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Cluster Computing – a Demarcate

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Abstract
A computer cluster is a group of linked computers, working together closely so that in many respects they form a single computer. The components of a cluster are commonly, but not always, connected to each other through fast local area networks. Clusters are usually deployed to improve performance and/or availability over that provided by a single computer, while typically being much more cost-effective than single computers of comparable speed or availability. The major objective in the cluster is utilizing a group of processing nodes so as to complete the assigned job in a minimum amount of time by working cooperatively. The main and important strategy to achieve such objective is by transferring the extra loads from busy nodes to idle nodes. The paper highlights the concepts of cluster computing and the principles involved in it.

Keywords: Cluster computing, networks, nodes, load

1.1 Introduction

Cluster computing provides a number of advantages with respect to conventional custom-made parallel computers for achieving performance greater than that typical of uniprocessors. As a consequence, the emergence of clusters has greatly extended the availability of high-performance processing to a much broader community and advanced its impact through new opportunities in science, technology, industry, medical, commercial, finance, defense, and education among other sectors of computational application.

1.2 Cluster Computing

Cluster computing is a collection of tightly or loosely connected computers that work together so that

they act as a single entity. The connected computers execute operations all together thus creating the idea of a single system. The clusters are generally connected through fast local area networks (LANs).

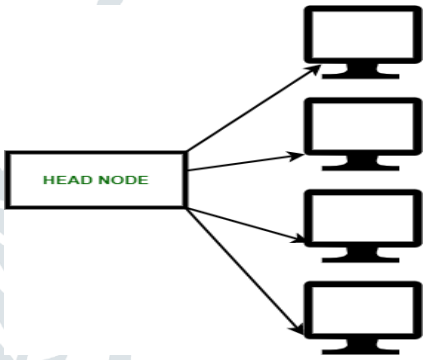

Fig1.1–Cluster Computing

1.3 Importance of Cluster Computing

1. Cluster computing gives a relatively inexpensive, unconventional to the large server or mainframe computer solutions.
2. It resolves the demand for content criticality and process services in a faster way.
3. Many organizations and IT companies are implementing cluster computing to augment their scalability, availability, processing speed and resource management at economic prices.

4. It ensures that computational power is always available.
5. It provides a single general strategy for the implementation and application of parallel high-performance systems independent of certain hardware vendors and their product decisions.

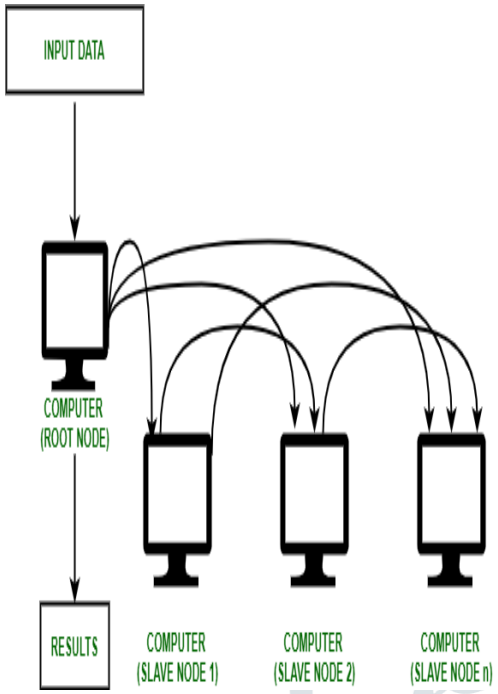

Fig1.2 Need of cluster computing

1.4 Types of Cluster computing

1. High performance (HP) clusters

HP clusters use computer clusters and supercomputers to solve advance computational problems. They are used to performing functions that need nodes to communicate as they perform their jobs. They are designed to take benefit of the parallel processing power of several nodes.

2. Load-balancing clusters

Incoming requests are distributed for resources among several nodes running similar programs or having similar content. This prevents any single node from receiving a disproportionate amount of task. This type of distribution is generally used in a web-hosting environment.

3. High Availability (HA) Clusters

HA clusters are designed to maintain redundant nodes that can act as backup systems in case any failure occurs. Consistent computing services like business activities, complicated databases, customer services like e-websites and network file distribution are provided. They are designed to give uninterrupted data availability to the customers.

1.5 Classification of Cluster

1. Open Cluster

IPs is needed by every node and those are accessed only through the internet or web. This type of cluster causes enhanced security concerns.

2. Close Cluster

The nodes are hidden behind the gateway node, and they provide increased protection. They need fewer IP addresses and are good for computational tasks.

1.6 Cluster Computing Architecture

- It is designed with an array of interconnected individual computers and the computer systems operating collectively as a single standalone system.
- It is a group of workstations or computers working together as a single, integrated computing resource connected via high speed interconnects.
- A node – Either a single or a multiprocessor network having memory, input and output functions and an operating system.
- Two or more nodes are connected on a single line or every node might be connected individually through a LAN connection.

