Survey on Reducing Power Consumption in Peer to Peer System

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***Abstract*—**Today, it is very crucial to reduce the consumption of natural resources, such as petroleum. In information system need of reducing electrical power consumption have been raised. There is large scope for reducing power consumption in network based applications. There are many solutions how to reduce the power consumption by servers e.g. by turning off servers which are not required to execute the requests.
In this paper, we surveyed how the Round Robin Algorithm and Consumption Laxity Based Algorithm are used to reduce the power consumption of server in peer to peer system and their demerits also.

Keywords*-Round Robin, Consumption Laxity Based*

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I. INTRODUCTION

The green IT technologies[3] have to be realized in order to reduce the consumptions of natural resources like oil and to solve air pollution on earth. In information systems, also the total electric power consumption of computers has to be reduced. Number of hardware technologies like low-power CPUs are now being developed [1].

"Energy management" is a concept that has a several meanings, but we're mainly concerned with the one that relates to saving energy in businesses like data centers, small organizations server. Energy management is the process of monitoring, controlling, and conserving energy of servers.
Capabilities of servers and their power consumption have increased over time. Multiply the power servers consume by the number of servers in use today and power consumption emerges as a significant expense for many companies. The processors and memory are main power consumers in server. Server processors are capping and regulating their power usage, but the amount of memory utilized in a server is growing and with that growth, more power is consumed by memory. Also, the amount of heat that is generated by an integrated circuit is a function of the efficiency of the component's design, the technology used in its manufacturing process, and the frequency and voltage at which the circuits operate. When servers are working, the whole chassis will heat up; cooling is required for keeping the components at a safe operating temperature, but cooling takes additional power. In addition to server component heat generation, need of extra cooling is arises. when parts of the server are run at higher voltages or frequencies than specified. This is known as over-clocking. Due to Over-clocking a server performance increased, but also generates a larger amount of heat. However, there are several methods to improve overall servers efficiency.

Peer-to-peer (P2P) system includes peer computers which are interconnected in overlay networks. Here, every peer computer can play both roles of server and client. Every client peer has to find a server peer which not only satisfies service requirement but also spends less amount of electric power [2].

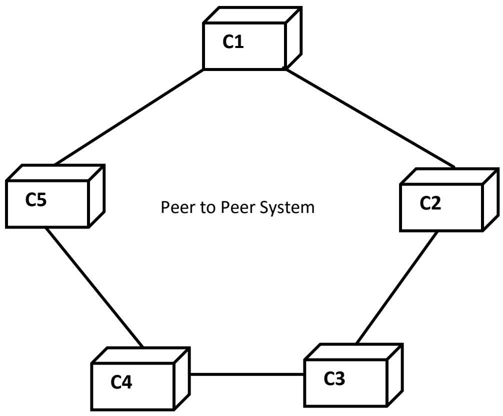


Figure 1. A Peer-to-Peer System of Nodes without Central Infrastructure

P2P system is fully distributed, i.e. no centralized coordinator. In information systems, total electric power consumption has to be reduced.

The Benchmark results determine the server's power consumption under various loads, measures transactions per watt in seconds, which is a particularly meaningful metric for comparing legacy servers with newer ones, and new models with one another, when making purchasing decisions and allows data center managers to use actual idle/peak power consumption for allocation of space and power. Integrating virtualized and load balanced applications across number of data centers allows server managers to shift the capacity on demand to maximize application availability while decreasing power and operating cost.

II. RELATED WORK

Green computing or green IT, follows to environmentally sustainable computing or IT. an Murugesan defines the field of green computing as "the study and practice of designing, manufacturing, using, and disposing of computers, servers, and associated subsystems—like monitors, printers, storage devices, and networking and communications systems — efficiently and effectively with negligible or no affect on the environment." The goals of green computing are similar to green chemistry; decrease the use of hazardous materials, maximize energy efficiency during the product's lifetime, and promote the recyclability or biodegradability of defunct products and factory waste. Research continues into key areas such as making the utilization of computers as energy-efficient as possible, and designing algorithms and systems for efficiency-related computer technologies [1].

In the early days of personal computing, under the DOS and CP/M operating systems, there was no power management—computers either used 100 percent of their power requirements or were switched off. Personal computer power management history dates back at least to 1989, when Intel shipped processors with technology to allow the CPU to slow down, suspend, or shut down part or all of the system platform, or even the CPU itself, to preserve and extend battery life. The growing importance of power management reflects the growing number of PCs in use and their transition to tools that go wherever people go.

The United States Environmental Protection Agency (EPA) publishes Energy Star guidelines that advised routes to reduce power Consumption.

Table 1. Energy-star guidelines

Equipment	Specifications for energy Star Label
Computers	Automatically enter a low-power "sleep" mode after a period of inactivity. Efficiently specification based action on the maximum continuous output power Rating of the power supply. (many computers use a 200-watt power supply for which the specification is 30 watts or less)
Monitors	Automatically enter two successive low-power modes of 15 watts and 8 watts or less after 15-30 minutes of inactivity.

