Before describing the two system specifications, the requirements for both clients must be examined. After they have fit the budget and the use cases for the client’s profession, both systems need to be upgradeable in the future. This will mean the system will cost less, and be more useful, in five to ten years’ time.

Both systems must be upgradeable because the system requirements for software are likely to increase in the future. For example, the Windows XP Home Edition operating system, released in 2001, required a 0.3GHz processor, 128MB of RAM, and 1.5GB of hard disk space[x]. Windows 8.1, released in 2013, required a 1.0GHz processor, 2048MB of RAM and 16GB of hard disk space[x]. This increase holds true for almost every other piece of software in use today, from browsers to computer games. For this reason, hardware capacity must be greater than currently necessary to allow for future hardware and software upgrades, including updates to the operating system itself. In particular, greater capacity is needed for main memory (RAM), and the hard disk.

The first system must support a small businessman: a Sole Trader. The primary system requirement besides the price is that the system will run small business accounting and inventory management software, which generally do not tax modern systems[x]. This requirement will be easy to meet as long as there is additional RAM and hard drive space alongside the OS. Home entertainment use may require support of resource-light[x] computer games. Finally, the system must be upgradeable, since new games and higher-definition video are likely to require more resources in five to ten years’ time[x].

(‘Resource-light’ in this context is defined as all programs needing approximately 2.0GHz processing power, 1GB RAM, and under 3GB hard disk space, such as FTL or Braid.)

(A resource-light game like ‘Braid’, released in 2009, is significantly lower than the requirements of FTL or Torchlight, released just three years later. This suggests a general upward trend in game requirements.)

|  |  |  |  |
| --- | --- | --- | --- |
| Supplier | Type | Description | Price (£) |
| eBuyer | Operating System | Windows 8.1 | 80.03 |
| Scan | Processor | Intel i3-4130 (3.4Ghz) | 79.98 |
| Scan | Motherboard | Gigabyte GA-H87-HD3 | 70.64 |
| Scan | RAM | Corsair 4GB DDR3 | 31.68 |
| Scan | Hard Drive | Seagate 500GB Barracuda | 35.98 |
| Scan | PSU | 500W Corsair CX500 | 46.20 |
| Scan | Case | Corsair 200R | 47.04 |
| Scan | Monitor | iiyama 22” | 117.86 |
| Scan | Keyboard | LMS Data K9020M | 4.98 |
| Scan | Mouse | Zalman ZM-M100 | 4.55 |
| Scan | Optical Drive | LiteOn IHAS124-14 | 11.98 |
|  |  | Shipping (£) | 10.98 |
|  |  | Total (£) | 541.90 |

*Fig. 1: Sole Trader Specification – prices correct as of 13/03/2014*

The processor is the most important part of the specification because it performs the mathematical calculations necessary for the software running on the system, so it has the greatest impact on overall system performance. The i3 processor selected has sufficient clock speed to make it useful for resource-light software written in five to ten years’ time. Power consumption is a worthwhile consideration, and at this price point the Intel i3-4130 is more suitable than the equivalent AMD system (the AMD A10-6800K), consuming 54W instead of the AMD chip which consumes 100W[x].

On a system without a dedicated graphics card, the motherboard provides all connectivity between the system and external peripherals. The key selection factor is upgradability, because once a motherboard is installed in a system it is inconvenient to upgrade: usually all the other components must be removed beforehand. This motherboard has a variety of video ports to connect a monitor, and even has PCI-E support should a video card be needed in the future. The motherboard supports USB3, which is useful for connecting external peripherals such as hard disks, mice, keyboards, printers etc. The faster transfer rate versus USB2 makes the transfer of large files to an external hard disk take less time.

Main memory temporarily stores data needed by the CPU. While Windows 8.1 requires only 2GB of main memory, 4GB is provided to leave room for applications to operate. One memory module is provided instead of two smaller modules, leaving the other slots on the motherboard free so that the system is more cost effective to upgrade in the future.

