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A comparative Performance of Different scheduling algorithms with FPBMS for optical network

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Abstract

Optical network should perform invasive computing, where the devices and the user are hooped together through a network. In optical network requirement of Quality of Service (QoS) will maintain the prepare scheduling algorithm and also various other issues in optical network like throughput, latency, fairness, etc. so in order to provide a better optimized scheduling algorithm with high efficiency, we proposed a novelFuzzy Priority Based Multi Scheduling (FPBMS) algorithm, it provides better throughput and less latency. The performance has been compared with Vague Logic Based Round Robin (VBRR) and fuzzy based Central Processing Unit (CPU). The experimental result shows that it is more efficient and to maintain the good QoS to support the variable length of packet scheduling in optical networks. We evaluate the performance of the proposed model in the NS-2 network simulator. As a result, we identify the performance analysis and comparison of our proposed algorithm with some existing algorithm shows the significance of the proposed work.

Keywords:Fuzzy Priority based Multi Scheduler (FPBMS), CircularQueue, Fuzzy Based Central Processing Unit (CPU),and Vague Logic Based Round Robin (VBRR).

1. Introduction

At present the information requirements to be transmitted for various purposes through the function of communication between the two points. In order to reduce the transmission time, the several parameters are considered like traffic rate, speed of signal mode, proper routing,etc. There are many issues in the packet scheduling such as increase the packet transmission response time, low throughput , high latency, waiting time, to overcome the issues the most essential scheduling algorithm need in optical networks. Optical network is broadly classification in different network to transmit different wavelength namely WDM and DWDM. A QoS supporting scheduling algorithm for optical burst switching DWDM networks [1]. [2] discussed about microwave linear beam tubes including Klystrons , reflex klystrons tubes (TWTs)and it studies microwave cross field tubes such as magnetrons and microwave measurements. The packet scheduling reconfiguration is motivating the need for scheduling the packet in the account for the

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switching performance time delay. The proposed scheduling result based on the Periodic MaxWeight(PMW) and Adoptive MaxWeight(AMW) , which, in contrast, requires no prior knowledge and to achieve 100% throughput[3]. The fixed size packet transmission scheduling algorithm allocates the fixed time for scheduling the various packets and bandwidth, which will lead to unnecessary time and wastage of bandwidth when the routing the different size of packet transmission in the network. Therefore, the novel priority and time window based traffic scheduling and routing spectrum allocation mechanism based on the fairness index of the spectrum configuration has been proposed [4].

2.Related Work

In the proposed [5] introduced fuzzy based round robin schedulerVBRR. This new extension scheduler has two frameworks, the first task using vague logic to handle the impreciseness and, second framework is to schedule the task, where the scheduler adopts optimum time for scheduling process. Therefore, the optimum time quantum reduces overhead on the scheduler. Hence, the total response time of the task has been improved to overcome the issue of switching context.A novel RR scheduling approach for real time system using fuzzy logic addressed[6]improves the minimum average waiting time, total around time and the switching rate. This approach is known as a fuzzy based Central Processing Unit (CPU) scheduling algorithm. Probable inconveniences with this approach includes a variable length packet scheduling problem, and priority with some new rules added to the fuzzy rule which assigns a new priority of processes in each round. This work tackles the problem to provide solutions to reduce the overall turnaround time and provide better switching performance in the optical network.

In [7] the solution for the scheduling the packet, and routing issues along with less latency obtaining the accurate result for the fuzz assignment of packet scheduling and routing with high throughput and maintain the quality of service was presented in performance of fuzzy based PBMS with PBMS and vital scheduling algorithm. The main tasks are considered in this method scheduled the variable length packet, switching performance, packet latency and maintain the QoS through satisfactory through four assignment task plan constrains. The first task, the length of packet size (zero) also allowed in queuing length. The second task is a circular queue possible, handle the more than one packet at a time and conform the unacceptable packet has been processed.

Third task is the total number of packets between the circular queues needs to arrange the number queue for task assignment. The final task is, the process based on the weight limit to other circular queue. The result of the assignment task proved that this novel scheduling algorithm more efficient over the existing algorithm for variable length packet scheduling. In [8] proposed approach constructs an adaptive polices for scheduling with reconfiguration delay for all optical data center networks. This proposed policy to achieve through optimality without knowing prior the traffic

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load in two classes 1.quasi-static is also referred to as batch scheduling, which select a series of scheduling based on a single scheduling computation process. 2. Dynamic police scheduling is computed based on the most up-to-date edge queue length information. Based on two polices suggests the utilized in the context of an electronic packet switch in order to reduce the delay with high improve performance.

