ISSN:0975-9646

Ravikant Dewangan/ (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 6 (6) , 2015, 5204-5206

Grid Computing- Proposed Methods

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Abstract- Large-scale science and engineering are done through the interaction of people, heterogeneous computing resources, information systems, and instruments, all of which are geographically and organizationally dispersed. The overall motivation for "Grids" is to facilitate the routine interactions of these resources in order to support large-scale science and Engineering.

Keyword- Grid, Artificial Intelligence

INTRODUCTION

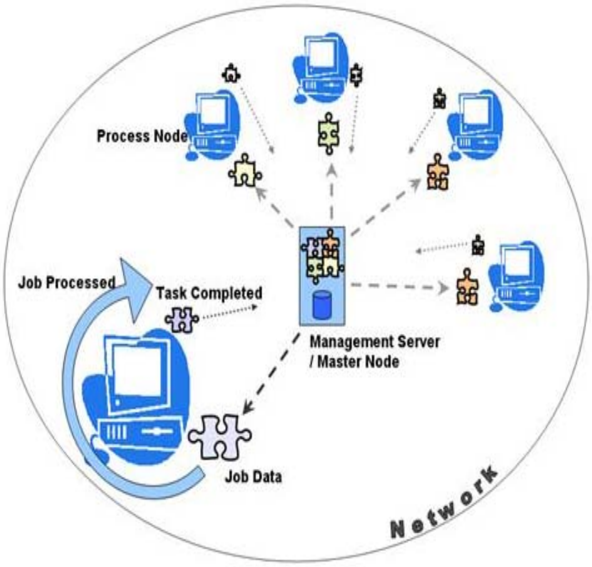
The easiest use of grid computing is to run an existing application on a different machine. The machine on which the application is normally run might be unusually busy due to an unusual peak in activity. The job in question could be run on an idle machine elsewhere on the grid.

There are at least two prerequisites for this scenario. First, the application must be executable remotely and without undue overhead. Second, the remote machine must meet any special hardware, software, or resource requirements imposed by the application. For example, a batch job that spends a significant amount of time processing a set of input data to produce an output set is perhaps the most ideal and simple use for a grid.

If the quantities of input and output are large, more thought and planning might be required to efficiently use the grid for such a job. It would usually not make sense to use a word processor remotely on a grid because there would probably be greater delays and more potential points of failure.

In most organizations, there are large amounts of underutilized computing resources. Most desktop machines are busy less than 5 percent of the time. In some organizations, even the server machines can often be relatively idle.

Grid computing provides a framework for exploiting these underutilized resources and thus has the possibility of substantially increasing the efficiency of resource usage. The processing resources are not the only ones that may be underutilized.



AGENTS

An agent is anything that can be viewed as perceiving its environment through sensors and acting upon that environment through effectors. A human agent has eyes, ears, and other organs for sensors, and hands, legs, mouth, and other body parts for effectors. A robotic agent substitutes cameras and infrared range finders for the sensors and various motors for the effectors. A software agent has encoded bit strings as its percepts and actions.

A rational agent is one that does the right thing. Obviously, this is better than doing the wrong thing, but what does it mean? As a first approximation, we will say that the right action is the one that will cause the agent to be most successful.

Often, machines may have enormous unused disk drive capacity. Grid computing, more specifically, a "data grid", can be used to aggregate this unused storage into a much larger virtual data store, possibly configured to achieve improved performance and reliability over that of any single machine. If a batch job needs to read a large amount of data, this data could be automatically replicated at various strategic points in the grid.

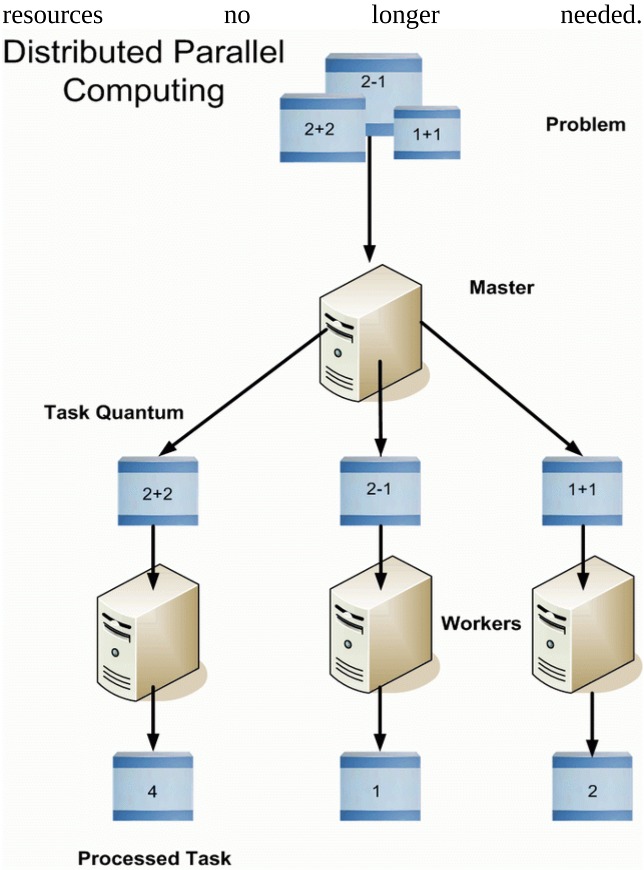
PERFORMANCE

Thus, if the job must be executed on a remote machine in the grid, the data is already there and does not need to be moved to that remote point. This offers clear performance benefits. Also, such copies of data can be used as backups when the primary copies are damaged or unavailable. Another function of the grid is to better balance resource utilization.

