Grid and Cloud Computing course at MTA, Semester 2012B

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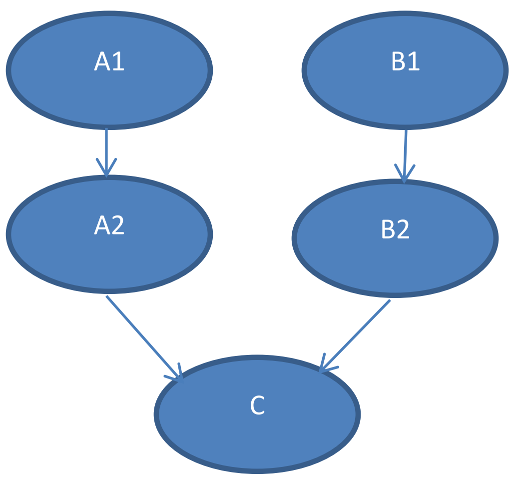
Home assignment #1: Condor, due Lecture #9.

1. Finish the Condor hand-on tutorial we started at the lab.
   http://research.cs.wisc.edu/condor/tutorials/tel-aviv-2004/
2. Condor DAG: Write all the necessary programs (in C/C++, Python or Java) and the Condor submit files in order to execute the following DAG:



Where:

A1 computes the natural logarithm, e, in a Monte Carlo method and writes the approximation into a file (queue 100 independent computations).

Follow the **Salt-Shaker** algorithm from reference [1]

A2 averages all the results of **A1** into a single number (a single computation)

B1 computes pi in a Monte Carlo Method and writes the approximation into a file (100 computations), see Reference [2] and the appendix.

B2 averages all the results of **B1** into a single number (a single computation).

C: compute e^pi-pi^e based on **A2** and **B2** and compare with the expected numerical result, ~0.68153491441822, to verify the whole DAG computation.

Notes

1. All the information between the different stages should be transferred using files.
2. Programming language: C/C++, Java or Python.
3. Target system: The educational Condor pool (shared file system?)

References

[1] Monte Carlo estimations of e by Pirooz Mohazzabi,
http://caos.fs.usb.ve/~srojas/Teaching/USB/MC_Intro/MC_readings_a/MC_a1_computing_e.pdf

[2] Module for the Pi Monte Carlo:
http://math.fullerton.edu/mathews/n2003/montecarlopimod.html

And this appendix:

Appendix A Computing π by a Monte Carlo Method

The basis of Monte Carlo methods is the use of random selections in calculations. π/4 (and hence π) can be computed by a Monte Carlo method as follows: A circle is formed within a square as shown in Figure 1. The circle has unit radius so that the square has sides 2 × 2. The ratio of the area of the circle to the square is given by

$$\frac{\text{Area of circle}}{\text{Area of square}} = \frac{\pi(1)^2}{2 \times 2} = \frac{\pi}{4}$$

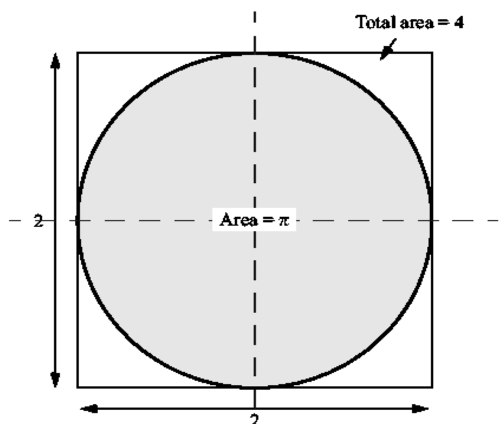


Figure 1

Points within the square are chosen randomly and a score is kept of how many points happen to lie within the circle. The fraction of points within the circle will be π/4, given a sufficient number of randomly selected samples.

Only one quadrant of the construction need be used. One quadrant of Figure 1 is shown in Figure 2, A random pair of numbers, (x_r, y_r) is generated, each between 0 and 1, and then counted if $y_r^2 + x_r^2 \le 1$; that is, $y_r \le \sqrt{1 - x_r^2}$.

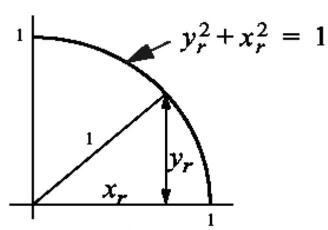


Figure 2