Addressing the power taken by the number of computers in use, the EPA the Energy Star label determines energy efficient products that save money by removing unnecessary energy use.

Energy-efficient office equipment saves energy by powering down and going to sleep during periods of inactivity. On a monthly or annual basis, this equipment uses about half as much energy as standard equipment, saving owners millions of dollars in electricity costs. The EPA is curioused in power management for other important reason: using power management in office equipment offers immense potential for dramatically cutting air pollution related with electricity use. Increased power costs underscore the benefits of using Energy Star qualified products.

The computer industry first presented the Advanced Power Management technology in 1992 to decrease power consumption below the 60 to 80 watt requirements of DOS-based systems. APM was formulated at Intel as a power management technology for mobile systems. The APM 1.0 specification was written by Intel, Microsoft, and IBM with the aim of coordination between BIOS-driven power management and the operating system to save from unpredictable behavior caused by the two operating independently. Desktops utilized APM mainly to allow the operating system to reduce CPU power when idle. The APM interface passed events between the operating system and the BIOS, such as the BIOS telling the operating system events such as "the platform is going to suspend now," or the operating system posting a "suspend request event." Prenominal versions of APM added handshaking, but the underlying target remained to coordinate power management actions between the operating system and the platform.

APM defined five power states:

- Full on.
- APM enabled—the processor clock can slow or stop.
- APM standby—the PC is idle, so the processor and device power states are decreased. Clocks may be stopped, but return to full operation is fast.
- APM suspends—the PC is idle, so the power level is reduced to minimum. More time may be required to resume operation.
- Power off

Table 2. Key Findings

Sr. no.	Author	Key finding
1	Tomoya Enokido [2011]	In Laxity-Based algorithm deadline constraints are satisfied. So that power consumption reduced for applications like database transcactions and data transmission.
2	Tomoya Enokido, Ailixier Aikebaier[2011]	In that servers are ordered in ascending order of maximum power consumption. So that power consumption more reduced in CTRB than RR.
3	Andreas Merkel, Frank Bellosa [2006]	Used energy-aware scheduling. In that energy characteristics of an individual task is determined that achieves energy balancing and minimized thermal imbalances between system processors. So that power consumption reduced in microprocessor system.
4	Tomoya Enokido, kota Suzuki,Ailixier Aikebaier[2010]	Servers are selected that took smallest transmission time for transmitting file to client. So that power consumption reduced in Communication-Based applications.
5	Tomoya Enokido, Kota Suzuki, Ailixier Aikebaier[2010]	By calculating estimated termination time and considering deadline constraints Laxity-Based algorithm reduced power consumption in distributed system.

A. Round- robin algorithm

In a load balancer K, types of round-robin algorithms are widely used. 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 processes 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 [1][2].

A. 1 Weighted round robin algorithm

The weighted round-robin scheduling is intended to better handle servers with different processing capacities. Every server can be allotted 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 weight assigned to servers [3].

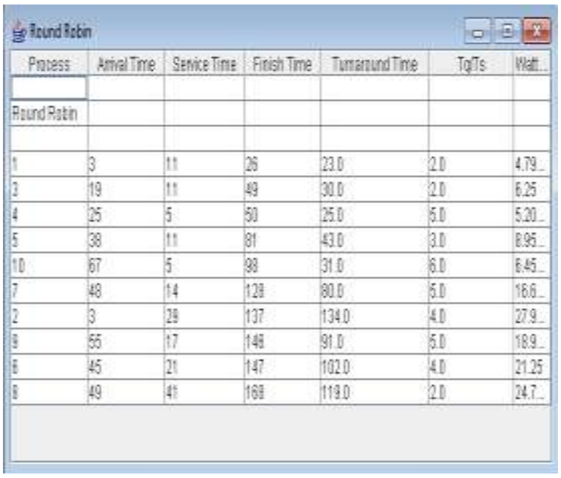
A. 2 Weighted Least Connection Algorithm

The weighted least connection scheduling is a superset of the least-connection scheduling, in which you can a performance weight to every 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 every server is a ratio to its weight[4].

Conclusion of Round Robin Algorithm are as follow Suppose,

Each Server Process Capacity = 20
No of Server in network =4
Total no. of Process dump by user = 300
Then,
Load on server = 300/4 = 75 process

Means that server can process this total number of processes but server can take more time to process these 75 processes and finally server consumes more power (Watts) than it ideal state, here ideal state is 20 processes. so that it consumes more power(Watts). This is main drawbacks of it.



Process	Arrival Time	Service Time	Finish Time	Turnaround Time	Tq/Ts	Watt...
Round Robin						
1	3	11	26	23.0	2.0	4.79...
3	19	11	49	30.0	2.0	6.25
4	25	5	50	25.0	5.0	5.20...
5	38	11	81	43.0	3.0	8.95...
10	67	5	98	31.0	6.0	6.45...
7	48	14	128	80.0	5.0	16.6...
2	3	29	137	134.0	4.0	27.9...
9	55	17	146	91.0	5.0	18.9...
6	45	21	147	102.0	4.0	21.25
8	49	41	168	119.0	2.0	24.7...