The proposed Software Defined Optical Network (SDON) scheduling algorithm [9] to solve the problem such as low service quality, fairness index and low throughput in wireless network, which is improved on the basis of number of packets, is close to the maximum load of the long term evolution frame. The author presented [10] challenge of dynamic data transfer demand present in the communication network. Consider dynamic multicast scheduling problem over the elastic optical network in terms of improving the link utilization by traffic load occurred for multicast demand. Performance analysis proposed method result to provide significant improvement in the quality service and reduced load when asymmetry of network link occurred.

3. Proposed work

3.1 FPBMS Scheduler

It delves into scheduler: Scheduler receives the number of packets from any network layer that will give has an input of scheduler FPBMS and output of FPBMS is given as an input of optical switch based on load information packets are transmitted. It is shown in Figure 3.1 packet flow in scheduler p_1, p_2 are input packets of the scheduler.

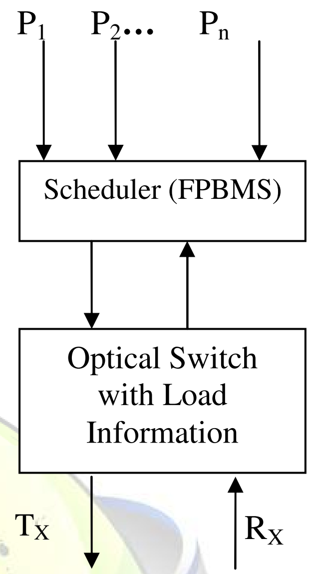

Figure 3.1: Packet flow in Scheduler

3.2Analyzation of Multi Scheduling

Set of jobs has considered where the job is defined as a set of operations with the processing and termination time. Some of the constraints are listed below.

- Constrain 1 (C1) in same processor, all job operations are executed.
- Constrain 2 (C2) simultaneous operation are restricted
- Constrain 3 (C3) at instant time, the maximum operation has been executed.

Where, C1, C2 and C3 define a set of compatibility constraints in between the different operations. Specifically, either or otherwise are said to be incompatible operations. Incompatible operations cannot be executed simultaneously. Constraint C1 also implies that once a job operation has been processed on a processor, then all operations must be executed on the same

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processor. However, the processor on which the operations of a job are executed is not known in advance; rather, it is determined as part of the solution to the scheduling problem. Furthermore, the operations of a job can be executed on processor in any order. The above defined scheduling problem can be logically divided into two sub problems. The first sub problem has to assign the job to a processor because of constraints (C1), it means that all job operations will be executed.

The second sub problem is to schedule the job operations on their allocate processors, so as to utilize maximum termination time, while the compatibility constraint (C2) and the constraint (C3) is also satisfied. This division directs in a causal way of solving the problem scheduling by applying existing algorithms to each sub problem in isolation [11].

Based on the survey and the novel idea of proposed scheduler has scheduled the variable length of packets and allows packets with a different circular queue. The required queue is formed based on the incoming packet, and the incoming packets join into the appropriate queue in this process every circle queue having the weightlimit. Therefore, without any packet loss all the packets are processed. Figure 3.2 (T_{cq} (10 nano sec)) and 3.3T_{cq} ((20 nano sec)) show the multi scheduling process.

