

My Senior  
Computer Science  
Project:

# How to Build a Computer

Yes you CAN have your  
Cake and eat it too!

By Peter Olsen

There are many advantages to building your own computer from scratch. A custom-built computer will be specifically designed with your particular needs in mind. This means it will contain only the components that you want – nothing more, nothing less – and you will know exactly what you are getting. You can mix and match parts to incorporate the best that each manufacturer has to offer. You can build your machine for a lower cost than an equivalent name brand. It will also be easier to upgrade than a factory-built machine.

In the process of building your own computer, you will learn a lot about computer hardware and how computers work in general. You will feel more in control of your machine by understanding how it was put together. You will also have greater confidence when troubleshooting problems. Most components come with a manufacturer's warranty, and for technical support there are many helpful forums on the internet where you can get your questions answered.

## **Things to Do First**

1. Decide what type of machine you want to build based on what you will be using it for. Various purposes include: word processing, web surfing, online courses, kids software, video editing, media room, high-end gaming, or a combination of the above.

2. Make a list of everything you will need. Here are the basics:

- Case
- Power Supply
- Motherboard
- Processor (CPU)
- Memory (RAM)
- Hard Drive(s)
- CD/DVD Drive(s)
- Video Card
- Sound Card
- Modem (If you have cable or DSL, an external modem will be supplied by your internet service provider.)
- Keyboard
- Mouse
- Speakers
- Monitor
- Operating System
- Battery Backup (recommended)

It is a good idea to have a long-term view when choosing your components, should you ever need to upgrade in the future. Pick a case that has extra bays if you want to add another drive at a later date. Make sure the case you decide to get is big enough to fit everything that you want to put in there, with plenty of air flow to keep it cool. Next time I will get a full tower instead of a mid-size tower.

3. Compare specifications, prices, reliability and compatibility of various parts offered by different manufacturers. It's actually better to buy a part that's six months old than to get the newest thing on the market. The price will have dropped by that time, any bugs will have been worked out, and there will be more information available on it.

4. Plan your budget. If your resources are limited, you will have to tailor your computer accordingly. Buy the best quality components that you can reasonably afford. Even if money is not an issue, it makes sense to choose parts that provide the most "bang for the buck." A top-of-the-line component could easily double the cost, while only marginally improving on the final result.

5. Purchase all of the parts. Be sure to shop around. Newegg.com usually has lower prices than Fry's Electronics, unless Fry's happens to have something on sale. Figure out if there will be any added costs such as sales taxes, shipping and handling. Look for manufacturer rebates, too, and don't forget to send them in.

## **Before You Get Started**

1. Clear the area. You will need a large, flat, hard surface that is clean and dust-free with plenty of room to work, like a kitchen table or wood floor.

2. Create a static-free environment. Wear cotton clothing and keep a piece of wood nearby to touch before touching your computer. If you have an anti-static bag left over from your board or other components, just touch the inside surface of the bag with your hands. The bag will absorb any static you may have. The foam that the mother board was packed in is also very safe to use when working. Don't stand on carpet when working on your computer. Carpets, especially synthetic ones, produce lots of static. Synthetic materials such as polyester upholstery can cause static electricity when you get up, sit down, or move around. Leather-soled shoes generate less static than rubber soles. You're more likely to generate a static charge when the atmosphere is dry and less likely when it's humid.

3. Gather your tools. (Philips screwdriver, flathead screwdriver, long-nose pliers, flashlight, and a small shallow container to hold screws so they don't get lost.)

4. Unpack the boxes and make sure the contents are all there. (I discovered that one of my power supply cords was missing.)

5. Read the manuals. See if there is anything else you need to get. (My computer building process came to a halt when I found out that the CPU didn't come with thermal paste and we had to make a special trip to go get some.) Keep the manuals handy, because you will need to refer to them from time to time as you are putting the machine together. When in doubt, always check the manual!



# Step-by-Step Directions

Open up the case.



Put the case on its side.



Get out the motherboard. Place the motherboard I/O shield into the slot in the case.



Align the motherboard holes with the standoffs and screw it in.



