USE OF INTERRUPT SERVICE FOR DYNAMIC LOAD BALANCING IN DISTRIBUTED SYSTEMS.

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ABSTRACT : Load balancing is the process of redistribution of workload amoung the nodes of the distributed system in order to improve the job response time. In order to achieve load balancing between the nodes we consider the Modified approach which is an improvement on the Centralized approach. The Centralized approach there exists a single node ,so the processing is done at high speed by using switching .Switching takes place whenever a process with high priority appears. This approach has a limitation that the supporting node is not assigned load initially .This limitation is removed in the Modified approach in which the centralized node are split into smaller node called supporting nodes. The paper discusses an algorithm to improve the efficiency of the system by replacing the centralized node with a number of nodes added by the interrupt service. This reduces the waiting time by a significant amount of time.

Keywords - *Distributed systems, Load Balancing, Priority.*

I. INTRODUCTION :

The Load balancing is the process of distributing load across a set of processors that are connected to a network. The load of the processor which is overloaded, is migrated to other processors which have load below the threshold load. Threshold load is such that an excess amount of load can be assigned to that processor. In a system with multiple nodes there is a very high chance that some nodes will be idle while the other will be over loaded. So the processors in a system can be identified as heavily loaded processors (enough jobs are waiting for execution), lightly loaded processors(less jobs are waiting) and idle processors (have no job to execute).The various benefits of using Load balancing in distributed systems are listed below.The nodes in distributed environment are heterogeneous in nature. Load estimation can be done by the processing power of the node which includes the overall configuration along with the processing speed of the node.

- Load balancing improves the performance of each node and hence the overall system performance.
- Load balancing reduces the job idle time.
- Small jobs do not suffer from long starvation.
- Maximum utilization of resources.
- Response time becomes shorter.
- Higher throughput.
- Higher reliability.
- Low cost but high gain.
- Extensibility and incremental growth.

Many load balancing algorithms have been developed but no single algorithm is appropriate for all applications. The selection of an appropriate load balancing algorithm depends on application parameters like balancing quality, load generation patterns and also hardware parameters like communication overheads. Generally

load balancing algorithms are of two types: first is static load balancing and second one is dynamic load balancing algorithm or static mapping-. The static balancing can be effective for computations that have predictable run-time behaviours . For the computations where run-time behaviour is non-deterministic or not so predictable, performing load balancing only once in the beginning is insufficient. For these cases, it might be better to perform the load balancing more than once or periodically during run-times. For example, in data parallel applications, the computational requirements associated with different parts of a problem domain may change as the computation proceeds. This occurs when the behavior of the physical system being modeled changes with time. Such adaptive data parallel computations appear frequently in scientific and engineering applications such as those in molecular dynamics and computational fluid dynamics. This paper discusses about load balancing in dynamic distributed systems in which load balancing decisions are based on current state of the system . In dynamic load balancing, tasks are allowed to move dynamically from an overloaded node to a node with less load or idle node. Dynamic load balancing algorithms are complex to implement but the benefits from the dynamic approach are much more as compared to its complexity.

II. PRIMARY APPROACH FOR DYNAMIC LOAD BALANCING

In distributed systems independent nodes are connected usually by a local area network.Dynamic load balancing is used to allocate the jobs to the host or the nodes for processing. Load calculation is done dynamically taking in account the number of process, structure of node, bandwidth of the node etc. Referring to the Fig. 1, initially the processes are stored in the process queue or the process can be assigned as they arrive.

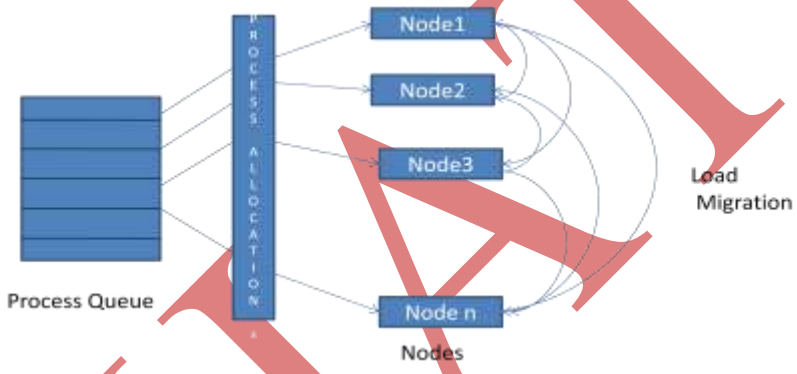

Figure1. Job Migration in Dynamic Load Balancing strategy.

