Reducing Power Consumption in Peer-to-Peer System

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Abstract **-In peer-to-peer (P2P) system every node is peer and there is no centralized server. In this paper we discuss how to reduce the total electric power consumption of computers in peer to peer system. First we discuss the Round Robin method for reducing power consumption. Then we discuss our proposed load balancer method with queue system for reducing the total power consumption of server peer in peer to peer system.**

I. Introduction

Peer-to-peer (P2P) system is composed of peer computers which are interconnected. Here, each peer computer can play both roles of server and client and the P2P system is fully distributed, i.e. no centralized coordinator or server. A server peer is a peer which can provide services to other peer like page request. A client peer issues a request to a server peer to obtain the service. On receipt of a request, a server peer performs the request and sends a reply to the client. If a client peer obtains some service, the client peer can provide other peers with the service [1]. A client peer first issues a request to perform a process to a load balancer**.** The load balancer selects one server node in the server set for the process and sends a request to the server node. On other hand, the process is performed on the server node and data is sent to the client peer. In a distributed manner, each client peer is equipped with a load balancer. The load balancer exchanges load information with the load of other peers. The load balancer K having two queue, priority queue and unsorted priority queue. The priority queue of load balancer maintains the server list or maintains the queue of server as per the machine or server capacity. And the other hand unsorted priority queue maintains client request for the data, in queue. Fig 1 shows peer to peer system with queue system.

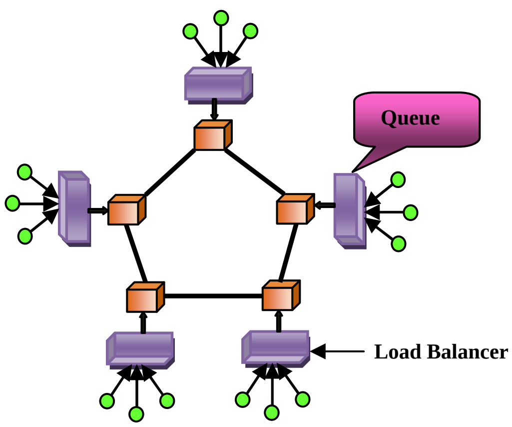


Fig 1. Load balancer with Queue

II. Methodology

1. Round Robin Algorithm

In round robin algorithm server S1…..Sn are arranged in order. A client request is first issue to the server S1.If the server S1 is overloaded i.e processor having maximum load of processes. Then request is sent to another server S2. If server S2 is also overloaded then request is sent to next server. Thus servers S1…..Sn in round robin methods are overloaded then request is issue to server Ci+1 where i<n.

Normally in round robin algorithm servers are ordered as per the fix weight and having two types weighted least connection (WLC) and weighted round robin (WRR). This weight factor is depends on two factor like ***power*** and ***performance*** of the server. When higher the performance of the server then we can assign more number of process to processor for computation and if server consumption is low then we can allocate more processes. Performance is calculated using estimated time of process execution on server and this information is stored in file for feature execution of same type of process.

A Weighted Round Robin (WRR) Algorithm

The weighted round-robin scheduling is designed to better handle servers with different processing capacities. Each server can be assigned a weight, an integer value that indicates the processing capacity. Servers with higher weights receive new connections first than those with less weight, and servers with higher weights get more connections than those with less weight and servers with equal weights get equal connections. In the implementation of the weighted round-robin scheduling, a scheduling sequence will be generated according to the server weights [7].

B Weighted least connection algorithm

The weighted least connection scheduling is a superset of the least-connection scheduling, in which you can assign a performance weight to each real server. The servers with a higher weight value will receive a larger percentage of connections at any one time. The Server Administrator can assign a weight to each server, and network connections are schedule to each server in which the percentage of the current number of live connections for each server is a ratio to its weight [6].