The hard drive contains a non-volatile store of data needed by the CPU. Windows 8.1 requires 16GB of hard disk capacity to operate, and will use additional space for virtual memory paging. Storage of a large music library or video collection may be required as the computer will be used for home entertainment. The 400GB left after system use should be ample for a home user’s needs. A compressed movie generally takes up about 0.5GB of memory; meaning over 700 videos could be stored on this disk.

The power supply unit (PSU) must have more than enough capacity to run the system. Overstretched power supplies will fail more frequently, because the power requirements of the system will fluctuate depending on use. For example, when a USB device is plugged into the system, it may draw power for its own operation, temporarily increasing the demand on the PSU[x]. This PSU has a bronze 80PLUS certification, meaning it is designed to operate at approximately 80% efficiency even when usage is low. This will reduce heat output and overall power consumption[x].

The Corsair case has slots to store internal cables so they do not become tangled, and two built-in fans. These fans, along with the CPU fan provided by Intel, satisfy all cooling requirements for the system. Good air circulation ensures the system remains cool while operating, increasing the lifetime and reliability of the computer.

The peripherals selected for the Sole Trader are kept fairly basic, to keep the price low. The optical drive must have the ability to read DVDs for home entertainment purposes. The monitor is connectable to the main computer via VGA or DVI ports, and is large enough for watching video. The monitor also includes two built-in speakers so dedicated speakers are not necessary.

The second specification is for a Web Designer. It has been kept broadly similar to the Sole Trader spec: this is because many of the requirements overlap. The Web Designer will use their system for handling their accounts and producing invoices, but the most important requirement besides the price is that this system will be used to create websites, video and images. The system must accommodate video and image manipulation programs, such as Adobe Photoshop, Adobe Dreamweaver or Sony Vegas Pro. The system must also be resilient: in the event of hardware failure the Web Designer might lose valuable work and resources that might take a long time to recover.

|  |  |  |  |
| --- | --- | --- | --- |
| Supplier | Type | Description | Price (£) |
| eBuyer | Operating System | Windows 8.1 | 80.03 |
| Scan | Processor | [Intel i7-4770K (3.5GHz)](http://www.scan.co.uk/products/intel-core-i7-4770k-1150-haswell-quad-core-35ghz-39ghz-turbo-1250mhz-gpu-35x-ratio-84w-retail) | 245.64 |
| Scan | Motherboard | Gigabyte GA-H87-HD3 | 70.64 |
| Scan | RAM | [Corsair 16GB DDR3](http://www.scan.co.uk/products/16gb-%282x8gb%29-corsair-ddr3-vengeance-low-profile-jet-black-pc3-12800-%281600%29-non-ecc-cas-10-10-10-27-x) | 121.39 |
| Scan | Video Card | Gigabyte GTX 760 4GB | 230.11 |
| Scan | Hard Drive | [4 x Seagate 1TB Barracuda](http://www.scan.co.uk/products/1tb-seagate-st1000dm003-barracuda-720014-sata-6gb-s-7200rpm-64mb-cache-8ms-ncq-oem) | 167.76 |
| Scan | Boot Drive | [Kingston 120GB](http://www.scan.co.uk/products/120gb-kingston-ssdnow-v300-sata-iii-120g-ssd-bundle) SSD | 73.34 |
| Scan | PSU | [760W Corsair AX760](http://www.scan.co.uk/products/760w-corsair-ax760-full-modular-80-plus-platinum-92-eff-eps-12v-sli-crossfire-1-x-120mm-fan-atx-psu) | 113.71 |
| Scan | Case | Corsair 200R | 47.04 |
| Scan | Monitor | 2 x iiyama 22” | 235.72 |
| Scan | Keyboard | LMS Data K9020M | 4.98 |
| Scan | Mouse | Zalman ZM-M100 | 4.55 |
| Scan | Optical Drive | LiteOn IHAS124-14 | 11.98 |
|  |  | Shipping (£) | 10.98 |
|  |  | Total (£) | 1417.87 |

*Fig. 2: Web Designer Specification – prices correct as of 03/04/2014*

The programs used by the Web Designer will increase the computational load required of the processor: the more processing power supplied the faster and more responsive these programs will be. The same holds true for greater main memory capacity and greater hard disk storage capacity: large images and video will have to be loaded into both these areas for the Web Designer to do their job.

