CS 594 Spring 2006

Cluster Computing
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Homework 5a: costs and models

INNOVATIVE COMPUTING LABORATORY
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Costs and models

This home work is to build a system that meets a set of requirements for a given work load, the system is also required to perform a secondary function but this is less important.

Home work is a written exercise with calculations

Needs to be **handed** or Emailed to the TA at the start of class 22nd February 2006

Costs

I want to build a system from commodity PARTS to do a certain workload

Workload A

I need 2 TF (2000 Gflops) of peak performance for a HPC job that is loosely coupled.
- There is little IO, and some communication

All systems will be assumed to have the same performance NICs and disks.

Secondary function
- I need to perform an in memory search, so each system will preload approximately a ¾ of a Gigabyte of data. Only the search time will be important.

Costs

I want to build a system from commodity parts to do a certain workload

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What you need to provide:

A set of quotes with technical details for the first workload and performance details for the second.

For the first set of quotes, the number of units, total cost, peak CPU (>=2TF!), cost per peak flop, power and space requirements.

For the second function, you just need the total memory storage (assuming ¾ gig per unit) and the parallel search rate.

Costs

Number of units and what type/model they are

total system cost:

N units x individual cost
+ cost of networking switch(es)
  - 8 port + 2 uplinks $100
  - 16 port + 2 uplinks $250
  - 32 port + 2 uplinks $500
  - 64 port + 4 uplinks $1000
+ cost of racks
+ 300$ (cost of a single mouse,keyboard and small monitor!)
+ cost of KVMs (assume a 256to1 unit costs 5000$ and they can be daisy chained)
+ cable costs (display to KVM, USB and mouse/keyboard cables 20$ per unit)
+ cost of power bricks, extension cords
  - 8 way block = $10 (120v 15A)
  - HC 16 way block = $150 (120v 200A)

actual peak CPU: use manufactures numbers x units (double precision)

Costs

power: assume systems use 80% of their rated PSU

base cost of power: 20c per KW/h
power cost: cost for running a system for a year including AC costs ☺

Additional power information. Power (watts)= current x voltage
Each wall connector (single phase) has a limit of 200A.
(Please note how many 200A circuits you need)
AC costs assume 1/10 W/h is needed to remove 1 W of energy from heated air.

space requirements: assume a rack is 0.5 meters deep and 2 meters long, holds 3 rows of actual systems with the switches, KVMs, UPS, monitor and keyboards on top. Assume 12 nodes per shelf. Rack cost = 50$ each. (You cannot buy ½ a rack!)
In between each row of racks is a 1 meter gap.

How many racks ? How many square meters of floor space do we need.

Which systems can you buy?

The TA has a list of available systems to choose from

There are three systems, one cheaper desktop, one better desktop and a 1U system.

Special notes

For a 1U system, assume ½m wide 1m long. Racks can be mounted side to side with no gaps if required. 40 units can be stacked vertically.

A rack including power regulator is $3000.

A rack uses a single cable to connect to the wall supply.

The systems

	Low-end	High-end	Server
Processor	Celeron D 340	Athlon X2(Dual Core) 4200+ 2.2GHz	Dual AMD Opteron 270 Dual Core 2GHz
Memory	1 GB DDR3200	1GB DDR 3200	4GB DDR 2700
Power	400 Watt ATX	400 Watt ATX	350Watt (1U)
Price	$320	$850	$6000