM, another dual channel DDR4 RAM can be installed, hence creating a quad channel RAM configuration. This would be particularly useful if the PC ever needed to be upgraded for video editing 8K content, as the table above suggests. There would be no need to purchase a new motherboard to install more RAM.

#### 4.2.4 Non-volatile main storage

After reading suggestions from Adobe that hard drives are not good enough for 4K video editing [33], it was clear that an SSD would be appropriate for this scenario. The shopping list therefore includes the Sabrent Rocket Q 2TB NVMe [23]. It has a top read speed of 3.2GB/s and a top write speed of 2.9GB/s [23] and will therefore be able to receive and transfer large 4K video files at an excellent speed.

Puget Systems suggest that NVMe drives are best used with Premiere Pro when “High bitrate footage (~2,000 mbps or higher)” [36] is used. Since 4K footage can be very large in size, the very high read and write speeds will save time and hence allow for more productivity. The storage chosen costs £209.99 [23].

I have chosen not to include any additional internal storage for the PC because a NAS unit will be used instead to permanently store the large video files. I have chosen 2TB of storage for the NVMe as I feel as if it is enough for storing programs and temporarily storing video files before they are transferred to the NAS unit.

**4.2.5 Graphics card (GPU)**

GPU acceleration is very important for video editing as it provides huge benefits, including:

- Playing back “effects and tranistions in real time without rendering them” [37].
- Allowing playback of videos “at high quality” [37].
- Reducing export time to H.264 and H.265 [36].

With these benefits in mind, it is clear that GPU acceleration is key. According to Adobe, the RTX 3070 and RTX 3080 both allow for GPU acceleration [37]. After realizing this, I initially wanted to get the RTX 3080 due to its better performance and larger Video Random Access Memory (VRAM) capacity: 10GB [38]. That is 2GB more than an RTX 3070 [24]. However, despite the fact that the RTX 3080 would help future proof in case the company ever wanted to edit at 8K (suggested by the table below [36]) - it is too expensive to include in the budget.

| Sequence Resolution   | 1080p | 4K  | 6K  | 8K+   |
|-----------------------|-------|-----|-----|-------|
| Minimum VRAM capacity | 4GB   | 6GB | 8GB | 10GB+ |

Figure 28: Table suggesting the amount of GPU VRAM needed for Premiere Pro. Source: [36].

According to the table above, the RTX 3070’s 8GB of VRAM is more than enough regardless and costs £469 – significantly less than the RTX 3080’s £649.

#### 4.2.6 Power supply (PSU)

In order to have a better estimate on the amount of PSU wattage needed, I used a power supply calculator from Newegg [17], as seen below.

The image shows a screenshot of the Newegg PSU wattage calculator. On the left, there is a vertical list of component categories with their respective icons and selected values:

- CENTRAL PROCESSING UNIT (CPU)**: AMD, Ryzen 9 5900X
- MOTHERBOARD**: ATX
- GRAPHICS PROCESSING UNIT (GPU)**: NVIDIA, GeForce RTX 3070 x 1
- RANDOM ACCESS MEMORY (RAM)**: 32GB DDR4 x 2
- SOLID STATE DRIVE (SSD)**: 1TB+ x 1
- HARD DISK DRIVE (HDD)**: Not Installed x 1
- OPTICAL DRIVE (CD/DVD/BLU-RAY)**: Not Installed

On the right, a callout box displays the recommendation: "Your recommended PSU wattage is: **490 Watts**". Below this, there are "RESET" and "SHOP PSUS" buttons. A small note at the bottom of the callout box states: "NOTE: The PSU wattage we recommend only gives you a general idea of what to consider when selecting a power supply. PCI cards, external devices, USB and FireWire devices, cooling fans, and other components may need more power."

Figure 29: Newegg PSU wattage calculator. Source: [17].

The calculator recommends a 490W or more PSU. However, after more research I found an article from Aaron Klotz from Tom's Hardware where he suggests that a system with an RTX 3070 and Ryzen 9 processor requires at least a 750W PSU [39]. I have therefore chosen the fully modular Corsair RM750x [25] as it provides enough power for all the components. It costs £115.

#### 4.2.7 Case

I made sure to choose a case that could fit all of the components chosen in it and supported ATX motherboards, since the motherboard chosen has an ATX form factor [21]. It has the following dimensions (L\*W\*H): 21.7cm x 49.6cm x 46.8cm [26]. As it is quite large and includes a pre-installed 120mm rear fan, it will help keep the systems temperature down. It comes at a reasonable price of £56.06 [26].

