PUTTING TOGETHER YOUR OWN DESKTOP COMPUTER

I have just replaced my primary desktop computer (I say primary as I have 2 others) and I would like to explain my logic in this change.

I don't expect everyone has the same reasons as I do for updating but it is not a bad thing to consider a change when your computer gets older.

My computer use is varied. Like most people, I use it for communications (e-mail, Skype, Go-to-Meeting etc.) photo and video manipulation using Adobe creative suite software, web site design etc. as well as testing and experimenting with other software and computer components. Consequently I like to keep my computer up to date and I am always reading up on new developments.

My previous machine was built in late 2008 and had Microsoft Vista as the operating system. It had a first generation i7 processors with a base frequency of 2.93 Ghz (realistic overclocking potential up to 3.4 Ghz with lots of cooling!) This also supported Intel graphics and was coupled with 16 gb of RAM, a 2 GB platter hard drive and at the time was considered quite a powerful unit.

Over the years since I purchased it went to Windows 7, Windows 8 and 8.1 and finally Windows 10. I also replaced the original 2 GB hard drive with a 500 GB solid state unit and a new 2 GB platter drive. I tried overclocking but the small increase to 3.0 Ghz did not justify the increase in core temperatures and the potential of failures.

I decided that after nearly 9 years this machine didn't owe me anything and there was the possibility of components wearing out. Many components were greatly improved over time plus new and very attractive units on the market were becoming irresistible!

Now there is a fine line between "want" and "can afford without having a lot of explaining to do" and being realistic I chose the latter!

I made out a list of components based on what I considered to be the essential elements I should consider and this came out as:

1. CPU. The new Intel Kaby Lake CPU was still not available for desktop units (November 2016) so I latched onto the best available the Skylake series i7-6700.
2. GPU. This was a tough call. I don't play many games on my computer but I do edit videos and play back movies so rather than the Gigabyte GTX 1080G (nearly $700) I went with the Radeon R9 nearly $200 less.
3. Memory. Memory is the most underrated component in a computer in my mind. Manufacturers are prone to skimp on this item to save pennies and the performance of the machine suffers. In my case I decide to install 32 GB at a cost around $220.
4. Hard Drives. For comparison, a standard platter drive at 7200 rpm (the norm today) has a read/write speed of around 120/80 MB/sec. A "standard" solid state drive (SSD) has a

read/write speed of 540/490 MB/sec a big improvement over a platter drive however the new Samsung Pro M.2 clocks in at 3500/2100 MB/sec! Of course, the Samsung is more expensive, a "standard" 500 GB SSD drive will cost around $XXX compared to a Samsung at $XXX but prices are falling and other manufacturers are coming out with faster speeds. I decided on a Samsung 960 Pro M.2 coupled with a 2TB platter drive. This way I can have my operating system and software on the fastest drive and my documents etc. on the platter drive.

So after selecting the major components I tallied up my costs.

Case: Corsair mid tower	90.00
Power Supply: Antec 750w	100.00
Mobo: ASUS Hi 70 pro gaming	170.00
CPU: Intel i7-6700 (Sky Lake) 3.4 GHz	365.00
CPU Heatsink	50.00
GPU: Radeon R9	565.00
RAM: 32 GB DDR4 (2 x 16 GB)	225.00
SSD: Samsung 512 GB 960 Pro M.2	350.00
HDD: WD Blue 2 TB HDD WD20EZRZ	80.00
DVD Play/Record unit:	26.00
OS: Windows 10 Pro	150.00
GRAND TOTAL (COMPONENTS)	**$2171 (before sales tax)**

The justification for choosing these components was basically these are the most up to date available at a price I wanted to pay at the time I was considering this project which was December 2016.

I also wanted to avoid liquid cooling. This is a personal preference; liquid cooling has improved in the last few years and pump failures have dropped dramatically. However, when a pump does fail (and it does still happen) the shutdown protection has just a couple of seconds to respond before the CPU and/or GPU are fried! For this reason, the Corsair case was a very good choice, it has many options for cooling fans (see Fig. 1) which
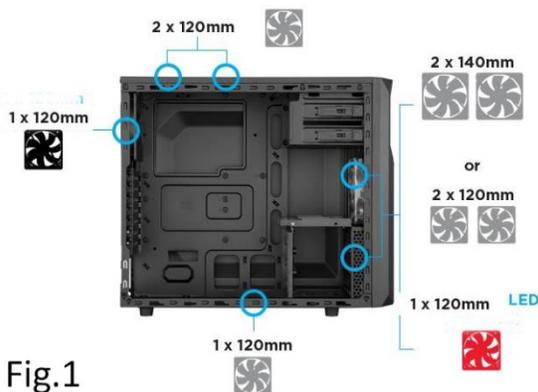

Fig.1

should keep the unit cool even if overclocked.