An organization may have occasional unexpected peaks of activity that demand more resources. If the applications are grid-enabled, they can be moved to underutilized machines during such peaks.

In fact, some grid implementations can migrate partially completed jobs. In general, a grid can provide a consistent way to balance the loads on a wider federation of resources.

This applies to CPU, storage, and many other kinds of resources that may be available on a grid. Management can use a grid to better view the usage patterns in the larger organization, permitting better planning when upgrading systems, increasing capacity, or retiring computing resources no longer needed.



SHARING

Sharing starts with data in the form of files or databases. A “data grid” can expand data capabilities in several ways. First, files or databases can seamlessly span many systems and thus have larger capacities than on any single system. Such spanning can improve data transfer rates through the use of striping techniques. Data can be duplicated throughout the grid to serve as a backup and can be hosted on or near the machines most likely to need the data, in conjunction with advanced scheduling techniques.

Sharing is not limited to files, but also includes many other resources, such as equipment, software, services, licenses, and others. These resources are “virtualized” to give them a more uniform interoperability among heterogeneous grid participants.

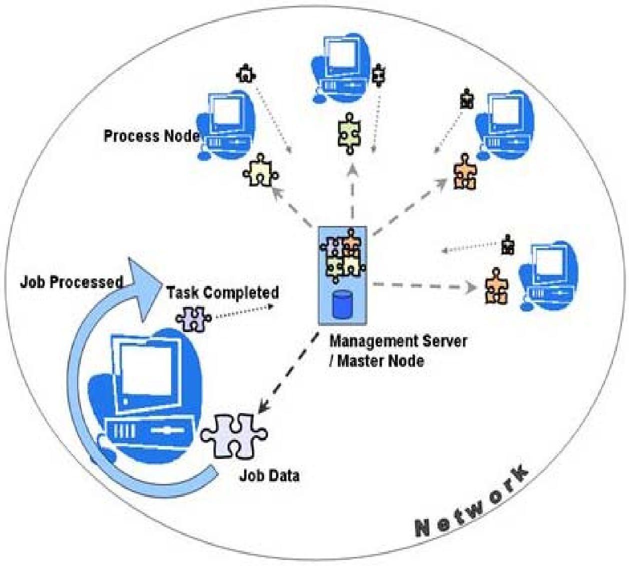
The participants and users of the grid can be members of several real and virtual organizations. The grid can help in enforcing security rules among them and implement policies, which can resolve priorities for both resources and users.

In addition to CPU and storage resources, a grid can provide access to increased quantities of other resources and to special equipment, software, licenses, and other services.

The additional resources can be provided in additional numbers and/or capacity. For example, if a user needs to increase his total bandwidth to the Internet to implement a data mining search engine, the work can be split among grid machines that have independent connections to the Internet.

In this way, the total searching capability is multiplied, since each machine has a separate connection to the Internet. If the machines had shared the connection to the Internet, there would not have been an effective increase in bandwidth.

Some machines may have expensive licensed software installed that the user requires. His jobs can be sent to such machines more fully exploiting the software licenses.



Some machines on the grid may have special devices. Most of us have used remote printers, perhaps with advanced color capabilities or faster speeds. In the future, we will see a complementary approach to reliability that relies on software and hardware.

A grid is just the beginning of such technology. The systems in a grid can be relatively inexpensive and geographically dispersed. Thus, if there is a power or other kind of failure at one location, the other parts of the grid are not likely to be affected.

Grid management software can automatically resubmit jobs to other machines on the grid when a failure is detected.

In critical, real-time situations, multiple copies of the important jobs can be run on different machines throughout the grid. Their results can be checked for any kind of inconsistency, such as computer failures, data corruption, or tampering.

The goal to virtualize the resources on the grid and more uniformly handle heterogeneous systems will create new opportunities to better manage a larger, more disperse IT infrastructure.

It will be easier to visualize capacity and utilization, making it easier for IT departments to control expenditures for computing resources over a larger organization.

The grid offers management of priorities among different projects. In the past, each project may have been responsible for its own IT resource hardware and the expenses associated with it.

Often this hardware might be underutilized while another project finds itself in trouble, needing more resources due to unexpected events. With the larger view a grid can offer, it becomes easier to control and manage such situations.

Administrators can change any number of policies that affect how the different organizations might share or compete for resources.

Aggregating utilization data over a larger set of projects can enhance an organization’s ability to project future upgrade needs. When maintenance is required, grid work can be rerouted to other machines without crippling the projects involved.

Autonomic computing can come into play here too. Various tools may be able to identify important trends throughout the grid, informing management of those that require attention.

CONCLUSIONS

The machine on which the application is normally run might be unusually busy due to an unusual peak in activity. Some machines on the grid may have special devices. Grid management software can automatically resubmit jobs to other machines on the grid when a failure is detected.

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