A dedicated video card is included in this build because Adobe Photoshop CS6 has been designed to take advantage of a dedicated video card. Having a video card will increase the responsiveness of this program when performing image transformations, such as scale and blur. The GTX 760 has 4GB of dedicated memory, and 192.2 GB/s memory bandwidth. A large amount of video memory means large images and video can be handled responsively. The memory bandwidth will improve image and video loading times because the data will reach the video card more quickly. The only trade-off made is one of performance over power consumption. In the case of the Web Designer the decision is weighted in favour of performance, so that the Web Designer can use his time more effectively, without having to wait for videos or image manipulation previews to load into memory.

The build includes four hard drives, each 1.5 TBs in size. These are to be set up in a ‘RAID 1+0’ configuration. Using RAID 1+0, the drives are split into two pairs. Each pair is responsible for a complete copy of the data on the system, meaning if one drive fails the other pair can be used to recover the data. This protects the Web Designer’s data from corruption. Within each pair, RAID 0 means that the data is ‘striped’ between the two drives. Data from a large chunk of memory, for example a video file, can be loaded into main memory in parallel using both drives at the same time, thus increasing the overall data read speed[x].

An SSD is provided to store the operating system files: the SSD will be the boot drive. Having the operating system booting from an SSD will reduce boot times from approximately 40 seconds to 5 seconds. This is because an SSD does not have to wait for a physical disk to start spinning; the drive can instead start transferring data almost instantaneously[x].

The Web Designer’s requirements for a monitor are identical to the Sole Trader since both must be able to view high fidelity video. Two monitors are supplied to the Web Designer since this is a common workflow aid for computer-aided design: one monitor is used to display tools and code, and the other can display the current output.

The two systems are similar in their basic composition, but they have crucial differences due to their different use cases. Each use case has been expanded upon to improve reliability and longevity. In both cases it is assumed that each customer will already have their own applications to transfer onto their system, but both systems have been built to amply deal with the more obvious software choices possible. Both machines came in under budget, allowing the rest of the budget to be spent on software or set aside for future upgrades.

[Windows XP spec](http://support.microsoft.com/kb/314865) x

[Windows 8.1 spec](http://windows.microsoft.com/en-GB/windows-8/system-requirements) x

[POS Maid requirements](http://inventory-management.findthebest.com/l/14/POS-Maid) x

[InFlow requirements](http://inventory-software-review.toptenreviews.com/inflow-details.html) x

[FTL requirements x](http://www.ftlgame.com/?page_id=192#reqs) (2012)

[Torchlight II requirements x](http://www.torchlight2game.com/support#faq_11) (2012)

[Braid requirements (2009)](http://store.steampowered.com/app/26800/)

[iPlayer video sizes](http://iplayerhelp.external.bbc.co.uk/help/mobile_tablet/faqs_mobile_downloads)

Sole trader

Intel: [link](http://ark.intel.com/products/77480/Intel-Core-i3-4130-Processor-3M-Cache-3_40-GHz) x

AMD: [link](http://shop.amd.com/uk/All/Detail/Processor/AD680KWOHLBOX?SearchFacets=category%3AProcessor) x

Comparison: [link](http://www.hardware-revolution.com/best-cpu-processor-apu-january-2014-intel-amd/) x

Price: £79.98 - Scan ([link](http://www.scan.co.uk/products/intel-core-i3-4130-s-1150-haswell-dual-core-34ghz-1150mhz-gpu-34x-ratio-54w-retail)) – 13/03/2014

Motherboard: [Gigabyte GA-H87-HD3](http://www.gigabyte.us/products/product-page.aspx?pid=4516#sp)

Reason: wide variety of graphics connectors (VGA, HDMI, DVI), plenty of space a processor upgrade and RAM or graphics card expansion.