I chose the Intel Skylake CPU as a unit capable of overclocking up to 4.0 GHz without much increase in temperature with the proposed cooling.

Graphics cards are something that depends very much on your computing needs. I do not play video games regularly but I do want the capability to play and edit videos, watch movies etc.

I am a big believer in installing as much memory as you can especially as the cost today is not outrageous. I elected to install 32 GB in 2 slots which is a good fit for this rig.

Storage today must include an SSD now that prices are coming down. In this instance, I chose the new Samsung 960 Pro M.2 model which is a speed demon. The regular SSD available from other manufacturers such as Kingston, Crucial etc. perform read/write tasks up to 500/450 Mps which is at least ten times faster than a standard platter drive but seems almost snail like compared with the new Samsung 960 M.2 which can read /write at speeds up to 3500/2100 Mps! These units cost a little more ($330 vs $200 for the regular 500 GB model) but the increase in speed more than justifies this. This drive is intended for the operating system and programs with a separate 2 TB platter drive installed for storing documents, images, videos etc. Now if money was not a consideration this could have used the 1 TB version of the Samsung 960 but that would be around $650 for the 1 TB model vs $80 for a 2 TB platter drive.

Additionally, I wanted a read/write DVD + CD player and auxiliary USB ports, HDMI, RJ45 are installed.

I wanted at least 4 USB (3.0) connections 2 front and 2 back and was able to get 6 including 2 USB 3.1 in the back which I use for my external HD and a 7 port USB hub. I also have 2 DVI connections in the back for the monitors.

I have had people ask why choose DVI connection rather than the newer HDMI. The difference basically is DVI is strictly video only, if you want to include audio you need an audio connection. However, the DVI connection has higher refresh rates than a HDMI so the image is slightly sharper than one from a HDMI connection. If you don't have a separate audio connection, then HDMI is the way to go but if you do then it is a matter of preference as prices are very similar for both cables. I am a bit of a traditionalist and I stayed with DVI as I have a very good Altec audio unit.

I have installed 2 x 24" BENQ monitors extended so I get the best possible viewing area and it is great for moving documents around for reference.

I ordered the unit in the 3rd week of December from my friends at AIM computer (more about them later) with the hope of having it by mid-January. However, I had not allowed for the huge demand for the Samsung SSD which was placed on back order by Samsung with an estimated delivery date of beginning of February. This actually dragged out until February 12th before the

unit was shipped but this was a good thing actually as on January 30th Intel released their latest CPU the i7-7700K (Kaby Lake) 4.2 GHz and I was able to change out for this unit!

My computer was ready on February 15th and I installed it with the new monitors but using my old "Altec" sound system which still has a very good range with 2 speakers. I also used my existing webcam a "Logitech" orbit model which are still being produced and I might add selling for $300 plus on Amazon! After I had installed everything I ran a speed test using Glary Utilities and had a boot time of 14 seconds! Of course, this was before I had installed many programs but now after loading up numerous software programs plus anti-virus, Office 365, Adobe Creative Suite and numerous smaller programs I still have a boot time of around 26 seconds. This is without overclocking the CPU which right now I think unnecessary as the Kaby Lake has a base clock speed of 4.2 GHz a vast improvement over my old computer at 2.93 GHz!

So, what about those of you who want or need a computer upgrade but don't want a rig like mine I see a couple of alternatives. Remember however that component prices can vary from one retailer to another, sometimes quite significantly, so check with all the major on line sources such as TigerDirect, New Egg, Microcenter, Tom's Hardware etc. and even Amazon. To buy locally you could try Fry's Electronics, Best Buy or even Office Max but try computer repair shops such as AIM, Cantrell's, Eric's etc. as well, they can help. Using the component lists as I see them will help the vendors to see what you are looking for and allow them to make suggestions.