Figure 2. Watt calculations for processes using RR algorithm

Turn Around time=finish time – arrival time
= 26-3 = 23

Now 23 microsecond is required for process one. Then calculate the Watts required for process one.
So, As per the formula calculate the power consumption.

Power consumption (Joule) = Freq. of processor * Processing time of process
= 750 * 23
= 17250 J

Now convert that power consumption in joule to Watts So,
1 watt hour = 3600 joule
Power consumption in Watts = 17250 / 3600
= 4.79 Watts

Similarly, determine power for remaining processes.
Avg. Power consumption=power consumed by total no. of processes / total no. of processes.

=141.25/10=14.12 watt

B. Consumption Laxity based Algorithm

The computation laxity (CL) of a process Ps shows how long it takes to perform up the process Ps from time t on a server Ci. Suppose a process Ps is issued to the load balancer K at time t . The Consumption Laxity of a process on each server Ci is given as follows:

(Consumption Laxity) *clis*(t) =ETps (t) – t

In the CLB algorithm, a server Ci which can most early terminate a process Ps is selected for the process Ps. A server Ci is selected for the process Ps at time by the following procedure [1] .

PCB (t, C, Ps)
{
CLi = φ;
For each server Ci in C
{
Calculate estimate termination time for ETi and ETps at time t.
/* ETi(t) = estimated termination time of current knote KPi(t) where server Ci is selected for a process Ps at time t.
ETps(t) = shows an estimated termination time of the process Ps on server
Ci at time t. */

clis(t) =ETps (t) – t;

CLi = CLi + { *clis*(t) };

}

Server = Ci Where *clis*(t) is minimum in CLi.;

Retrun (Server);

}

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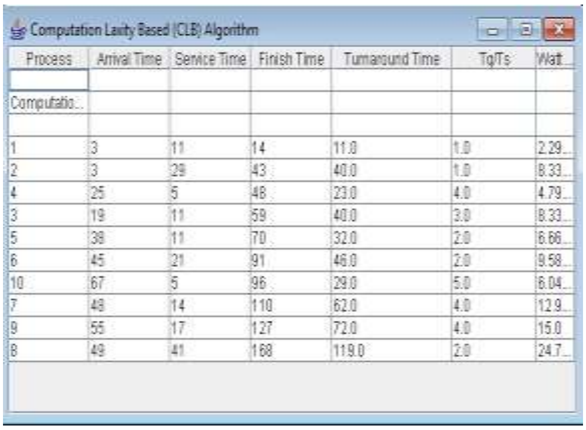
Computation Laxity Based (CLB) Algorithm

Process	Arrival Time	Service Time	Finish Time	Turnaround Time	Tq/Ts	Watt
Computatio...						
1	3	11	14	11.0	1.0	2.29...
2	3	29	43	40.0	1.0	8.33...
4	25	5	48	23.0	4.0	4.79...
3	19	11	59	40.0	3.0	8.33...
5	38	11	70	32.0	2.0	6.66...
6	45	21	91	46.0	2.0	9.58...
10	67	5	96	29.0	5.0	6.04...
7	48	14	110	62.0	4.0	12.9...
9	55	17	127	72.0	4.0	15.0
8	49	41	168	119.0	2.0	24.7...

Figure 3. Watt calculations for processes using CLB algorithm

Power consumption (Joule) = Freq of processor * Processing time of process

= 750 * 11

= 8250 J

Now Convert that power consumption in joule to Watts So,

1 watt hour = 3600 joule

Power consumption in Watts = 8250/3600

= 2.29 Watts

Similarly, determine for remaining processes.

Avg. Power consumption=power consumed by total no. of processes / total no. of processes.

=98.75 / 10=9.87 watt

III. PROBLEM DOMAIN

Round robin algorithm processes the number of requests. But When number of requests are increases then server cannot processes the number of requests than its ideal processing capacity.

Then it takes more time and finally it consumes more power. Consumption laxity based algorithm calculates estimated termination time of processes. Once the estimation time is calculated for process use this information for the next same process and dump that process on same server whether that server is under load or overload. There is no situation when the server is under load, but drawback is that server is overloading then it takes more time to process the request and consumes more power.

Also, by using consumption laxity based algorithm scheduling of the requests is not achieved in proper manner. so that server is overloaded most of the times. so that power consumption increases.

IV. CONCLUSION

In this paper we discussed two techniques to reduce consumption of power. We surveyed that Round Robin and Consumption Laxity Based Algorithm are used to reduce power consumption. But they are having some drawbacks. Proposed system overcomes the drawbacks of these two algorithms to reduce power consumption. In proposed system we will use Scheduling with queue system that works as load balancer. so that our aim to reduce the consumption of power is achieved. Proposed system overcomes drawbacks of Round Robin and Consumption Laxity Based Algorithm.

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