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An adaptive delay aware optimized Scheduling In all optical networks

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***Abstract*—In this paper, we proposed multicast scheduling in a real time optical packet interconnects/switches. Optical communication, in particular Wavelength Division Multiplexing (WDM) technique has become a promising networking choice to meet ever-increasing demands on bandwidth. Optical buffer based on multicast enabled Fiber Delay Line (M-FDLs), have been proposed for contention resolution in optical packet/burst switching system which enables flexible packet duplication and controlling delay. We proposed a multicast scheduling algorithm called Earliest Deadline First (EDF) that considers the schedule of each packet processes in a priority queue. The each processing module can complete the packet scheduling for a time slot in O(1) time. This approach achieves the high performances in fixed packet length slot for a single packet transmission.**

Index terms-Optical interconnects, WDM, multicast scheduling, MFDL, EDF.

I.INTRODUCTION

A. Optical Networks

Optical interconnect is seen as a potential solution to meet the performance requirements of current and future generation of data processors. They have negligible frequency dependent loss, low cross talk andoffer high bandwidth, low latency, and minimum power consumption along with a lack of vulnerability to EMI. There are many promising optical interconnect technologies and this paper presents a brief analysis of current state of optical interconnect technology.Interconnect has moved to the forefront as the limiting factor in IC performance.

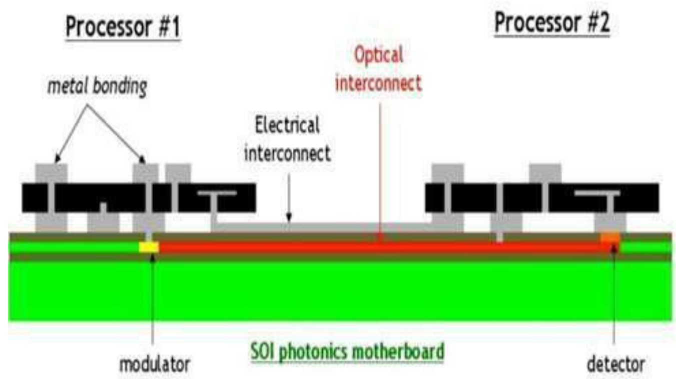

Figure1.Optical Interconnect

B. Effect of PDR in MFDL

Fig. 1 shows the results of the packet delivery ratio under multicast traffic condition by comparing EDF algorithm with LLMS [1] under different load. As a result in the figure, that packet delivery ratio is increased by Optical Burst Switching.

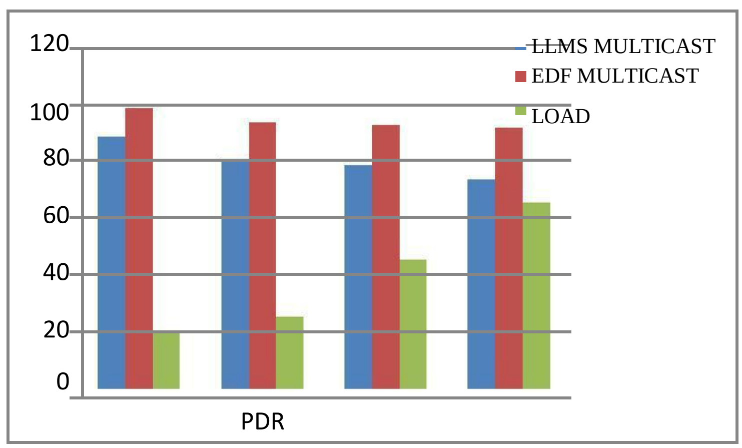

Figure.2. Effect of PDR in MFDL

II. RELATED WORK

For flexible delay operation, LLMS algorithm based solution has been developed in [1],can achieve superior performance in terms of average packet delay and packet delivery ratio but faces serious scalability problem as the port count and port speed increase. It is therefore critical to design a scheduler of lower time complexity for high speed optical packet interconnects. To enable easier processing at network interfaces with high throughput, transparent optical packet switching is developed in the KEOPS project [2], but it operates only for fixed time slot.High bandwidth and QOS are essential requirements for efficient video conferencing which are provided by non-blocking multicast in WDM [3], also provides short multicast latency. This presents more practical and complex analysis of multicast only under limited wavelength conversion. The virtual output queuing (VOQ) is used for an efficient and simple buffering strategy to remove the HOL blocking,[5] yet queue structure is not possible for heavy congestion, Optical packet switching (OPS) fabric architectures and corresponding all-optical contention resolution schemes is designed to achieve the best performance in optical buffer queues. But it is suitable only for MIQ-OPS not for CIOQ-OPSL.

III. Objectives & Overview Of The Proposed MECHANISM

A. Objectives

In this paper, we proposea multicast enabled FDLS (M-FDLs) that provides flexible delay for each incoming multicast packet. Each packet consists of optical payload and label. Here Data is transferred as a payload which carries the actual data to the destination. Headers are appended to payload for transport and discarded at their destination. Optical label is used for routing and forwarding functions. Next the packets are sent through multiple FDL segments in a single MFDL buffer. Every FDL segment can provide a delay time (T). Each MFDL is multiplexed in the scheduling algorithm of EDF(Earliest Deadline First. To support flexible packet duplication for multicast packets, switching module is done by the concept of Optical Burst Switching(OBS), by which the packets will move out of the M-FDLs completely and directed to the interconnect for transmission. In case of loss in the packets they are fed back to label processors which route the packet to the switching module through the schedule.

B. Overview ofthe proposed Mechanism

We propose an Earliest Deadline First (EDF) in optical interconnect without using any pipeline and parallel processing. Each data from packet are scheduled to buffer and Optical Burst Switching route the packets to the destination.The destination node verifies the task block of packet forwarding values and checks with the new task. If the new task and task block of packet forwarding is verified, the new task is allowed at the top or bottom of the queue. If the new task value is same as the current task, there will be no changes and the process is continued.

