Applications of High Performance Computing

The following are examples of the types of uses that have been cited when requesting accounts on the HPC systems at the Alabama Supercomputer Center.
Chemistry

- Designing new polymers
- Hazardous waste disposal
- High energy compounds (fuels or explosives)
- Fundamental understanding of compounds and reactions
- Man made diamonds
- Chemistry of crystals
Medicine

- Understanding disease mechanisms
- Determining the structure of proteins
- Simulation of air flow in lungs and nasal cavities
- Simulating viruses
Fluid Dynamics

- Simulations of turbulent flow
- Heat transfer calculations
- Flow in cavities
- Simulation of hurricanes and cyclones
Computer Science

- Grid computing
- Benchmarking of high performance computers
- Algorithm development
- Parallel programming
Physics

- Understanding optical properties of materials
- Simulating fluid flow in microgravity and magnetic fields
- Simulations of collisions between galaxies
- Simulating the earth's magnetosphere
Electrical Engineering

- Simulations of electromagnetic scattering
- Electromagnetism calculations
- Simulations of aircraft being struck by lightning
- Model integrity of older bridges in Alabama
- Simulations of structural strength of mechanical parts
- Applying genetic algorithms to engineering problems
- Air flow at Mach 4
Teaching

• High performance computing
• System administration
• Numerical methods
• Computational chemistry
Benefits to Alabama

- Lower cost than putting similar facilities on every university & college campus.
- Gives small colleges access to resources that only large universities could afford.
- Better education for students.
- Helps universities attract federal grants.
- Presence of universities and educated work force attracts technology oriented businesses to Alabama.