#### 4.2.8 Monitor

It was clear from the start that since the company will be editing 4K video content, it is best to edit on a 4K monitor in order to see all of the details. However, I had to make the choice between a TN/IPS/VA monitor panel. TN panels have poor colour accuracy and are therefore not the best choice for video editing [40]. I ended up going for an IPS supporting monitor due to their great colour accuracy and because VA panels “have higher chances of motion blur when you are playing or viewing fast-paced action” [40].

The monitor chosen is the LG UHD 24UD58 which has a 24 inch 4K IPS display at the cost of £260.40 [27].

#### 4.2.9 Accessories

- **Keyboard and mouse** – I have chosen a basic keyboard and mouse combination from Logitech, called the MK120 [8] at a cost of £16.99. I saw no need to purchase any expensive keyboard or mouse as they provide no extra benefit for video editing.
- **Card reader** – A card reader is required so that 4K camera footage can be exported to the PC. I have therefore chosen the InVaFoCo UHS-II SD 4.0 card reader [28] that supports both microSD and SD memory cards and USB 3.0 ports for faster data transfer rates. It allows for write speeds of up to 250MB/s and read speeds of up to 280MB/s. It costs just £16.99 [28].
- **Ethernet cable** – As the motherboard supports one 2.5gb/s port and a 1gb/s port, it made sense to go for an ethernet cable supporting up to 2.5gb/s. I have therefore chosen the UGREEN Ethernet Cable which costs £9.99. It supports speeds of up to 10gb/s [29].

## Chapter 5 Scenario 2 - Additional storage

In addition to the PC components and its accessories, a Network Attached Storage (NAS) unit is needed to store the vast amount of video files that will be accumulated. The NAS must:

- Initially have 16TB of available storage
- Be expandable up to 56TB of available storage (from 8TB drives).
- Be supported by RAID configurations

### 5.1 Shopping list

| Name of product                                                                                                           | Price                      | Image of product                                                                                                                                             |
|---------------------------------------------------------------------------------------------------------------------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NAS - Synology DS1817 8 Bay                                                                                               | £984.99                    | <br><i>Figure 30: Synology DS1817 8 Bay. Source: [41].</i>                  |
| 3x Hard drives -<br>Seagate IronWolf<br>8 TB NAS<br>Internal HDD<br>(ST8000VN0022)<br><br>Total initial<br>storage: 24TB. | 3 x 202.<br>Total:<br>£606 | <br><i>Figure 31: Seagate IronWolf 8 TB NAS Internal HDD. Source: [42].</i> |

Total price: £1590.99 (including VAT).

Additional information: 2x RJ-45 Ethernet cables are included with the NAS [41]. These will be connected to a switch. Other necessary cables including a power cable is included.

5.2 Justification for the NAS, its configuration and storage

Below I have justified why I have chosen the NAS, its configuration and storage for scenario 2.

5.2.1 Redundant Array of Independent Disk (RAID) configuration

As the client wants a cost effective, efficient RAID configuration for redundancy, I have chosen RAID 5. The reason I chose RAID 5 is because packets of parity data are created and stored in every drive in the NAS unit [43]. This means that unlike RAID 1 that requires a large amount of storage of which only half is available, RAID 5 only takes up the equivalent storage of 1 drive, spread out across all drives [43]. Therefore, although RAID 1 has good redundancy, it would be much more expensive.

I also considered RAID 6 however decided against it since it would require more storage and in terms of speed and performance, it is worse than RAID 5 [43]. The RAID calculator from International Computer Concepts [44] demonstrates that:

RAID 5 requires 64TB of total storage for 56TB of available storage:



Figure 32: Results from RAID 5 calculator for 64TB of storage. Source: [44].

RAID 6 requires 72TB of total storage for 56TB of available storage:

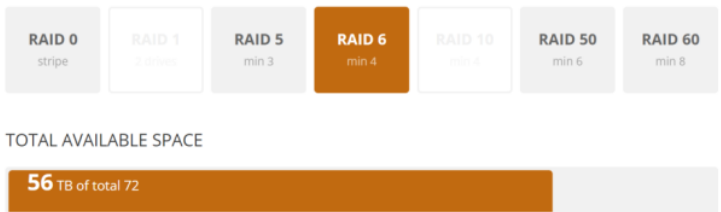


Figure 33: Results from RAID 6 calculator for 72TB of storage. Source: [44].