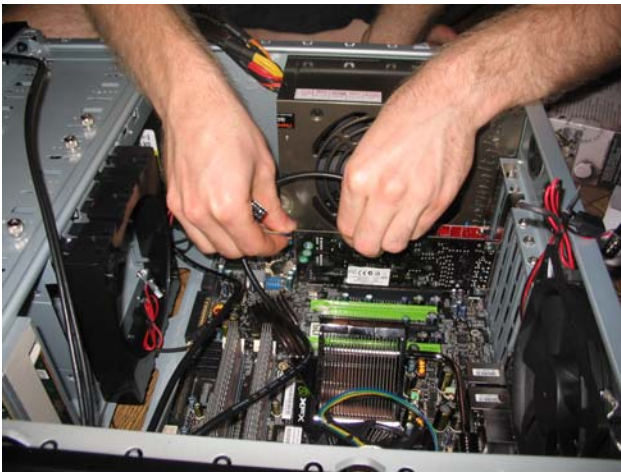
Place the CPU in the CPU socket on the motherboard. Apply thermal paste to CPU.



Attach the CPU heat sink.



Put the power supply in.



Attach the wires from the case to the motherboard.



Put in your various cards (sound, video, modem). If your card requires extra power, attach the power cord to the power supply.



Put the hard drives into their bays, and attach the data cables to the motherboard, and the power cables to the power supply.



Put in the optical drives, and attach the data cables to the motherboard, and the power cables to the power supply.



Attach the power cord from the PSU to the wall.

Perform a boot test.



Unplug the computer.



Close up the case.



Put the computer in its place.





Plug in all external devices (monitor, keyboard, speakers, mouse, etc). Turn the computer on.



Look at all those cables!



Install the operating system and hardware drivers.



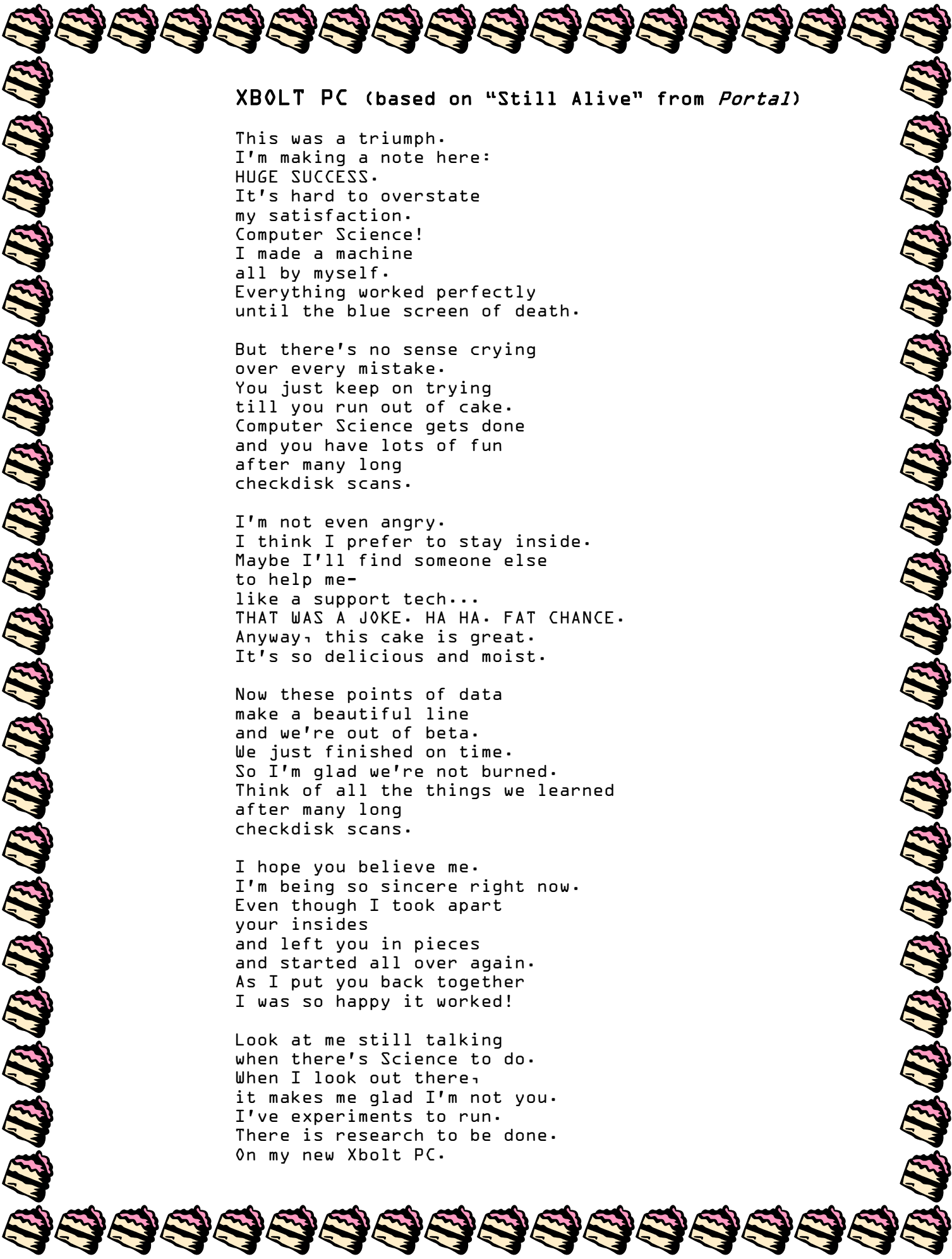
“OK, the test is over now. You win! Go back to the recovery annex for your cake!”

