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Cyberscience: Computational Science and the Rise of the Fourth Paradigm

Honors 352, Class #0.2

August E. (Gus) Evrard, PhD

Fall 2010

University of Michigan

complex systems seminar today at noon

Tuesday, September 14
5670 Haven Hall (note room)
12:00pm-1:15pm

David Rand, Research Scientist
Program for Evolutionary Dynamics
Psychology Department
Harvard University

"Reward, punishment and the evolution of cooperation"

Cooperation, where one individual incurs a cost to benefit others, is a fundamental aspect of all levels of the natural world as well as human society. Yet cooperation poses a challenge to evolutionary biologists and social scientists: How can the fundamentally selfish process of natural selection favor "altruistic" cooperation, and why are humans, as strategic decision-makers, often willing to help others at a cost to themselves? In my talk, *I will explore this question using a combination of evolutionary computer simulations and behavioral experiments involving economic games*. I will focus particularly on the role of punishment and reward in discouraging free-riding and fostering cooperation. In the realistic context of repeated interactions where reputation is in play, I show that denial of reward promotes cooperation as effectively as costly punishment. Yet costly punishment is destructive and reduces the payoffs of both players, while denial of reward does not. Thus the use of costly punishment is detrimental to both the individual punisher and to the group as a whole. These results raise serious questions about the role of costly punishment in promoting cooperation, and emphasize the importance of developing opportunities for constructive interactions between individuals to help prevent "tragedies of the commons".

(my emphasis)

today

* follow-up on reading quiz

* hardware deconstruction lab!

* blog site (blogger vs. wordpress?) and first assignment:

       What has scientific computing done for society?
       What interests me most about scientific computing is ...

1st reading quiz: buzzwords

ad hocalgorithmsbeowulfbeowulf beowulf clusterbeowulf clusterbeowulf clusterbig Sciencecomputational ecologycloudcomputing cloudcuratingcurating datadata acquisition toolsdata bricksdata cubedata cubedata miningdata storesdatabasedatabaseflat filesftp: file transfer protocol? informatics metadataoverlay journalparadigmparadigmparadigmparadigmpetabytepetabytep etabytepetabyteprovenancequery schema

Beowulf (computing)

From Wikipedia, the free encyclopedia
(Redirected from Beowulf cluster)

Originally referring to a specific computer built in 1994, **Beowulf** is a class of computer clusters similar to the original NASA system. Originally developed by Thomas Sterling and Donald Becker at NASA, Beowulf systems are now deployed worldwide, chiefly in support of scientific computing. They are high-performance parallel computing clusters of inexpensive personal computer hardware. The name comes from the main character in the Old English poem *Beowulf*, which was bestowed by Sterling because the epic poem describes the Beowulf as having "thirty men's heft of grasp in the gripe of his hand."[1]

A *Beowulf cluster* is a group of what are normally identical, commercially available computers, which are running a Free and Open Source Software (FOSS), Unix-like operating system, such as BSD, GNU/Linux, or Solaris. They are networked into a small TCP/IP LAN, and have libraries and programs installed which allow processing to be shared among them.

There is no particular piece of software that defines a cluster as a Beowulf. Commonly used parallel processing libraries include Message Passing Interface (MPI) and Parallel Virtual Machine (PVM). Both of these permit the programmer to divide a task among a group of networked computers, and collect the results of processing. Examples of MPI software include OpenMPI (OpenMPI) or MPICH (MPICH). There are additional MPI implementations available.

Provisioning of Operating System and other software for a Beowulf Cluster can be automated using software, Open Source Cluster Application Resources(OSCAR) for example. OSCAR installs on top of a standard installation of a supported GNU/Linux distribution on a cluster's head node.

The Borg, a 52-node Beowulf cluster used by the McGill University pulsar group to search for pulsations from binary pulsars.

http://en.wikipedia.org/wiki/Beowulf_cluster

Aarchiba, "Beowulf cluster the borg," http://en.wikipedia.org/wiki/File:Beowulf-cluster-the-borg.jpg

Hardware deconstruction lab

Find, label and photograph these components (10 pts each)

power port
power supply / voltage converter
disk*
disk slots and cabling
ethernet port
memory slots
memory cards (*aka* chips)*
cpu (central processing unit)
graphics chip
graphics port
usb port*
capacitor
resistor

* may be missing on some units

For Thursday

- reading quiz for week 2

taken from Cosma proposal and Szalay/Blakeley articles only
please bring your laptops

- read other articles in 4th P, Sec.1+2 for group project ideas

- prepare draft of first blog posts

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