RAID 5 therefore has the benefit of requiring less storage (thus lower cost), is more efficient and has good redundancy.

5.2.2 Network Attached Storage (NAS) unit

After deciding that a RAID 5 configuration was best, I searched for an 8 bay Network Attached Storage (NAS) unit with good specifications. I chose the DS1817, which costs £984.99 [41]. Crucially, it is compatible with RAID 5 configurations [46]. It includes 8 bays, which is perfect as 8x8TB of drives is equal to 64TB total. It has read speeds of up to 1577MB/s and writes speeds of up to 739MB/s [41], 4GB DDR3L RAM [45] and a “quad-core 1.7 GHz processor” [46]. It has a “Maximum single volume size” [46] of 108TB and

includes 10gb/s RJ-45 ethernet ports [46]. It therefore fulfils the requirements set out by the graduate, as listed above.

### 5.2.3 Non-volatile storage for NAS

As explained earlier, a total of 64TB is needed for this scenario when used with a RAID 5 configuration and when considering that 56TB of that storage must be available storage. However, only 24TB of storage is initially needed, since 16TB of that is available storage in a RAID 5 configuration. I have therefore chosen 3 of the of the Seagate IronWolf 8TB NAS Internal Hard Disk Drives (HDDs) [42], costing £202 each and at a total cost of £606. I found out that the HDDs are compatible with the DS1817 NAS via Synology's compatibility list [47]. I chose the Seagate HDD with the model number: ST8000VN0022.

I made sure to choose a NAS HDD instead of a regular desktop HDD because they're made to perform for much longer periods at a time than regular HDDs are [48]. Due to the mass amount of storage required, this is necessary. According to Seagate (the manufacturers of the chosen HDD), it has a maximum "Sustained Transfer Rate" of 210MB/s [49].

### 5.3 How to access data from the PC to NAS and expected data transfer speeds

The NAS and PC will be connected via ethernet cables to a local switch/router and will hence be on the same network. Once the NAS is turned on, the PC can access the NAS by using a browser and entering "find.synology.com" [50] into the URL. After signing in and configuring the NAS it can now be accessed at any point by simply entering the NAS's IP address "with port 80 on the end" [50].

The read speed of the chosen NAS (when considering a 1gb/s ethernet port for the PC [21]) is 444.89MB/s and the write speed is 449.33MB/s [51], as seen via official benchmarks from Synology, below:

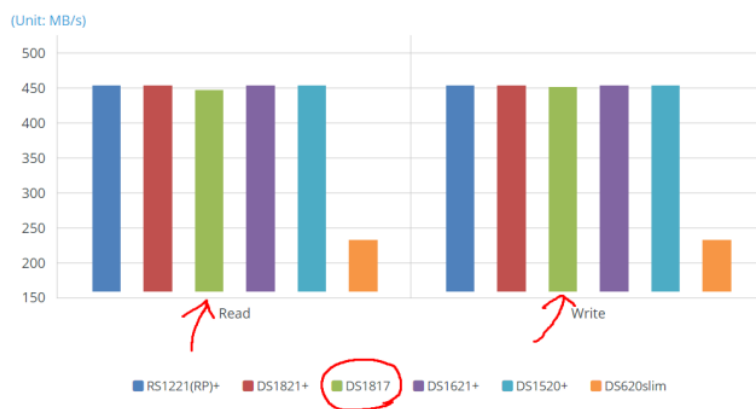


Figure 34: Chart revealing the read and write speed of the DS1817 NAS. Source: [51].

## **Chapter 6 Conclusion**

In conclusion, all of the components/accessories for both scenarios have been listed and fully justified. The low budget PC and its accessories cost a total of £562.80 (including VAT). I made sure not to recommend any expensive components due to the low budget. I made some compromises such as not having a dedicated GPU and instead having an integrated GPU on the CPU in order to keep costs down. Nevertheless, the setup will allow the relative to do the tasks outlined, such as communicate to their family via Skype.

The high end PC and its accessories cost a total of £2516.40 (including VAT), hence is over the approximate budget of £2500 by £16.40. The PC components chosen have been researched thoroughly to ensure they are optimal for 4K video editing. The NAS and its 16TB of initially available storage (reduced from 24TB due to RAID 5) cost a total of £1590.99 (including VAT). The NAS has 8 bays and hence will allow for a total of 64TB of storage (when using 8TB HDDs), thus 56TB of available storage when used in a RAID 5 configuration.