IV. Algorithm implementation

A. Earliest Deadline First (EDF)

Optical packet interconnect is a single wavelength, input-buffered and several MFDL placed in an input port is capable of providing flexible delay and provide duplicate copies for the entered input packets.We adopt a centralized scheduler called Earliest Deadline First (EDF), which keeps track of all the arriving packets in the current time slot and it is placed in a queue by calculating arrival time.The packet which has least time to live(waiting time) is moved to the optical burst switching module where the scheduling is done and distributed to the multiple user without causing any damage to the incoming and outgoing packets. The delay is reduced to be flexible and hence the PDR and throughput of the packet is improved.

V. Performance Evaluation

A. Simulation Model and Parameters

We simulate our proposed algorithm using an NS2. In our simulation,front end is TCL and back end is C++. We demonstrated by using 50 nodes in NxNOptical Multicast packet interconnects. The optical interconnect may be used for both home and commercial appliances and here we demonstrated using 1330nm.

Tool	NS2 red hat
No.of.nodes	50
Area	50X50
Simulation Time	50 sec
Wavelength	1330m

Table1. Simulation parameter

B. PSEUDOCODE

```
Scheduling of a task for packet:
// task block is assigned to the new task using malloc function
 Calculate absolute deadline.
Absolute deadline= system up time of the RCX+relative deadline
//Priority chain transverses till current priority = priority of new task
IF absolute deadline of new task < absolute deadline of first task
New task is added to the top of the priority queue
// Priority block is assigned to the point to the new task
IF absolute deadline of new task < absolute deadline of last task
 New task is added to the bottom of the priority queue
IF absolute deadline of new task < absolute deadline of current task
 Break
 task is added bove the current task
Deadline Monitoring: (done at every timeslot)
get the system up time of the RCX
```

// list of tasksare traversed under the priority level

IF absolute deadline of the task < system up time // kill the task using the kill function

C. Performance Metrics

We evaluate the performance of optical networks according to the following metrics.

Packet Delay: The amount of time required to push all the packet bits into wire. The packet delay should be kept low.

Packet Efficiency: The ratio of datadelivered from transmitter to the receiver without causing any damage in the meanwhile.

PDR: The ratio of number of delivered data packets from the sources to the destinations.Better performance of protocol, is achieved by greater the value of packet delivery ratio.

THROUGHPUT: The rate at which a processor can do the operation in instruction per second or in a given period.

Simulation results are presented in the next part. We compare our Earliest Deadline First(EDF) algorithm with the LLMS algorithm [1] in an optical interconnect.

C. Simulation Results

By optical burst switching, the packets delay is reduced from transmitting data from source to the destination and with the help of EDF algorithm, PDR is improved.

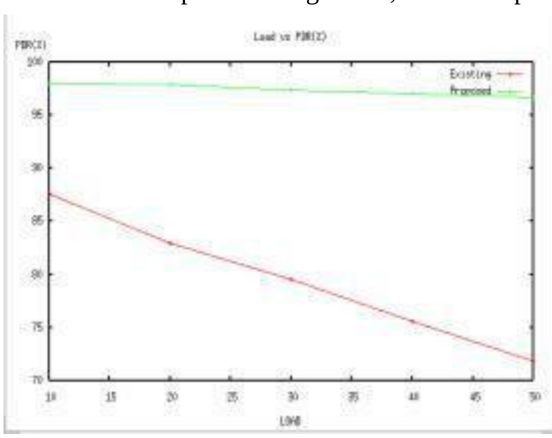

Figure.3(a). Packet Delivery Ratio (vs.) Load

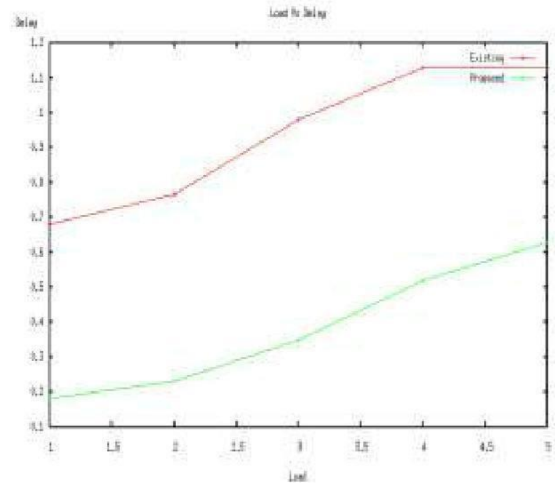

Figure .3(b). Load (vs.) Packet Delay

Figure1 show the results of Packet Delivery Ratio(PDR), here themulticast optical burst switching method is used to improve PDR forpackets.

Figure2 shows the results ofpacket delay. Because of adopting least time to leave strategy, the packets are transmitted without traffic even under thecongestion path. Thus the delay is minimized and we obtain higher throughput.From the result, we can see that EDF has higher PDR than LLMS algorithm.

VI. CONCLUSION

In this research, we considered multicast scheduling problem for optical multicast interconnects. We proposed an efficacious optical buffer called multicast-enabled FDLs (M-FDLs), which can provide flexible delay for resultant copies of each multicast packet. Further, Earliest Deadline First (EDF) Scheduling Algorithm is proposed to optimize delay by giving priority to the dead-lined transmitted packet and hence achieves close to optimal average delay and packet drop ratio even under the most traffic conditions. Time to live strategy is easily extendable to provide QoS differentiation. Finally, we evaluated the performance of transmitted packets by extensive simulation of EDF.

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