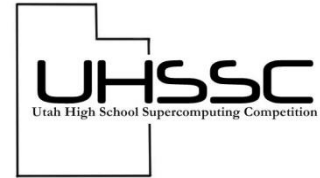**Meet your UHSSC Hardware**
Utah High School Supercomputing Competition
**Dan McGuire**
December 11, 2011

The hardware that you will be using for the Utah High School Supercomputing Competition (UHSSC) has been recovered from a retired Angstrom Titan Supercomputer. A quick Google of "Angstrom Titan" finds that the company no longer exists! No worries, the system still works and is fine for a high school competition. Below is a picture of the system that will be delivered to you at the 2012 UHSSC kickoff.

We will provide you with these components of the system pictured below and described in detail on the following pages:
1) A POWERBRIGHT 3000 Watt 110 to 220 Volt AC transformer.
2) An ANGSTROM frame with 13 blades that slide in/out of the frame.
3) A CISCO SR-216T 16 port Ethernet switch with connecting cables.
4) A Lite-On IHDP118-08 CD/DVD ROM drive.
5) A set of 8 CentOS 5.7 install CD's.

You will have to provide:
1) A VGA monitor
2) A PS-2 keyboard and mouse
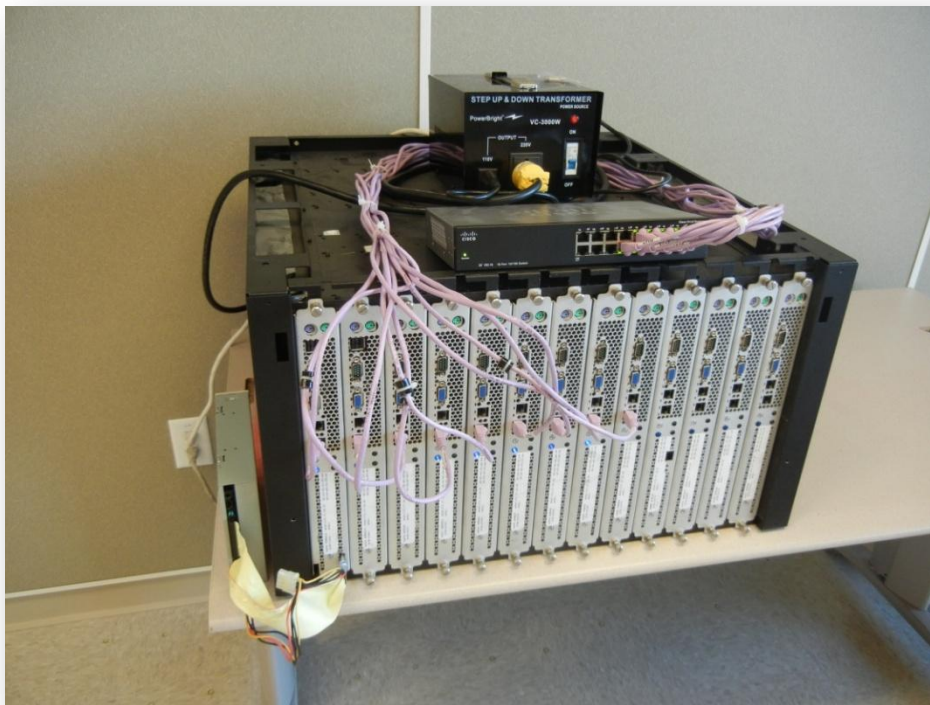
UHSSC Competition System

POWERBRIGHT VC-3000W 110 to 220 Volt Step-up Transformer

The Angstrom Titan computer was designed to operate using 220 Volts AC. The power outlets at your school provide 110 Volts AC. The most cost effective way for us to resolve this issue was to use a step-up transformer. The PowerBright VC-3000W has been chosen for this purpose.