## Chapter 7 References

- [1] Aria, "Intel Core i3 9100 9th Gen Desktop Processor/CPU Retail," *Intel*, [Online]. Available: <https://www.aria.co.uk/Products/Components/Processors/Intel+CPUs/Core+i3++Socket+1151+Coffee+Lake/Intel+Core+i3+9100+9th+Gen+Desktop+Processor%2FCPU+Retail+?productId=71286>. [Accessed 8 Apr 2021].
- [2] CCL Computers Limited, "Gigabyte B365M DS3H Intel Socket 1151 Motherboard," *Gigabyte*, [Online]. Available: <https://www.cclonline.com/product/296456/B365M-DS3H/Motherboards/Gigabyte-B365M-DS3H-Intel-Socket-1151-B365-Chipset-MicroATX-Motherboard/MBD2694/>. [Accessed 8 Apr 2021].
- [3] Amazon, "Corsair CMK8GX4M2A2400C14 Vengeance LPX 8 GB (2 x 4 GB) DDR4 2400 MHz C14 XMP 2.0 High Performance Desktop Memory Kit, Black," *Corsair*, [Online]. Available: <https://www.amazon.co.uk/Corsair-CMK8GX4M2A2400C14-Vengeance-Performance-Desktop/dp/B00S51XM5Q>. [Accessed 8 Apr 2021].
- [4] Amazon, "Samsung 860 EVO 500 GB SATA 2.5 Inch Internal Solid State Drive (SSD) (MZ-76E500), black," *Samsung*, [Online]. Available: <https://www.amazon.co.uk/Samsung-MZ-76E500B-EU-Solid-State/dp/B078WQT6S6>. [Accessed 8 Apr 2021].
- [5] Amazon, "Thermaltake Versa H17 Micro-ATX Case - Black," *Thermaltake*, [Online]. Available: <https://www.amazon.co.uk/Thermaltake-Versa-H17-Micro-ATX-Case/dp/B077GBTN76>. [Accessed 8 Apr 2021].
- [6] Amazon, "Corsair CP-9020066-UK RM Series RM450 80 Plus Gold 450W ATX/EPS Fully Modular Power Supply Unit," *Corsair*, [Online]. Available: <https://www.amazon.co.uk/Corsair-CP-9020066-UK-RM450-Modular-Supply/dp/B00FG9FUYQ?th=1>. [Accessed 8 Apr 2021].
- [7] Amazon, "AOC e2470SWH - 24 Inch 60Hz, TN, 5ms FHD Monitor, Speakers, Vesa 100 x 100, 1ms response time (1920 x 1080 @ 60Hz, TN, 5ms, HDMI/VGA/DVI)," *AOC*, [Online]. Available: [https://www.amazon.co.uk/AOC-e2470Swh-Widescreen-Multimedia-1920x1080/dp/B015510NDM/ref=cm\\_cr\\_arp\\_d\\_product\\_top?ie=UTF8](https://www.amazon.co.uk/AOC-e2470Swh-Widescreen-Multimedia-1920x1080/dp/B015510NDM/ref=cm_cr_arp_d_product_top?ie=UTF8). [Accessed 8 Apr 2021].
- [8] Currys, "LOGITECH MK120 Keyboard & Mouse Set," *Logitech*, [Online]. Available: <https://www.currys.co.uk/gbuk/computing-accessories/computer-accessories/mice-and-keyboards/mice-and-keyboard-packages/logitech-mk120-keyboard-mouse-set-10725270-pdt.html>. [Accessed 9 Apr 2021].
- [9] Amazon, "Ziyituod 3000Mbps WiFi 6 Bluetooth5.1 PCIe WiFi Card | Up to 2402Mbps | Intel WiFi 6 AX200 | 5G/2.4G Wireless Network Card With 160MHz,OFDMA,Ultra-Low Latency | For Windows 10 64bit," *Ziyituod*, [Online]. Available: [https://www.amazon.co.uk/Ziyituod-Bluetooth5-0-2974Mbps-Wireless-Bluetooth/dp/B07Z1W8Y16/ref=sr\\_1\\_3?\\_encoding=UTF8&c=ts&dchild=1&keyword](https://www.amazon.co.uk/Ziyituod-Bluetooth5-0-2974Mbps-Wireless-Bluetooth/dp/B07Z1W8Y16/ref=sr_1_3?_encoding=UTF8&c=ts&dchild=1&keyword)

s=Network%2BCards&qid=1618937214&s=computers&sr=1-3&ts\_id=430513031&th=1. [Accessed 9 Apr 2021].