If you use your rig for everyday tasks such as e-mail sending and receiving, browsing the web but also for some image manipulation using software such as photo manipulation, some easy video editing etc. I envisage a unit with the capability to do the job efficiently (i.e. with reasonable speed) without costing too much. I have called this **"the everyday budget desktop"** computer and put a price tag of around $800 on this rig.

If you are a less demanding user and focus on e-mail and web browsing and some basic "office" work I see a unit I called the **"everyday basic desktop"** computer and put on a price tag of around $500 for this unit.

I investigated rigs that were on sale at Best Buy, Fry's and on line at New Egg, Amazon, Tiger Direct etc. but I never saw a setup I was completely happy about in either category.

 I decide to draw up my ideas for the two different computers mentioned above using components that had a 4-star (out of 5) rating and were not too expensive.

EVERYDAY BUDGET DESKTOP

PART	DESCRIPTION	RATING	APPROX. PRICE
Case	Phantecks Enthoo Evolv ITX	4.5 ★	$70
PSU	EVGA 450	4.5 ★	$40
Mobo	Gigabyte GA-H110N	4.5 ★	$75
CPU	Intel i5- 6600	5 ★	$180
GPU	ASUS GeForce GTYX 750 2 GB	4 ★	$120
RAM	Ballistix Sport 8GB (4GB x 2) kit DDR3	4.5 ★	$60
SSD	Sandisk 240 GB	4.5 ★	$70
HDD	1 TB Hitachi 7200 rpm SATA	4 ★	$44
OS	Windows 10 (home) OEM		$93
APPROXIMATE TOTAL PRICE			**$752**

The case for this is a mini ITX model which has a single stock fan, one of its big selling points. Secured under the front panel is a 200 mm monster large enough to help cool the CPU, GPU, and hard drive all on its own. If you would prefer a mid-tower case, try a NZXT S340 Elite at around $80 as an alternative.

This unit has the Intel i5 -6600 3.9GHz processor which has overclocking capabilities but it is fine at base clock speed. However, with the recommended GPU the need for a substantial CPU such as the Intel-i5 is really not required and substituting an Intel Pentium G4600 ($70) could save $110! I have left the i5 in the mix but this alternative is viable and could drop the overall cost down to less than $650! The graphics card is very good for most tasks and 8 GB of RAM should be fine, but there is room for expansion on the mother board up to 32 GB. The Mobo also has the capability of handling a couple of extra cards for additional USB ports etc.

With the price of solid state drives falling it is almost mandatory to have one for the "C" drive holding Windows and the software. This 240 GB unit should be adequate for most users, it takes a lot of software to fill up 240 GB!

The platter hard disc drive rotating at 7200 RPM is typical and should be more than enough for storing documents, pictures and videos.

For the "basic" model I was most interested in ensuring that the configuration would be more than for sending and receiving e-mails, web browsing and some basic office tasks such as writing letters etc. I didn't envisage playing video games, complex video and image editing etc. I also did not see the need for a large internal HD, if extra storage is needed in the future it is easy to hook up an external drive, a 2TB unit can be bought for less than $90.

EVERDAY BASIC DESKTOP

PART	DESCRIPTION	RATING	APPROX. COST
CASE	NZXT Source 210ATX	4.5★	$40
PSU	Corsair CX500 W 80+	4.5★	$50
Mobo	Gigabyte GA-H110M-S2H MicroATX	4.5★	$65
CPU	Intel Pentium G4400 3.3 Ghz Dual-Core	4.0★	$55
RAM	2 x 4 GB HyperX Fury Black DDR4-2400	4.5★	$50
SSD	Crucial MX300 275 GB	4.5★	$85
OS	Windows 10 OEM		$93
	APPROXIMATE TOTAL PRICE		**$438**

This rig has everything you need (except a keyboard, mouse and monitor!) to perform all your usual everyday tasks without busting your budget.

Once you have decided which route you want to take, basic or budget, you then have to decide if you want to try and build it yourself (a daunting task!) or ask around local shops for quotes and suggestions. I would not recommend trying to build yourself unless you are prepared to spend many hours not only putting things together but doing it correctly. You are better leaving this to the professionals.