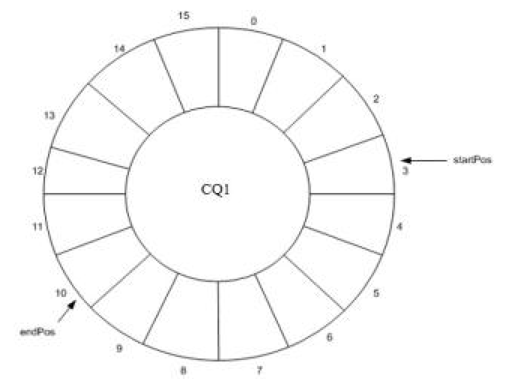

Figure 3.2T_{cq} (10 nano sec) Multi scheduling process

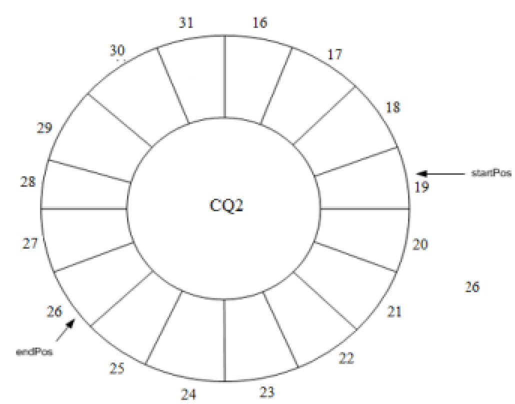

Figure 3.3T_{cq} (20 nano sec) Multi scheduling process

- T_i - Processing time of individual packet
- P_i - Total number of packets
- CQ(n)- Number of circular queues.
- S_T - Sleep time between circular queue
- $T_{cq\,(n)}$ - Total circular queue time

This work assumed packet size header as 20 to 60 bytes and data as 20 to 65536 bytes. The Figure 3.6 shows the small information format and header format.

Total processing time (P_{cq}(n)) of multi scheduler calculated by using equation 1 and 2.

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$$P_{cq(n)} = \sum_{n=1}^{Y} T_{cq(n)} \quad (1)$$

$$T_{cq(n)} = \sum_{i=0}^{n} T_i + \sum_{T=0}^{1} S_T \quad (2)$$

The complexity of time and space of the proposed algorithm is improved compared to other conventional algorithm because the packets sorting procedure are not processed separately.

3.3Fuzzification

To design a fuzzy assignment method, assume that there is 'n' number of packets processed through 'm' number of circular queues. The reason for adapting circular queues is to avoid the starvation while utilizing resources. This work tries to reduce the total space occupied by the queues, reduce the total processing time and maintain the QoS after every packet is processed.

The following constrains should be satisfied with assignment procedure:

- To process the packets without any packet loss. The packet is processed by any one processing queue, but the queue can handle more than one packet at a time.
- Zero size of data packets is allowed.
- In order to maintain the stability of packets between the processing circular queues, it is essential to specify the number of processing circular queues assigned to the process.
- The capability of processing for each circular queue is considered to make a decision and assume the number of packets is assigned to circular queue within a weight limit.
- If the processing circular queue 'i' is able to handle some other packets 'j' and assume that the circular queue possibly takes a long time to process the data packet, in such conditions processing queue 'i' will be dispossessed to process.

3.4 Defuzzification

The defuzzificationin [12] process has been used to find the crisp values and it represents the average value of the trapezoidal fuzzy numbers, Robust's Ranking Technique which is universally accepted Technique for defuzzification.

$$R(\tilde{a}_{11}) = \int_0^1 0.5(a_\alpha^l, a_\alpha^u)\, d\alpha$$

3.5 Pseudo code:

```
Begin fuzzy based PBMS Procedure
{   fuzzy
    {//create the multi objective assignment problem in fuzzy
            Compute   S̃ = ( s̃ij ) m x n; Space  S̃
          Compute   T̃ = ( t̃ ij ) m x n; Time  T̃
    Compute   Q̃ = ( q̃ ij ) m x n; Qualityof service  Q̃
//Transform, multi objective fuzzy assignment problem to single object Problem.
    }
   Begin defuzzy
     {//convert the fuzzy assignment to conventional assignment problem
   Fuzzy assignment problem
      {
        If (queue ≠ packets)
          {
for (i=0; i≥ n ; i++)
              {
for (j=0; j≥n; j++)
                {
      Include dummy queue and packets to avoid the least element in the column;
                       }
                     }
     Compute
              {
Sij= (Sij – the smallest element); // select smallest element in the row and subtract
that element with each element in the row.
              }
if ((number of assignment = =number of 'n')||( Sij≥ 0 &&Sij==0))
        {
else if
          {
for (i=0; i≥ n; i++)
           {
for(j=0 ; j≥ m; j++)
            {
assign ( □ ) to zero & cross off(X)
}
}
          }
return optimal solution
        }
    }
else if
      {
           Place (√) which rows were not have assigned zeros
           Place (√) which columns contain zero in the above marked rows
           Place (√) which rows contain assigned zero in the above marked
columns.
        }
     }
else if
      {
From reduced matrix, find the least element not covered by any one of the lines.
Subtract the selected element from all the unmarked elements and add the same
selected element to whose elements' position at the intersection of two lines.
  } }   }
```

4. Experimental results

4.1Performance Analysis of Fairness

From the figure 4.1 the traffic rate is at point below 5 bps as fairness index 96 which prove the improved in performance of FPBMS compared to fuzzy based CPUandVBRR.