VC-3000W Front Panel

VC-3000W Rear Panel

The front panel has a main power outlet that provides 220 VAC for your computer. Making sure that the front panel breaker (blue switch) is in the OFF (down) position, you can plug the computer into this receptacle.

This receptacle is a NEMA6 220V 20A connector and it is different from the ones that you are familiar with, so a picture is shown to the right. The two blades are at right angles, to prevent you from plugging it into a 110VAC socket.

NEMA6 Connector

There is another standard 110V output on the front panel of the VC-3000W, and you can use this to power the Cisco 16 port Ethernet switch.

Notice on the rear panel that there is a voltage selector. This is simply a conductive jumper, and it MUST BE IN THE 110V position. It should be installed and taped in this position when you get the system. Do not change the location of this jumper.

In addition, there is a cylindrical fuse holder on the rear panel. This fuse holder twists counterclockwise to release the spring-loaded fuse, and clockwise to install the fuse.

This fuse should not be an issue in your system, but if you do happen to need a new one, go to Radio Shack and get a 20 Amp, 250 Volt fuse:
http://www.radioshack.com/product/index.jsp?productId=2102755

ANGSTROM Computer Frame and 13 Dual Processor Blades

The actual computer consists of a frame that contains 13 "blades" (single blade pictured below). Each blade has dual AMD Opteron Processors, as well as power supply, disk drive and support hardware.

A single slide-in blade from the UHSSC Competition System

To the upper left is a switching power supply. To the lower left a 40GB hard drive. The rest of the blade is taken up by a HDAMA dual Opteron Server motherboard. The copper-colored objects are copper heatsinks that take heat away from the Opteron processors. On top of the heat sinks are clear plastic air "tunnels" (not visible) that force the cool air entering from the front of the blade to pass through the fins of the heatsinks.

THESE PLASTIC AIR TUNNELS MUST BE IN PLACE ON EACH BLADE BEFORE POWER IS APPLIED TO THE SYSTEM, OTHERWISE THE PROCESSORS WILL SELF DISTRUCT. ALSO, ALL 13 OF THE BLADES MUST BE PLUGGED INTO THE FRAME TO GET PROPER AIR FLOW!!!

To the upper right you can see the four wire power connector and the ribbon IDE cable that exit from the front of the blade to allow installation of the CD/DVD ROM.

The picture to the right shows a single blade front panel.

At top are the PS-2 keyboard (purple) and mouse (green) connectors.

Below these are two USB 1.0 connectors (yes, 1.0!!!) that are NOT available of every blade so don't count on them.

Below these is a DB-9 serial port connector which you will NEVER use.

Below the serial port is the VGA connector for your monitor.

Below the VGA connector are two Ethernet receptacles: you will ONLY use the lower one.

Finally, below the Ethernet sockets are the disk activity (yellow) lamp, the power (blue lamp) and on the lower right the power button. You can see the CD/DVD power/IDE connector extending through the front.

Blade Front Panel

The frame that contains the blades looks like this:

Frame Front View

Frame Rear View

From the front you can see the green connectors that supply the 220VAC to each of the blades. Nothing else is supplied through these connectors.

From the rear you can see the four 220VAC fans that provide airflow and cooling for the system. There are slots (not shown) on the top and bottom of the frame that are blocked with duct tape (NOT Duck Tape, quack, quack!) to force air to flow over the processors. If this duct tape is damaged in any way, replace or repair before you use the system.

Powering Up the Frame

After you power up the frame (I use the switch on the POWERBRIGHT VC-3000W front panel for this), the fans and blades will come on momentarily and then power down. In order to power up the system, you MUST wait for one minute and then press the button on the rear of the frame for three seconds. Then a microcontroller in the rear of the frame will sequentially power up all of the blades, and you are ready to go!

This button is shown to the right, deceptively labeled "Nest Power Off". It also provides a power off function if pressed for three seconds while power is on!