I think it boils down to what shops charge for labor, the level of their expertise and their willingness to take on smaller jobs. To give you an idea on costs, to purchase the components, assemble the rig and test my new rig described earlier AIM computer charged me for 2 hours' labor, $130. I thought this was very reasonable considering time taken for ordering and assembling all the components (and my changes as things evolved).

For anyone interested in using them I would be more than happy to introduce you to them. I have also heard very good reviews about Cantrell's in Pleasant Hill. They have been around a long time (I remember having Diablo Valley PC User Group meetings at their place many years ago, when we lost our meeting room at the B of A building in Concord and before we starting meeting at DVC).

However, I happened come across another way of getting an economical computer. I am sure many of you have heard of "refurbished" computers, Dell has a website devoted to these and many of the major manufacturers such as HP, Acer and Lenovo sell these units to major retailers such as Tiger Direct (on line) and Fry's stores.

Basically, these computers were assembled for a specific task such as data entry for big operators and leased for a certain time period. During this time operators spent all day (and sometimes nights) putting in data to main frame computers and at the end of the lease period they were returned to the leasing company or manufacturer. Some manufacturers such as Dell

overhaul these units and then sell them directly to the public, others to third party retailers. Usually these rigs have limited storage and computing power but are solid built units. If you visit the Dell refurbished outlet you will find not only computers but printers, hard drives and many other computer components. Other units are refurbished by Microsoft approved shops such as "AST" (who I believe are affiliated with Lenovo) and who did the job on the unit described below.
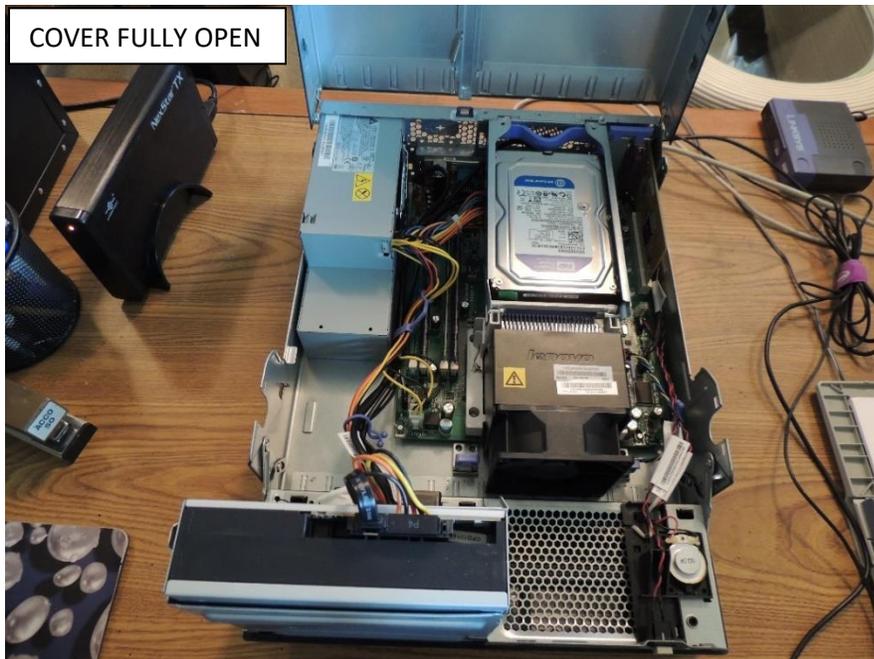
I noticed recently that Fry's has been selling refurbished Lenovo ThinkCenter desktop computers for $99 on a special offer every couple of weeks (rather than the claimed "normal" price of $199) so I went and took a look at them. The specification was not wonderful but for the price the machine had potential. Basic spec. Is as follows:

Lenovo M58E Refurbished Desktop PC with Intel Core2Duo 2.33GHz Processor,4GB Memory,250GB Hard Drive, DVD ROM drive, Windows 10 home.

These units are also on sale on the web at New Egg for $99.99 every day, but there could be a shipping charge.

However, with 45 GB of additional memory and changing out the 250 GB for a 500 GB SSD you would have a very useful basic computer which at a pinch could be used for video editing. Another good point about this unit is the ease of access to the components which would make it easy for anyone to do the upgrades. The case can be opened up for these changes without any tools whatsoever!

