

Report on Project:

Quad Quad Core Computer

Computer Organization I, WS 2007/08

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Goal of the Project

The goal of the Quad Quad Core project was to build a high-end Supercomputer with four Quad Core processors and at least 16 GB of memory. The intended use was for hardware intensive calculations, not as a typical server or desktop computer but rather as a high end calculating-machine. The budget available was said to be around 7,000 €.

Selection of the components

Core subject of the project was the selection of the appropriate mainboard, processors and memory, as well as choosing components compatible with that mainboard and processors. Additionally, we tried to select components that did not slow down the computer more than necessary.

Difficulties occurred in finding compatible cooling for the Socket F processors, as those are not that common, as well as finding a redundant power supply, in which we did not succeed.

Details of the components

Our first choice of components was that we separately selected mainboard, power supply, coolers, and case, which were as following:



Mainboard

Thunder N3600QE

The board supports up to four AMD Opteron Processors of the series 8000 and up to 64 GB DDR2 (16 slots) registered ECC memory. Furthermore,

it has two Gigabit network interface cards and an onboard graphics card (Nvidia nForce Pro 3600).

Costs: 620,- €



Power Supply

SilverStone ST1000

Power consumption total: 1,000 W

Combined Power 3.3V/5V: 200 W

Efficiency: 80 %

Costs: 255,- €



Cooling

JOUJYE JJ-A48G Cooler Socket AM2 for 1U Server

Measurements: 10.6 x 7.9 x 2.8 cm

Costs: 4 · 35,- € = 140,- €



Case

Chieftec BH-01B-B-B

Measurements: 20.5 x 44.2 x 54 cm

Costs: 65,- €

However, later we decided that it would be more convenient and economic to order a barebone computer which had motherboard, power supply, cooling, and case already preinstalled, thus making it perfectly suitable for use as a server:

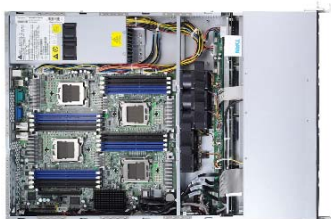
Barebone

Tyan Transport GT24 B4980

Motherboard:

- TYAN S4980 system board
- E-ATX footprint, 12" x 13"

Processors:



- Quad 1207-pin socket
- Supports up to 4 x AMD® Opteron™ (95w) Rev. F 8000 series Dual Core/ Quad Core processors
- Up to 1.0GHz Hyper-Transport link support

Chipset:

- nVIDIA NFP3600 (MCP55 Pro)
- SMSC SCH5017

System Memory:

- Up to 64GB registered, ECC memory
- Up to (16) DDR2 667/533/400 DIMMs

Integrated Video:

- XGI® Volari Z7 (XG20)
- 16 MB frame buffer memory

Integrated LAN Controller

Enclosure:

- Industry 19” rack-mountable 1U chassis
 - (1) slim DVD-ROM bay
 - (4) 3.5” HDD bays
- Dimensions: 645mm x 436mm x 43.5mm

Power Supply:

- EPS 12V 1U, 600W

Front Panel Features:

- I/O: (2) USB 2.0 ports
- LED indicators: HDD Active, power, (2) LAN, ID, sys. warning
- Switch: power, reset, NMI, ID

Back I/O Ports:

- Stacked PS/2 Mouse & Keyboard ports
- (1) double-decked USB2.0 ports
- (1) COM1 connector
- (1) 15-pin VGA port
- (2) side-by-side RJ45 10/100/1000 Base-T port with link/activity LED

Storage:

- Hard Disk Drives: support (4) SATA-II storages w/ RAID 0, 1, 0+1,5, JBOD
- (4) CPU passive heatsinks

Integrated Storage Controller:

- (4) SATA-II ports support running at 3.0Gb/s, by MCP55P

System Cooling:

- (3) 40*40*56mm & (2) 40*40*28mm system fans
- (4) Passive CPU heatsinks

Costs: 1354,- €

Then, we could concentrate on selecting the other crucial components, which were:



Processors

AMD Opteron 8347

The processor has a clock rate of 4 x 1900 MHz, 128 KB L1 Cache, 512 KB L2 Cache, and a combined 2 MB L3 Cache.

Costs: 4 · 710,- € = 2840,- €

Memory

Originally we had planned to use the **Kingston ValueRAM DIMM 4096 MB** for our project.

Costs: 16 · 240,- € = 3840,- €



However, for reasons of economy, we switched to the following RAM:

Kingston DDR2-677 REG ECC 2048 MB

Costs: 16 · 92,- € = 1470,- €

Hard Disk

Western Digital Raptor 150GB SATA (WD1500ADFD)

We intended to find a hard disk with fast access time.

Rotations/minute: 10,000

Access time: 4.6 ms (read)



Cache: 16 MB

Costs: $2 \cdot 153,- \text{€} = 306,- \text{€}$

Total price of all components: 5995,- €.

Ordering and Waiting Process

The ordering process began around the end of November 2007. We had planned to have the parts delivered before Christmas, in order to have enough time to assemble the computer and get it fully working before the holidays. Unfortunately, the delivery was extremely delayed due to supply bottlenecks of some parts, especially the processors. The last remaining parts were finally delivered on January 30, 2008, just in time to get the assembly started in the very last lesson before the holidays.

Assembly and Software Installation



The assembly was not that complicated, as most parts were already pre-installed on the case (mainboard, power supply, and coolers). The only thing left for us to do was to install the processors, heat sinks, memory, and hard disks.



With all parts (hopefully) correctly installed, we closed the case and attached monitor, keyboard, mouse, and the power cord. Then we finally switched the computer on the first time. Sadly, apart from the fans starting to run and some blinking LEDs nothing happened (no output signal on the screen).



We pulled the plug again and reopened the case to check again if all parts were correctly installed and connected. We first suspected some wrong jumper configuration to be the problem, but could not find any errors. So we tried to switch it on again but first removed three of the processors. Now, with only one processor, the PC worked perfectly fine.

After some research on the board manufacturer's web site we found out that apparently a BIOS update was necessary to get the board working with all four processors. So we created a bootable USB flash drive and



applied the BIOS update from there. Then, with the missing processors reinstalled, it finally worked.

The next thing to do was to install the operating system. We found out that, apparently, the only Linux distributions supporting all cores of the processors were SUSE Linux and Ubuntu Server Edition. We chose to install Ubuntu Server, which worked without any problems.



One last little issue occurred when we tried to compile and install MPI, which for some reason wouldn't work. After some time we found out that the system time was set to the wrong date (1999), which caused the compile errors.