ALL OF THE BLADES MUST BE INSTALLED IN THE SYSTEM BEFORE POWER IS APPLIED, AS THEY ARE NECESSARY TO SET UP THE CORRECT AIRFLOW OVER THE OPTERON PROCESSORS.

Rear Panel Power Button

1	2	3	4	5	6	7	8	9	10	11	12	13
headnode 10.0.0.1	node1 10.0.1.1	node2 10.0.1.2	node3 10.0.1.3	node4 10.0.1.4	node5 10.0.1.5	node6 10.0.1.6	node7 10.0.1.7	TURN POWER OFF ON THIS BLADE	TURN POWER OFF ON THIS BLADE	TURN POWER OFF ON THIS BLADE	TURN POWER OFF ON THIS BLADE	TURN POWER OFF ON THIS BLADE

Above is the suggested configuration for the system.

The leftmost blade (with the CD/DVD drive) is the headnode, and the other nodes extend to the right form it. We have found that running 8 blades at 100% capacity draws about 12 amperes, so we have decided to limit the number of computer nodes to 7 (+headnode = 8). The other blades in the right five positions should be turned on using the rocker switch on the rear of the blade. A picture of this switch is shown below. The "O" symbol is OFF, the "|" symbol is ON.

Blade Power Rocker Switch

CISCO SR-216T 16 port Ethernet Switch

Data connectivity between the computers in the cluster is provided by a CISCO SR-216T 10/100 Mbit/s Ethernet switch.

The front panel of the SR-216T has 16 RJ-45 sockets. You should connect an Ethernet cable from the LOWER socket on each of the blades to one of the ports on the SR-261T.

You should then connect the provided power cable from the SR-216T to the 110V output on the front panel of the POWERBRIGHT VC-3000W.

When the SR-216T is first powered up, ALL of the green LEDs on the front panel should illuminate momentarily. After that, the LEDs will light only to indicate data traffic on the Ethernet port.

Be careful! This device learns where the addresses are in the local Ethernet network. If you change cables, it may take up to five minutes for the SR-216T to "re-learn" the location of the ports. *The best thing to do if you change cable configuration is to power cycle the system.*

Lite-On IHDP118-08 CD/DVD Drive

The CD/DVD drive is a Lite-On IHDP118-08 DVD ROM drive and attaches to the head node (leftmost position in the Frame) via a four pin Molex Power connector, and a standard IDE ribbon cable. These two connections extend through a vertical slot on the front panel of the head node.

A Set of 8 CentOS 5.7 Install CD's

These are provided as a convenience to get you started on installing your head node. You can also get the ISO images for these CDs at any of many CentOS download sites: http://isoredirect.centos.org/centos/5/isos/x86_64/


To complete the installation of you system you will need to download the ISO's from the above URL.

What do I need to use the system:

A VGA Monitor – the monitor plugs into the VGA connector on the front of the blades. If everything goes well, it will always be connected to the head node.

A PS-2 Keyboard and Mouse – "What's PS-2?", you may ask. It's an old standard for connecting human interface devices like keyboards and mice. It is a round connector with a diameter of about a half inch (see http://en.wikipedia.org/wiki/PS/2_connector)
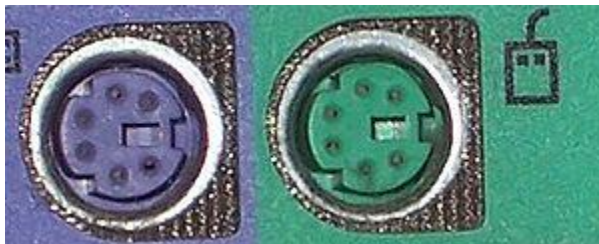
Color	Description
Purple	Keyboard
Green	Mouse

The purple connector is for the keyboard and the green for the mouse. I found a very cheap PS-2 keyboard & mouse at my local Thrift Store!

For hardware questions: dmcguire@uhssc.org
For software questions: kasimir@uhssc.org