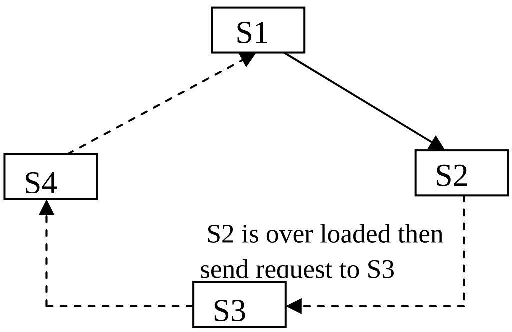


Fig 2 Server selection in Round Robin

III. Implementation

1. Proposed system: Load balancer with Queue System.

A client peer issues a request to a server peer. Each client peer has to find a server peer which not only satisfies service requirement but also spends less amount of electric power. There are two types of applications, transaction-based and transmission-based applications. In the transaction-based applications, a client peer issues a request to a server peer and the server peer mainly consumes CPU resources to process the request, e.g. encode multimedia data in Web pages. Web applications are the typical examples. On the other hand, a server peer transmits a large volume of data to a client peer like file transfer protocol (FTP) applications.

There are three situation occurred while performing Request on SERVER.

Situation 1: When CLIENT send One Request to SERVER it take few micro seconds for Complete request while SERVER is working on various request.

Situation 2: When SERVER is fully loaded (or when SERVER is working on its maximum working capacity.) that time same request take more time for completion in same SERVER machine.

Situation 3: When SERVER is overloaded that time Request take time from few second to infinity for perform request because SERVER is working on busy state. And possibly it needs to restart.

Then, we discuss how much electric power a server peer spends to perform processes initiated by client peers. We propose a power consumption model for performing processes in a server peer. Each Server peer consumes maximally the electric power if at least one process is performed on the server peer. Otherwise the server peer consumes minimum electric power. It's a key of reducing power consumption on SERVER peer. We already discuss situation 2 and situation 3 consumes more power as compare situation 1. Because it take more time to perform same task as compare to situation 1. That's why our suggested algorithm will try to avoid situation 2 and situation 3 with the help of load balancer. In Load balancer we sagest 3 sub module for sending request to server peer.

1) Module contains information of Servers maximum no of request processing capacity and no of request currently running on Server peer.Is used to Track server capacity and No of currently running Requests. If server is working within its maximum capacity then the process immediately send to server. But if server is working with maximum capacity then all the process generated by client is transfer to module 2.
2) Module contain queue of request generated by client peer.

   Is used to contain all the process generated by client. This module contains the waiting request queue until server is not free.
3) Module contain queue of request processed by Server and send to client peer.

1.1 Estimation for server selection

A. Use previous history (Process) – That file contains process history i.e. on which machine the process was executed. This file use sorted queue method. Parameters for this file are- Machine Id, request-time, server load.

B. Use Previous history (Capacity) – That file contain information about server processing capacity i.e. how many client to be handle?

2. Power Consumption

For calculating the power consumption of server peer-

Energy Consumption = Frequency of Processor X Processing Time of Processor (Joule) (1)

Conversion of energy in Joule into Watts [9].

