Report on System Requirements for a Business Computer

After meeting the clients’ use case and budget, both systems must be upgradeable to be useful in three to five years because software system requirements 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. Windows 8.1, released in 2013, required a 1.0GHz processor, 2048MB of RAM and 16GB of hard disk space. Hardware capacity must be greater than currently necessary to allow for future hardware and software upgrades, such as updates to the operating system. Greater capacity is particularly 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 be used for home entertainment: this includes casual gaming and watching videos. Computer game system requirements generally increase over time, even within the ‘casual’ gaming market. For example, a resource-light game like ‘Braid’, released in 2009, has significantly lower requirements than comparable games released just three years later, such as ‘FTL’ or ‘Torchlight’. The system must therefore have greater processing power and main memory capacity than currently necessary. The system must also run small business accounting and inventory management software. These programs do not generally tax modern hardware.

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| --- | --- | --- | --- |
| 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 performs the mathematical calculations necessary for the software running on the system, and therefore has the greatest impact on overall system performance. The i3 processor selected has sufficient clock speed to make it useful for the Sole Trader’s applications, and to still be useful in the next three to five years. The Intel i3-4130 consumes less power (54W) than the equivalent AMD system (the AMD A10-6800K consumes 100W).

On a system without a dedicated graphics card, the motherboard provides all connectivity between the system and external peripherals. An upgradeable motherboard is useful 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 external hard disks and printers. The faster transfer rate over 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 permanently stores all files kept by the system, including application and user files. 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 and the space 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 (BBC Mobile - Size of programme downloads, no date). An external hard drive is also included, to allow the Sole Trader to keep a backup of his accounts data.

The power supply unit (PSU) must have more than enough capacity to run the system. 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 (80 PLUS Certified Power Supplies and Manufacturers, no date).

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 increases the lifetime and reliability of the system, because it reduces the risk of overheating.

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 some 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 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 risks losing valuable work and resources that may 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 on the processor compared to the Sole Trader: the more processing power supplied the faster and more responsive his resource-intensive programs will be. The same reasoning holds true for the increased main memory capacity and greater hard disk storage capacity.

A dedicated video card is included in this build because Adobe Photoshop CS6 has been designed to take advantage of a dedicated video card (Adobe Systems Incorporated, 2012). Having a video card will increase the responsiveness of this program when performing image transformations, such as image scaling and adding motion 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 1.5TB in size. The drives are to be set up in a ‘RAID 1+0’ configuration. The RAID 1+0 splits the drives 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 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 transfer speed (Ramesh Natarajan, 2010).

An SSD is provided as a boot drive. Having the operating system booting from an SSD will significantly reduce boot times because an SSD does not have to wait for a physical disk to start spinning; the drive can instead start transferring data immediately (Aleksey Meyev, 2008).

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.

Each use case has been expanded upon to improve reliability and longevity of each system. 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.

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http://www.thegeekstuff.com/2010/08/raid-levels-tutorial/

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Adobe Systems Incorporated (2012) *FAQ: What features use the GPU and how do I troubleshoot GPU issues?*

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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

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

Sole trader

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

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

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