# Comparison of Grid Computing vs. Cluster Computing

Grid computing is focused on the ability to support computation across administrative domains sets it apart from traditional computer clusters or traditional distributed computing. Grids offer a way of using the information technology resources optimally inside an organization. In short, it involves virtualizing computing resources.

Grid computing is often confused with cluster computing. Functionally, one can classify grids into several types: **Computational Grids (including CPU scavenging grids)**, which focuses primarily on computationally-intensive operations, and **Data grids**, or the controlled sharing and management of large amounts of distributed data.

## Definitions of Grid Computing

There are many definitions of the term: Grid computing:

1. A service for sharing computer power and data storage capacity over the Internet
2. An ambitious and exciting global effort to develop an environment in which individual users can access computers, databases and experimental facilities simply and transparently, without having to consider where those facilities are located. [RealityGrid, Engineering & Physical Sciences Research Council, UK 2001] http://www.realitygrid.org/information.html
3. Grid computing is a model for allowing companies to use a large number of computing resources on demand, no matter where they are located.
www.informatica.com/solutions/resource_center/glossary/default.htm

### Difference Between Cluster Computing VS. Grid Computing

When two or more computers are used together to solve a problem, it is called a computer cluster . Then there are several ways of implementing the cluster, Beowulf is maybe the most known way to do it, but basically it is just cooperation between computers in order to solve a task or a problem. Cluster Computing is then just the thing you do when you use a computer cluster.

Grid computing is something similar to cluster computing, it makes use of several computers connected is some way, to solve a large problem. There is often some confusion about the difference between grid vs. cluster computing. The big difference is that a cluster is homogenous while grids are heterogeneous. The computers that are part of a grid can run different operating systems and have different hardware whereas the cluster computers all have the same hardware and OS. A grid can make use of spare computing power on a desktop computer while the machines in a cluster are dedicated to work as a single unit and nothing else. Grid are inherently distributed by its nature over a LAN, metropolitan or WAN. On the other hand, the computers in the cluster are normally contained in a single location or complex.

Another difference lies in the way resources are handled. In case of Cluster, the whole system (all nodes) behave like a single system view and resources are managed by centralized resource manager. In case of Grid, every node is autonomous i.e. it has its own resource manager and behaves like an independent entity.

### Characteristics of Grid Computing

Loosely coupled (Decentralization)
Diversity and Dynamism
Distributed Job Management & scheduling

**Characteristics of Cluster computing**

Tightly coupled systems
Single system image
Centralized Job management & scheduling system

**Areas of Grid Computing and it's applications for modeling and computing**
1.Predictive Modeling and Simulations
2.Engineering Design and Automation
3.Energy Resources Exploration
4.Medical, Military and Basic Research
5.Visualization

**1.Predictive Modeling and Simulations**
Predictive Modeling is done through extensive computer simulation experiments, which often involve large-scale computations to achieve the desired accuracy and turnaround time. It can also be called "**Modeling the Future**". Such numerical modeling requires state-of-the-art computing at speeds approaching 1 GFLOPS and beyond. In case of Computational Biology , It is the modeling and simulation of self-organizing adaptive response of systems where spatial and proximal information is of paramount importance.
Areas of Research include:
1.Numerical Weather Forecasting.
2.Flood Warning
3. Semiconductor Simulation.
4. Oceanography.
5. Astrophysics (Modeling of Black holes and Astronomical formations).
6. Sequencing of the human genome.
7. Socio-economic and Government use.

**2.Engineering Design and Automation**
Applications include:
1.Finite-element analysis.
2.Computational aerodynamics.
3.Remote Sensing Applications.
4.Artificial Intelligence and Automation
This areas requires parallel processing for the following intelligence functions:
1.Image Processing
2. Pattern Recognition
3. Computer Vision

**3.Energy Resources Exploration**
Applications include:
1. Seismic Exploration.
2. Reservoir Modeling.
3. Plasma Fusion Power.
4. Nuclear Reactor Safety.

**4.Medical, Military and Basic Research**
Applications include:
1. Medical Imaging
2. Quantum Mechanics problems.

3. Polymer Chemistry.
4. Nuclear Weapon Design.

**5.Visualization**

Applications include:

1.Computer-generated graphics, films and animations.
2.Data Visualization.