- [10] Amazon, "Dericam Webcam, HD 1080P Webcam with Microphone, Computer Web Camera for PC,MAC,Laptop, Plug and Play USB Webcam with Privacy Cover for Youtube, Skype, Video Calling, Conferencing, Gaming," *Dericam*, [Online]. Available: [https://www.amazon.co.uk/gp/product/B083SJRM6/ref=ppx\\_yo\\_dt\\_b\\_search\\_asin\\_title?ie=UTF8&psc=1](https://www.amazon.co.uk/gp/product/B083SJRM6/ref=ppx_yo_dt_b_search_asin_title?ie=UTF8&psc=1). [Accessed 9 Apr 2021].
- [11] N. Kirsch, "Intel Core i3-9100 4-Core Processor Review," *LegitReviews.com*, 19 Aug 2019. [Online]. Available: [https://www.legitreviews.com/intel-core-i3-9100-4-core-processor-review\\_213639](https://www.legitreviews.com/intel-core-i3-9100-4-core-processor-review_213639). [Accessed 9 Apr 2021].
- [12] ebayer, "MSI MPG Z390 GAMING PLUS 1151 DDR4 ATX Motherboard," *MSI*, [Online]. Available: <https://www.ebuyer.com/860393-msi-mpg-z390-gaming-plus-1151-ddr4-atx-motherboard-mpg-z390-gaming-plus>. [Accessed 9 Apr 2021].
- [13] Amazon, "Rasalas 8GB Kit (2x4GB) PC3-12800 DDR3L 1600MHz SODIMM, 4GB DDR3 1600 2Rx8 PC3L-12800S 1.35V 204-Pin CL11 Dual Rank Laptop RAM Memory," *Rasalas*, [Online]. Available: [https://www.amazon.co.uk/Rasalas-PC3-12800-1600MHz-PC3L-12800S-204-Pin/dp/B08B5SBXHN/ref=sr\\_1\\_15?dchild=1&keywords=2x4gb+ram&qid=1619117002&quartzVehicle=29-411&replacementKeywords=2x4gb&sr=8-15](https://www.amazon.co.uk/Rasalas-PC3-12800-1600MHz-PC3L-12800S-204-Pin/dp/B08B5SBXHN/ref=sr_1_15?dchild=1&keywords=2x4gb+ram&qid=1619117002&quartzVehicle=29-411&replacementKeywords=2x4gb&sr=8-15). [Accessed 9 Apr 2021].
- [14] Transcend Information, "What is the difference between SDRAM, DDR1, DDR2, DDR3 and DDR4?," *Transcend Information*, [Online]. Available: <https://www.transcend-info.com/Support/FAQ-296>. [Accessed 9 Apr 2021].
- [15] B. Hale, "Single Channel vs. Dual Channel vs. Quad Channel Memory," *TechGuided.com*, 7 Apr 2020. [Online]. Available: <https://techguided.com/single-channel-vs-dual-channel-vs-quad-channel/>. [Accessed 9 Apr 2021].
- [16] Amazon, "Seagate BarraCuda 1 TB Internal Hard Drive HDD – 3.5 Inch SATA 6 Gb/s 7200 RPM 64 MB Cache for Computer Desktop PC (ST1000DM010)," *Seagate*, [Online]. Available: [https://www.amazon.co.uk/Seagate-Barracuda-internal-silver-ST1000DM010/dp/B01LY65EVG/ref=sr\\_1\\_4?c=ts&dchild=1&keywords=Internal+Hard+Drives&qid=1619178107&refinements=p\\_n\\_size\\_browse-bin%3A10625607031&s=computers&sr=1-4&ts\\_id=430502031](https://www.amazon.co.uk/Seagate-Barracuda-internal-silver-ST1000DM010/dp/B01LY65EVG/ref=sr_1_4?c=ts&dchild=1&keywords=Internal+Hard+Drives&qid=1619178107&refinements=p_n_size_browse-bin%3A10625607031&s=computers&sr=1-4&ts_id=430502031). [Accessed 9 Apr 2021].
- [17] Newegg, "POWER SUPPLY CALCULATOR," *Newegg*, [Online]. Available: <https://www.newegg.com/tools/power-supply-calculator/>. [Accessed 10 Apr 2021].
- [18] PCPartPicker, "System Builder," *PCPartPicker*, [Online]. Available: <https://pcpartpicker.com/list/>. [Accessed 10 Apr 2021].