As shown in the diagram above processes can be stored in the queue or the processes are allotted as they arrive. When they are assigned one by one to the primary nodes. Process migration is the migration of heavily loaded nodes to the nodes having light weighted nodes. During process migration the light weight nodes are searched in the cluster. If the appropriate node is found then load is transferred to that node else nearby is searched in the cluster and if the load balancing protocol matches the transfer takes place.

III . CENTRALIZED APPROACH FOR LOAD BALANCING

In the centralized approach we have a centralized node in each cluster in order to handle the overload and the congestion problems that arise in the network. Due to the congestion problem nod es are unable to find a node in the same cluster due to the overload problem. In the centralized approach ,whenever the primary node is overloaded, it searches for the other light weighted nodes, if such a node is found load transfer takes place between these two nodes and the load is balanced. On the other hand if such a node is not found, there is a centralized node

which is assigned the overload from the primary node. This also avoids the congestion and the networ k delayas the traffic between the primary node and the centralized node is kept very low.

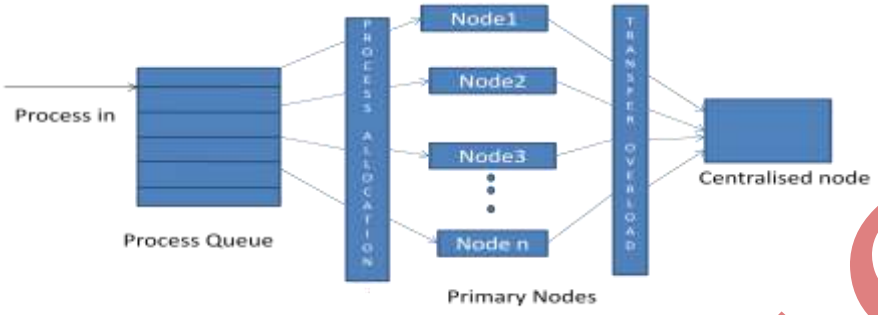

Figure 2. The Centralized approach to load balancing.

IV. MODIFIED APPROACH FOR DYNAMIC LOAD BALANCING

In the Modified approach the centralized node is split into smaller nodes called supporting nodes (SN). Initially the supporting nodes are assigned some load and a priority list is maintained. Suppose a process Pi is currently executed by node SNi and a Primary node Ni is overloaded , then it searches for the supporting node SNi suitable for transferring its overload ,so Ni will interrupt the SNi and assign priority to the coming process. A call to the interrupt service routine is made in order to handle the interrupt. If suitable Primary node is not found, the Primary node will approach supporting node .After finding suitable node ,it will interrupt SN for executing this process. Sn executes the ISR for handling the interrupt.

The interrupt service routine compares the priority of each coming process with the currently executing process and perform the switching between the currently executing process and process coming from he primary nodes. Process from PN is also assigned some priority . If the process from PN is having priority greater than priority of the current process running on SN , then process from PN is current process and process running on SN is stored in priority queue. If the process fom PN is having less priority than the priority of current process running on SN. The process from PN is stored in the priority queue.

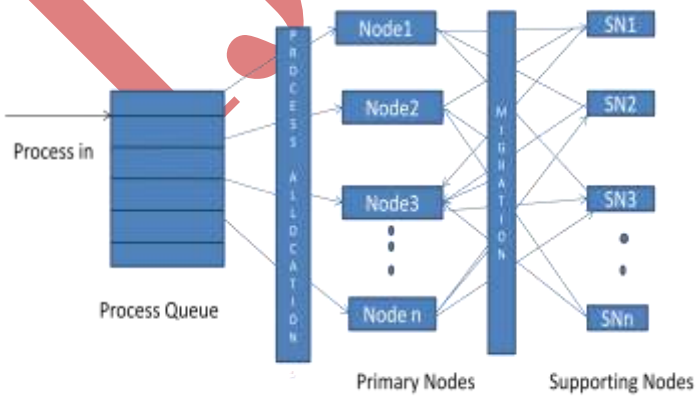

Figure 3: Modified Approach for Dynamic Load balancing for Distributed systems.

IV. CONCLUSION

The Modified approach for dynamic load balancing is suitable for distributed systems as the main aim of distributed systems is to execute the process at minimum cost. The minimum cost is considered in terms of the time required for achieving the load balancing be between the nodes. The Modified approach reduces the time for which the nodes remain idle ,inspite that there are tasks that are to be executed. Our future emphasis is on calculation of the complexity of the modified approach which should turn out to be minimum. One of the techniques used for this calculation is Ant Colony Optimisation. Mainly this used to minimise the complexityfor this approach.

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