Main factors: price, expansion, video output

Price: £70.64 - [link](http://www.scan.co.uk/products/gigabyte-ga-h87-hd3-intel-h87-s-1150-ddr3-sata-iii-sata-raid-pcie-30-%28x16%29-d-sub-dvi-d-hdmi-atx)

RAM: Corsair 4GB DDR

Reason: room for OS and for applications, including HD videos and basic games.

Price: £31.68 - [link](http://www.scan.co.uk/products/4gb-corsair-ddr3-desktop-pc3-12800-%281600%29-non-ecc-unbuffered-cas-11-11-11-30-15v)

Hard Disk Drive: Seagate 500GB Barracuda

Reason: price, plenty of room for OS, applications, music and video

Price: £35.98 - [link](http://www.scan.co.uk/products/500gb-seagate-st500dm002-barracuda-720014-sata-6gb-s-7200rpm-16mb-cache-85ms-ncq)

PSU: 500W Corsair CX500

Reason: reliable, plenty of room for expansion

[Fluctuations](http://smallbusiness.chron.com/effect-insufficient-power-supply-pc-66723.html) x

[80PLUS](http://www.plugloadsolutions.com/80pluspowersupplies.aspx) x

Price: £46.20 - [link](http://www.scan.co.uk/products/500w-corsair-builder-series-cx-cp-9020047-uk-80-plus-bronze-sli-crossfire-eps-12v-quiet-fan-atx-psu)

Case: Corsair 200R

Case Price: £47.04 - [link](http://www.scan.co.uk/products/corsair-carbide-series-200r-compact-mid-tower-performance-case-with-usb-30-w-o-psu)

Optical Drive: LiteOn IHAS124-14

Reason: price, DVD capability

Price: £11.98 - [link](http://www.scan.co.uk/products/liteon-ihas124-14-24x-dvdr-8x-dvddl-dvdplusrw-x8-rw-x6-dvd-ram-x12-sata-black-oem)

Monitor: iiyama 22”

Reason: widescreen dimensions ideal for watching films, resolution also crisp enough for this

Price: £117.86 - [link](http://www.scan.co.uk/products/22-iiyama-xu2290hs-b1-ips-led-monitor-ultra-slim-bezel-hdmi-dvi-vga-1920x1080-250cd-m2-5m1-5ms-speak)

Keyboard: LMS Data K9020M

Reason: multimedia keys

Price: £4.98 - [link](http://www.scan.co.uk/products/lms-data-k9020m-black-multimedia-keyboard-with-9-hot-keys-usb)

Mouse: Zalman ZM-M100

Reason: it’s a mouse

Price: £4.55 - [link](http://www.scan.co.uk/products/zalman-zm-m100-usb-optical-mouse-3-button-with-scroll-wheel-1000dpi-usb)

Same:

Motherboard

Case

Monitor

Keyboard

Mouse

PSU

Optical Drive

Different:

Processor – [i7-4770K](http://ark.intel.com/products/75123/intel-core-i7-4770k-processor-8m-cache-up-to-3_90-ghz) - [£245.64](http://www.scan.co.uk/products/intel-core-i7-4770k-1150-haswell-quad-core-35ghz-39ghz-turbo-1250mhz-gpu-35x-ratio-84w-retail) - 03/04/2014

SSDs boot time [source](http://en.wikipedia.org/wiki/Solid-state_drive) x

[Raid 0](http://en.wikipedia.org/wiki/Nested_RAID_levels)

RAM – 16GB

[SSD](http://www.scan.co.uk/products/120gb-kingston-ssdnow-v300-sata-iii-120g-ssd-bundle) - Kingston 120GB

Cooler?

[GTX 760](http://www.scan.co.uk/products/4gb-gigabyte-gtx-760-oc-rev-2-28nm-pcie-30-6008mhz-gddr5-gpu-1085mhz-boost-1150mhz-cores-1152-dport-)

Scan £230.11

4GB on-board memory

170W power consumption

256-bit memory interface

192.2 GBps memory bandwidth

1152 CUDA cores