- [19] Currys, "AMD Ryzen 9 5900X Processor," *AMD*, [Online]. Available: <https://www.currys.co.uk/gbuk/computing-accessories/components-upgrades/processors/amd-ryzen-9-5900x-processor-10216689-pdt.html>. [Accessed 14 Apr 2021].
- [20] Scan, "Noctua Intel/AMD NH-D15 chromax.black CPU Cooler," *Noctua*, [Online]. Available: <https://www.scan.co.uk/products/noctua-nh-d15-chromaxblack-cpu-cooler-intel-amd-dual-nh-a15-fans-300-1500rpm-825cfm-airflow-246db-4>. [Accessed 14 Apr 2021].
- [21] CCL Computers Limited, "ASUS ROG Strix X570-E Gaming AMD Motherboard," *ASUS*, [Online]. Available: <https://www.cclonline.com/product/289459/90MB1150-M0EAY0/Motherboards/ASUS-ROG-Strix-X570-E-Gaming-AMD-Socket-AM4-X570-Chipset-ATX-Motherboard/MBD2677/>. [Accessed 14 Apr 2021].
- [22] ebayer, "Corsair Vengeance LPX Black 64GB 3200MHz DDR4 Dual Channel Memory Kit," *Corsair*, [Online]. Available: <https://www.ebuyer.com/974330-corsair-vengeance-lpx-black-64gb-3200mhz-ddr4-dual-channel-memory-kit-cmk64gx4m2e3200c16>. [Accessed 14 Apr 2021].
- [23] Amazon, "Sabrent Rocket Q 2TB NVMe PCIe M.2 2280 Internal SSD High Performance Solid State Drive R/W 3200/2900MB/s (SB-RKTQ-2TB)," *Sabrent*, [Online]. Available: <https://www.amazon.co.uk/Sabrent-Rocket-Internal-Performance-SB-RKTQ-8TB/dp/B0829DZH2W?th=1&tag=hawk-future-20&ascsubtag=pcg-gb-8889874275979734000-20>. [Accessed 14 Apr 2021].
- [24] NVIDIA, "GEFORCE RTX 3070," *NVIDIA*, [Online]. Available: <https://www.nvidia.com/en-gb/geforce/graphics-cards/30-series/rtx-3070/>. [Accessed 14 Apr 2021].
- [25] Amazon, "Corsair RM750x 80 PLUS Gold, 750 W Fully Modular ATX Power Supply Unit - Black," *Corsair*, [Online]. Available: <https://www.amazon.co.uk/Corsair-RM750x-Fully-Modular-Supply/dp/B07B72D43N>. [Accessed 14 Apr 2021].
- [26] Amazon, "Cooler Master MasterBox MB520 - ATX PC Case with Tinted Front Panel, Racing Intakes, Transparent Side Panel, Flexible Air Flow Configurations - Red Accent," *Cooler Master*, [Online]. Available: [https://www.amazon.co.uk/Cooler-Master-MCB-B510L-KANN-S00-MB510L-Computer/dp/B07G4KCRRK/ref=sr\\_1\\_2?dchild=1&keywords=case%2Bpc&qid=1619018571&refinements=p\\_89%3ACooler%2BMaster&rnd=1632651031&s=computer&sr=1-2&th=1](https://www.amazon.co.uk/Cooler-Master-MCB-B510L-KANN-S00-MB510L-Computer/dp/B07G4KCRRK/ref=sr_1_2?dchild=1&keywords=case%2Bpc&qid=1619018571&refinements=p_89%3ACooler%2BMaster&rnd=1632651031&s=computer&sr=1-2&th=1). [Accessed 14 Apr 2021].
- [27] Amazon, "LG UHD 24UD58 24 Inch Monitor 4K IPS (3840 x 2160, 2x HDMI, DisplayPort, 250 cd/m2, 5ms, AMD Freesync), Black," *LG*, [Online]. Available: <https://www.amazon.co.uk/LG-24UD58-Monitor-DisplayPort-Freesync/dp/B01JM4E3UC>. [Accessed 15 Apr 2021].