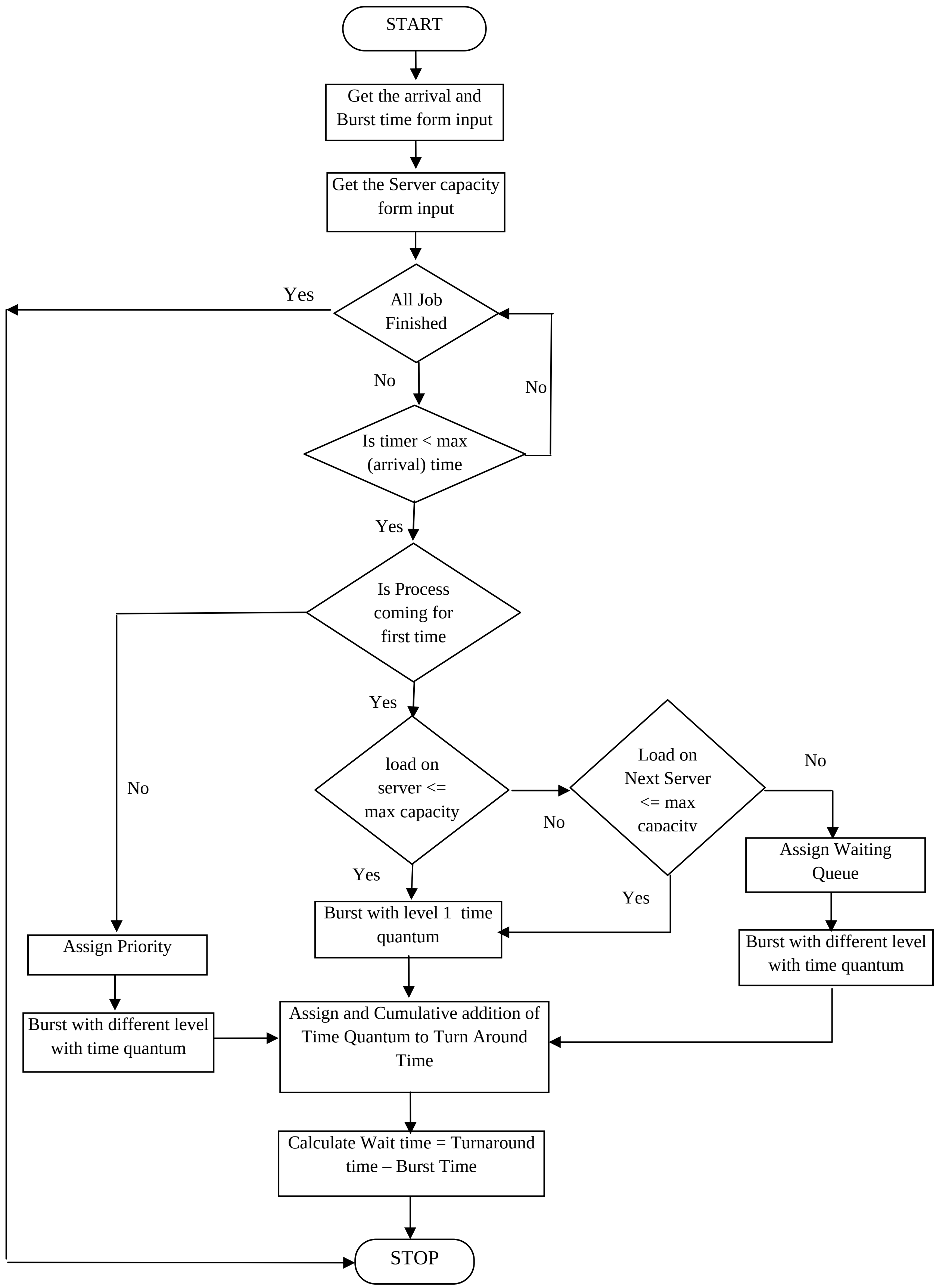
1Watt hour = 3600J

Joules = Watt x Seconds Therefore Watts = Joules/ Seconds (2)

TABLE I. Definitions for terms relevant to flowchart

Term	Definition
Wait Time	Amount of time spent ready to run but not run
Burst Time	Burst time is an assumption of how long a process requires the CPU between I/O waits.
Turnaround Time	Mean time from submission to completion of process.
Arrival Time	Time at which the process starts executing

Flow Chart for load balancer with queue system



Conclusion

As we discuss, reducing power consumption in peer to peer system we have to implement queue system along with round robin algorithm. Sorted queue method contains process history. Using this history file load balancer compare the current request with existing same request and particular current server capacity i.e. how many processes are working on server. So as per the proposed solution we can say that load increases on server means server take more time to process the request that is processing time is increases server consumes more power, for this problem reduce the server load up to its better performance level so that server will consumes less power.

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