- **Distributed Password Auditing/Recovery**

Password Recovery Task

The use of Computer Accounts and Passwords as a means of accessing computer systems is ubiquitous. As long as passwords have been used, people have attempted to guess them for a variety of reasons.

Passwords on most modern systems are maintained as a one-way-hash. The one-way-hash is a hash function that will take the password, certain other values, and compute a hash. If the hash function is strong, it will be computationally difficult to determine the password given only the hash. Knowing how the hash is computed however, allows you to verify the password. Systems validate passwords by computing the hash from the inputted password, in the same way it was created, and compare the hash values - if the hash values match - then you have verified the password.

The nature of this also lends itself to a technique for recovering passwords. If you can obtain the password hashes - specifically you can guess and test to determine if a particular hash matches a particular password. This is the technique used by a variety of password recovery (or cracking) programs. Such programs may use simple guessing, but most often use a dictionary of words, and will sometimes permute the words in the dictionary, and try various combinations to see if a password hash matches a password based on a word (or a modification of a word). These tools are used both by the people who attack systems (to guess passwords) and by the people who try to prevent attacks by auditing users' passwords (The role you are currently playing).

- **Paraview**

http://www.paraview.org/
Paraview Instructions
One of the most important steps in the research process is the analysis of data generated via experiment or simulation. In many cases, a key to insight in this analysis step is the visualization of huge amounts of data that represent some aspect of a physical system.

ParaView is a data analysis and visualization application that is widely used in a variety of scientific disciplines. With ParaView researchers can quickly build visualizations to analyze their data using qualitative and quantitative techniques. Eata exploration can be done interactively in 3D or programmatically using ParaView's batch processing capabilities.

Of greater interest for the cluster competition, ParaView was developed to analyze extremely large datasets using distributed memory computing resources. It has been run on supercomputers to analyze datasets of petascale size and, has become an integral tool in many national laboratories, universities and industry. ParaView has also won several awards related to high performance computation.

- ## Parconnect

Reproducibility Task

What's in that pond scum? A vast ecosystem of microbes make up a microbiome that can be studied by sequencing genes from an environmental sample. Assembling the genes of a huge number of organisms that have been directly sampled is a major challenge in metagenomics.

For the first time ever, students in the cluster competition will be asked to replicate the results of a publication from a past Supercomputing conference, using a distributed de novo assembler (ParConnect) for metagenomic assemblies.

Publication: http://dx.doi.org/10.1145/2807591.2807619

Student Cluster Competition Reproducibility Initiative
Winner: http://sc16.supercomputing.org/studentssc/scc-reproducibility-initiative-winner/

- ## Gromacs (Mystery Application)

Gromacs is a versatile package to perform molecular dynamics, i.e. simulate the Newtonian equations of motion for systems with hundreds to millions of particles.

It is primarily designed for biochemical molecules like proteins, lipids and nucleic acids that have a lot of complicated bonded interactions, but since GROMACS is extremely fast at calculating the nonbonded interactions (that usually dominate simulations) many groups are also using it for research on non-biological systems, e.g. polymers.