- [28] Amazon, "InVaFoCo UHS-II SD 4.0 Card Reader USB 3.0 SD Micro SD Memory Card Reader for Photographers, Videographers, DSLR Cameras, 4K Videos Backup to PC," *InVaFoCo*, [Online]. Available: <https://www.amazon.co.uk/UHS-II-Reader-Easy-Link-Photographers-Videographers-Black/dp/B01N6595PR>. [Accessed 15 Apr 2021].
- [29] Amazon, "UGREEN Ethernet Cable, Cat 7 Gigabit Lan Network RJ45 High-Speed Patch Cord Flat 10Gbps 600Mhz/s STP Compatible with Raspberry Pi 4, PC, Game Console, PS5, PS4, Switch, Modem, Smart TV, Patch Panel (3M)," *UGREEN*, [Online]. Available: <https://www.amazon.co.uk/UGREEN-Ethernet-Gigabit-Network-Design/dp/B00QV1F160>. [Accessed 15 Apr 2021].
- [30] Adobe, "Premiere Pro system requirements," *Adobe*, [Online]. Available: <https://helpx.adobe.com/uk/premiere-pro/user-guide.html/uk/premiere-pro/system-requirements.ug.html>. [Accessed 16 Apr 2021].
- [31] Puget Systems, "Adobe Premiere Pro: AMD Ryzen 5000 Series CPU Performance," *Puget Systems*, [Online]. Available: <https://www.pugetsystems.com/labs/articles/Adobe-Premiere-Pro-AMD-Ryzen-5000-Series-CPU-Performance-1960/>. [Accessed 16 Apr 2021].
- [32] Currys, "AMD Ryzen 9 5950X Processor," *AMD*, [Online]. Available: <https://www.currys.co.uk/gbuk/computing-accessories/components-upgrades/processors/amd-ryzen-9-5950x-processor-10216688-pdt.html>. [Accessed 16 Apr 2021].
- [33] Adobe, "Optimizing your system for Premiere Pro and After Effects," *Adobe*, [Online]. Available: <https://helpx.adobe.com/uk/premiere-pro/kb/hardware-recommendations.html>. [Accessed 17 Apr 2021].
- [34] Jon, "5 Best CPU Coolers for the Ryzen 9 5900X and 5950X," *PremiumBuilds*, 11 Nov 2020. [Online]. Available: <https://premiumbuilds.com/cpu-coolers/best-cpu-coolers-for-ryzen-9-5900x-5950x/>. [Accessed 17 Apr 2021].
- [35] Tom's Hardware, "Asus ROG Strix X570-E Gaming Review: More Fast USB, Lower Price," *Tom's Hardware*, 25 Jul 2019. [Online]. Available: <https://www.tomshardware.com/uk/reviews/asus-rog-strix-x570-e-gaming-atx-motherboard,6246.html>. [Accessed 17 Apr 2021].
- [36] Puget Systems, "Recommended Systems for Adobe Premiere Pro," *Puget Systems*, [Online]. Available: <https://www.pugetsystems.com/recommended/Recommended-Systems-for-Adobe-Premiere-Pro-143/Hardware-Recommendations>. [Accessed 19 Apr 2021].
- [37] Adobe, "GPU accelerated rendering," *Adobe*, [Online]. Available: <https://helpx.adobe.com/uk/premiere-elements/using/gpu-acceleration.html>. [Accessed 19 Apr 2021].