Don't forget to think of a cool name for your computer. Mine is called the Xbolt PC.



Here are the highlights of my homemade Xbolt PC!

Motherboard	XFx MB-N780-ISH9
Processor	Intel Core 2 Duo E8400
Ram	Corsair 4096MB (4GB) PC2-6400 DDR2
Power Supply	Thermaltake Toughpower 1200W Power Supply
Case	Antec 900 Mid Tower Case
Video Card	eVGA Geforce 8800 GTS 512MB (2x)
Hard Drives	Western Digital Raptor 74GB 10,000rpm SATA Seagate Barracuda 500GB 7200rpm SATA (2x)
DVD Drives	Samsung 20X DVD±R DVD Burner ASUS DVD-ROM Drive
Sound Card	Creative Sound Blaster X-Fi XtremeGamer
Operating System	Microsoft Windows XP Professional SP2 (Service Pack 2)
Monitor	Hanns-G 28" Widescreen HDMI LCD Monitor
Speakers	Creative Inspire P7800 7.1 Speaker System
Keyboard	Saitek Eclipse II
Mouse	Microsoft M03-00090 Mouse
Battery Backup	Belkin 1100VA



XBOLT PC (based on "Still Alive" from *Portal*)

This was a triumph.  
I'm making a note here:  
HUGE SUCCESS.  
It's hard to overstate  
my satisfaction.  
Computer Science!  
I made a machine  
all by myself.  
Everything worked perfectly  
until the blue screen of death.

But there's no sense crying  
over every mistake.  
You just keep on trying  
till you run out of cake.  
Computer Science gets done  
and you have lots of fun  
after many long  
checkdisk scans.

I'm not even angry.  
I think I prefer to stay inside.  
Maybe I'll find someone else  
to help me-  
like a support tech...  
THAT WAS A JOKE. HA HA. FAT CHANCE.  
Anyway, this cake is great.  
It's so delicious and moist.

Now these points of data  
make a beautiful line  
and we're out of beta.  
We just finished on time.  
So I'm glad we're not burned.  
Think of all the things we learned  
after many long  
checkdisk scans.

I hope you believe me.  
I'm being so sincere right now.  
Even though I took apart  
your insides  
and left you in pieces  
and started all over again.  
As I put you back together  
I was so happy it worked!

Look at me still talking  
when there's Science to do.  
When I look out there,  
it makes me glad I'm not you.  
I've experiments to run.  
There is research to be done.  
On my new Xbolt PC.