Pressing two buttons on the front sides allows the top cover to be opened up to reveal the everything inside and grasping the back of the DVD drive completely reveals the memory slots.

MEMORY SLOTS
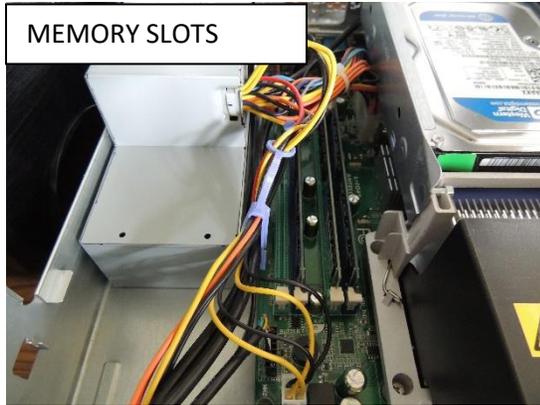
A 4 GB memory stick will cost you about $30. The easiest way to determine what you need is to visit the Crucial website and they will quickly scan your computer and recommend the right unit. When you receive it just check you have it lined up correctly over the card slot, push in firmly until you here a click and the card is installed!

The HDD is situated at the right rear of the case and pressing the blue retaining bar allows the drive to be lifted out for replacement. A new SSD for this machine will run you from $150 to #300 depending on the specs and manufacturer but an average price of $200 is easily attainable.

 It may be necessary to buy a 2.5" model (intended for laptops) and buy an adapter to fit this machine which will run you about $15.

To replace the drive, you must first clone the existing drive to the new drive using software such as EaseUS Todo Backup Free Edition or if you want to pay a paid edition is available for $10 which does away with all the ads and "begging"! You will need a USB to SATA cable to connect the computer to the new drive which costs around $12 (or you can borrow from a friend, I have one!) and using the software clone the existing drive contents to the new drive. After this is completed it is just a matter of

HD DRIVE
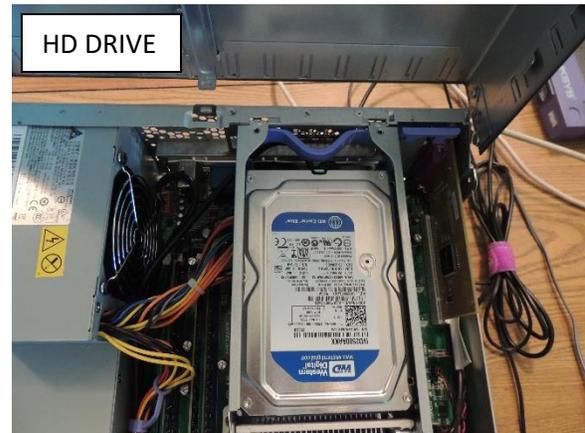
unplugging the existing drive and plugging in the new one. Drop the drive back into the slot close the cover and you are ready to go.

You now have a good machine for a total outlay of around $350 which is a bargain. Anyone interested in this approach please contact me and I will gladly assist you.

As another incentive, Windows 7 which is still very popular even though support for this ceased about 3 years ago, was just declared "intrinsically insecure" by Microsoft!

HD REMOVED
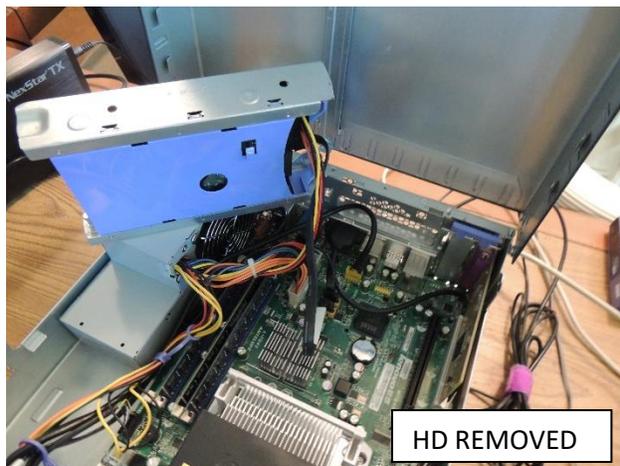
This then is a summary of your options for replacing your old desktop, at these prices there is no excuse for trying to handle that old Windows Vista machine anymore!