- [38] NVIDIA, "GEFORCE RTX 3080," *NVIDIA*, [Online]. Available: <https://www.nvidia.com/en-gb/geforce/graphics-cards/30-series/rtx-3080/>. [Accessed 19 Apr 2021].
- [39] Tom's Hardware, "Nvidia's RTX 3000 Power Supply Requirements Amp Up PSU Shortage Concerns," *Tom's Hardware*, 16 Sep 2020. [Online]. Available: <https://www.tomshardware.com/uk/news/nvidias-rtx-3000-power-supply-requirements-PSU-shortage-2020>. [Accessed 19 Apr 2021].
- [40] The WiredShopper, "IPS vs TN vs VA – Which Panel Type Should I Choose?," *The WiredShopper*, 18 Feb 2021. [Online]. Available: <https://thewiredshopper.com/ips-vs-tn-vs-va/>. [Accessed 20 Apr 2021].
- [41] Amazon, "Synology DS1817 8 Bay Desktop Network Attached Storage Enclosure," *Synology*, [Online]. Available: [https://www.amazon.co.uk/Synology-Desktop-Network-Attached-Enclosure/dp/B072PX756V/ref=sr\\_1\\_13?dchild=1&keywords=%228%2Bbay%22%2Bnas&qid=1619032782&refinements=p\\_36%3A90000-110000&rnid=428432031&s=computers&sr=1-13&th=1](https://www.amazon.co.uk/Synology-Desktop-Network-Attached-Enclosure/dp/B072PX756V/ref=sr_1_13?dchild=1&keywords=%228%2Bbay%22%2Bnas&qid=1619032782&refinements=p_36%3A90000-110000&rnid=428432031&s=computers&sr=1-13&th=1). [Accessed 21 Apr 2021].
- [42] Amazon, "Seagate IronWolf 8 TB NAS Internal Hard Drive HDD – 3.5 Inch SATA 6 Gb/s 7200 RPM 256 MB Cache for RAID Network Attached Storage (ST8000VN0022)," *Seagate*, [Online]. Available: <https://www.amazon.co.uk/Seagate-IronWolf-Internal-Systems-Workload/dp/B01M1BUBSO?th=1>. [Accessed 21 Apr 2021].
- [43] Dataplugs, "RAID Level Comparison: RAID 0, RAID 1, RAID 5, RAID 6 and RAID 10," *Dataplugs*, 21 Aug 2018. [Online]. Available: <https://www.dataplugs.com/en/raid-level-comparison-raid-0-raid-1-raid-5-raid-6-raid-10/>. [Accessed 22 Apr 2021].
- [44] International Computer Concepts, "RAID CALCULATOR," *International Computer Concepts*, [Online]. Available: <https://www.icc-usa.com/raid-calculator/>. [Accessed 22 Apr 2021].
- [45] Synology, "DiskStation DS1817," *Synology*, [Online]. Available: <https://www.synology.com/en-uk/products/DS1817>. [Accessed 22 Apr 2021].
- [46] Synology, "DS1817," *Synology*, [Online]. Available: [https://global.download.synology.com/download/Document/Hardware/DataSheet/DiskStation/17-year/DS1817/enu/Synology\\_DS1817\\_Data\\_Sheet\\_enu.pdf](https://global.download.synology.com/download/Document/Hardware/DataSheet/DiskStation/17-year/DS1817/enu/Synology_DS1817_Data_Sheet_enu.pdf). [Accessed 22 Apr 2021].
- [47] Synology, "Synology Products Compatibility List," *Synology*, [Online]. Available: [https://www.synology.com/en-uk/compatibility?search\\_by=products&model=DS1817&category=hdds\\_no\\_ssd\\_trim&filter\\_brand=Seagate&filter\\_size=8TB&filter\\_class=NAS&p=1](https://www.synology.com/en-uk/compatibility?search_by=products&model=DS1817&category=hdds_no_ssd_trim&filter_brand=Seagate&filter_size=8TB&filter_class=NAS&p=1). [Accessed 22 Apr 2021].

- [48] Synology, "Why choose NAS drives over desktop drives for your NAS?," *Synology*, [Online]. Available: <https://blog.synology.com/xmas-wishlist-why-choose-nas-drives-over-desktop-drives-for-your-nas>. [Accessed 22 Apr 2021].
- [49] Seagate, "3.5 HDD DATA SHEET," *Seagate*, [Online]. Available: [https://www.seagate.com/www-content/datasheets/pdfs/ironwolf-12tbDS1904-9-1707US-en\\_US.pdf](https://www.seagate.com/www-content/datasheets/pdfs/ironwolf-12tbDS1904-9-1707US-en_US.pdf). [Accessed 22 Apr 2021].
- [50] R. Edmonds, "How to connect to your Synology NAS," *Windows Central*, 4 Jun 2018. [Online]. Available: <https://www.windowscentral.com/how-connect-your-synology-nas>. [Accessed 22 Apr 2021].
- [51] Synology, "Performance," *Synology*, [Online]. Available: [https://www.synology.com/en-uk/products/performance#5\\_8bay](https://www.synology.com/en-uk/products/performance#5_8bay). [Accessed 22 Apr 2021].

# Comp Arch Assign (2004728) Robert Jamieson

## GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

Instructor

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GRADING FORM: GJ\_2019

ROBERT IWAN JAMIESON

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### ENGAGEMENT WITH LITERATURE



Superb level of targeted, relevant background reading and research sources.

83

### KNOWLEDGE AND UNDERSTANDING



Extremely competent demonstration of knowledge of the underlying concepts and technologies used.

85

## COGNITIVE AND INTELLECTUAL



Choices backed up with excellent justification as well as reliable research sources used.

**85**

## PRACTICAL APPLICATION



Extremely appropriate systems specified with no glaring omissions or obvious errors.

**85**

## TRANSFERABLE SKILLS



Generally well laid out and presented. Good use of the 1.1, 1.2 method of breaking the document up into sections. Try not to use the "I" first person style for formal reports/assignments such as this.

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