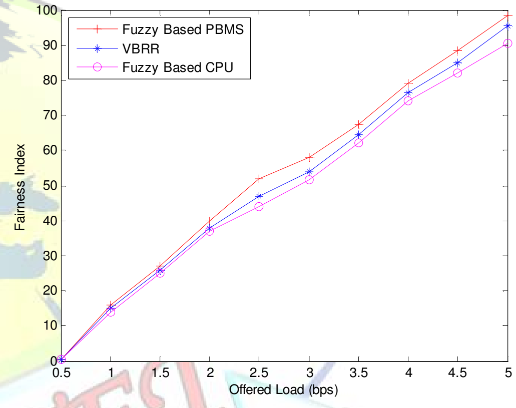
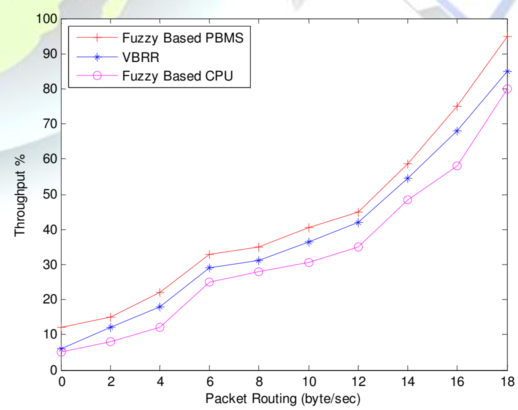


Figure: 4.1 Analysis of fairness index with VBRR and Fuzzy based CPU

4.2 Performance Analysis of Throughput



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Quality Parameters	Algorithm		
	Fuzzy based CPU	**VBRR**	**FPBMS**
Fairness Index (%) Vs load offered (bps)	90	94	96
Throughput (%) Vs Packet Routing(byte/sec)	45-78	45-85	45-95
Latency(micro sec) Vs Message size(byte)	2-12	2-8	2-5

Figure: 4.2 Analysis of throughput with VBRR and Fuzzy based CPU

Define the throughput is measure of the number of packets transmitted (P_t) over the network per unit of time (T) for maximum throughput configuration, illustrate by Figure 4.2 shown as per the proposed scheduling algorithm can efficient improves performance of throughput from 45% - 95% with increasing packet routing.

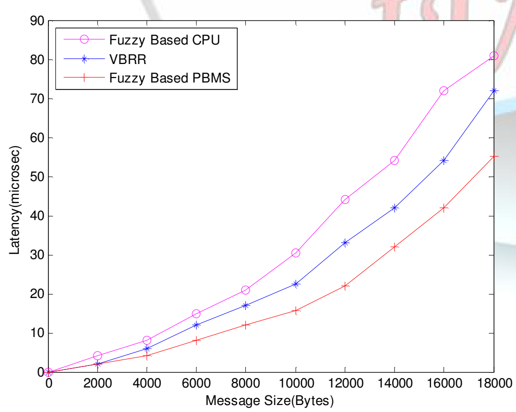

Figure: 4.3Analysis of latency with VBRR and Fuzzy based CPU

4.3 Performance Analysis of Latency

Figure 4.3 shown average latency (turnaround, response time and waiting time) and size of message respectively. Fuzzy based algorithm has taken lowest packet transmission time 2-5 ms in case 6000bytes of the packets (message size) transmitted to the network. So, conclude that the FPBMS has been better performing over the both fuzzy based CPU and VBRR scheduling algorithm.

Table 1 comparative results

The performance evaluation result of our proposed FPBMS algorithm comparison with fuzzy based Central Processing Unit and VBRR are shown in Table 1.

5. Conclusion

In this research work, a FPBMS algorithm is proposed for optical network, which performance animproved on the basis of the conventional scheduling algorithm. The performshas evaluated through the significant parameters such as fairness, throughput and latency. The simulation and comparison results show that the algorithm is more suitable for schedule the variable length of packets in optical network over the other conventional scheduling algorithms.

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