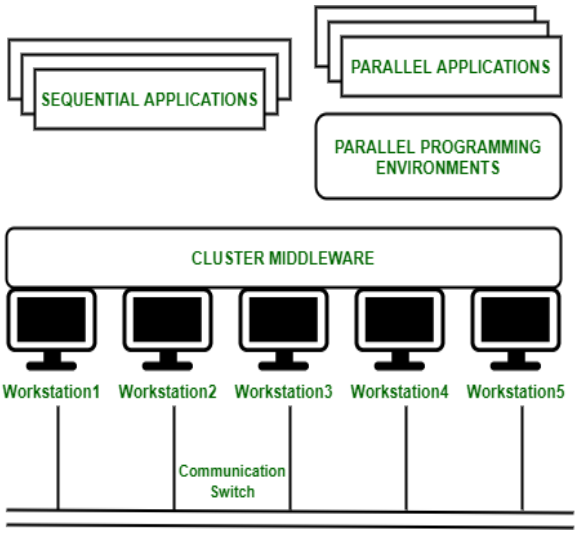

Fig 1.3 Cluster Computing Architecture

1.7 Components of a Cluster Computer

1. Cluster Nodes
2. Cluster Operating System
3. The switch or node interconnect
4. Network switching hardware

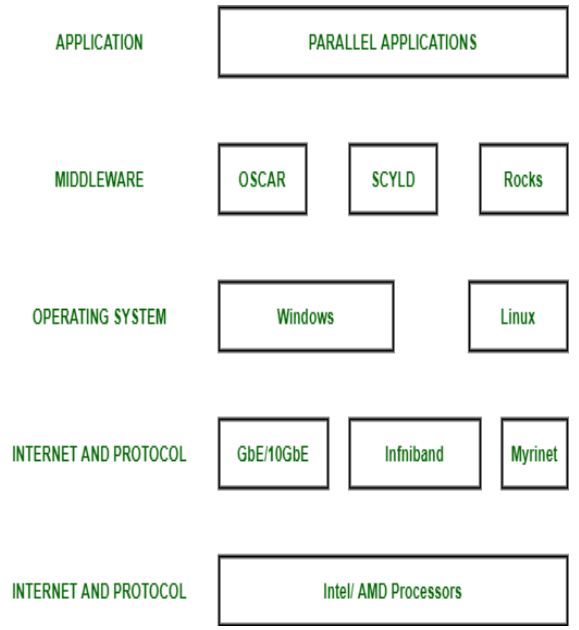

Fig 1.4 Cluster Components

1.8 Advantages of Cluster Computing

1. High Performance
The systems offer better and enhanced performance than that of mainframe computer networks.

2. Easy to manage
Cluster Computing is manageable and easy to implement.

3. Scalable
Resources can be added to the clusters accordingly.

4. Expandability
Computer clusters can be expanded easily by adding additional computers to the network. Cluster computing is capable of combining several additional resources or the networks to the existing computer system.

5. Availability
The other nodes will be active when one node gets failed and will function as a proxy for the failed node. This makes sure for enhanced availability.

6. Flexibility
It can be upgraded to the superior specification or additional nodes can be added.

1.9 Disadvantages of Cluster Computing

1. High cost
It is not so much cost-effective due to its high hardware and its design.

2. Problem in finding fault
It is difficult to find which component has a fault.

3. More space is needed
Infrastructure may increase as more servers are needed to manage and monitor.

1.11 Difference between Cluster and Grid computing

	Cluster Computing	Grid Computing
Basic Idea	Aggregation of resources.	Segregation of Resources.
Running Processes	Same processes run on all computers over the cluster at the same time.	Job is divided into sub-jobs each is assigned to an idle CPU so they all run concurrently.
Operating System	All nodes must run the same operating system.	No restriction is made on the operating system.
Job Execution	Execution depends on job scheduling. So, jobs wait unit it's assigned a runtime.	Execution is scalable in a way that moves the execution of a job to an idle processor (node).
Suitable for Apps	Cascading tasks. If one tasks depends on another one.	Not suitable for cascading tasks.
Location of nodes	Physically in the same location	Distributed geographically all over the globe.
Homo/Heterogeneity	Homogenous	Heterogeneous
Virtualization	None	None
Transparency	Yes	Yes
Security	High	High, but doesn't reach the level of cluster computing.
Interoperability	Yes	Yes
Application Domains	industrial sector, research centers, health care, and centers that offer services on the nation-wide level	industrial sector, research centers, health care, and centers that offer services on the nation-wide level
Implementation	Easy	Difficult
Management	Easy	Difficult
Resource Management	Centralized (locally)	Distributed
Internet	No internet access is required	Required

1.10 Applications of Cluster Computing:

- Complex computational problems can be solved.
- It can be used in the applications of aerodynamics, astrophysics and in data mining.
- Weather forecasting. Image Rendering.
- Various e-commerce applications.
- Earthquake Simulation.
- Petroleum reservoir simulation.

Reference:

1. https://www.watelectronics.com/cluster-computing-architecture-its-types/

2. https://www.geeksforgeeks.org/an-overview-of-cluster-computing/

3. https://www.semanticscholar.org/paper/A-Comparison-between-Cluster%2C-Grid%2C-and-Cloud-Ali/cb4c5cce7c3b14332e97933cf43a6ff6839e3b14/figure/1