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Comparison between Different Scheduling Strategies by Using Cost239 Optical Network

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Abstract

In this paper we present different demand policies in scheduled lightpath demand (SLDs) .SLD is a demand for a set of lightpaths (connections), defined by a tuple (s,d,n,α,ω) where s and d are the source and destination nodes of the lightpaths, n is the number of requested lightpaths α, ω and are the set-up and tear-down times of the lightpaths. The objective of this paper to increase resource utilization ratio by using channel reuse. In this paper we works on Cost 239 network by assigning the same channel to several lightpaths, by using different wavelengths which varies according to the time (set-up and tear-down).By comparison of demand policies which also depend upon time(set-up and tear-down) every demand policy has own schedule. By using Cost 239 network we found the result which demand policy is effective and scheduled first and we compare each policy by using graphical representation and then find which policy is best for scheduling and increase the resource utilization.

Keywords

WDM, RWA, STATIC TRAFFIC, DEMAND POLICIES

1. Introduction

At the present scenario the popularity of the Internet and using of Internet exponential increasing day by day in computer society that's why bandwidth demands also increasing. Wavelength division multiplexing (WDM) divides the enormous bandwidth of an optical fiber into many non-overlapping wavelength channels. WDM optical networks are able to meet the rapid growth of bandwidth demands and are considered to be the most appropriate choice for future Internet backbone. In a WDM optical network with path based protection, each connection has two link disjoint paths: one working path and one protection path. A connection request is considered blocked if no sufficient resources are available to route either path. Efficient resource utilization can be achieved through backup resource sharing, a technique that allows multiple protection paths to share some common wavelength-links as long as their corresponding working paths are link disjoint while 100% restorability is still maintained. Shared path protection outperforms, in terms of resource used, other protection techniques based on the dedicated reservation of backup capacities [1]. In Optical network optoelectronic approach mainly used, Optoelectronic approach is the most practical method today to realize wavelength conversion [4].

1.1 RWA Problem

In informal terms, the RWA problem under consideration is the following: given a network and a set of SLDs, find the routing in the network for the SLDs which meets an optimality criterion. Then, for this routing solution, find the assignment of wavelengths to lightpaths that minimizes the number of required wavelengths, while satisfying the wavelength continuity constraint (no wavelength conversion exists in the optical network). Different optimality criteria may be considered in the routing sub-problem, for instance, the minimization of the number of WDM channels or the minimization of the congestion (the number of lightpaths in the most loaded link).congestion minimization is important when the number of wavelengths in the network is limited [3].

In wavelength convertible networks, a lightpath may be assigned a different channel on each fiber it traverses. However, full range all-optical wavelength conversion is generally not feasible, due to both cost and technological restrictions. Therefore, most practical networks do not assume wavelength conversion capabilities. In the absence of wavelength converters, a lightpath must be assigned the same channel on all links. This is called the wavelength continuity constraint. The RWA problem, under both the static and dynamic traffic models. In recent years there has been an increasing number of applications that require periodic use of lightpaths (e.g. once per day, or once per week) at predefined times. For example, an online "class" with one two hour lecture per week on a specified day and at a specified time, or a bank transferring its data to a central location every night between 2 am and 4 am. A new model, called the scheduled traffic model, has been proposed in the literature to handle such demands [2].The traffic model based on SLDs is different from the static and dynamic-random lightpath traffic models. Static traffic means that all the demands are known in advance and do not change over time, whereas dynamic-random traffic means that the arrival and holding times of demands are random. The SLD traffic model is deterministic because all the demands are known in advance and is dynamic because it takes into account the evolution of the traffic load in the network over time. In this paper we are using static traffic, because it is fixed and do not change over time [3]. In this paper, we are introducing different demand policies in scheduled traffic model by using static lightpath traffic .Our objective is to maximize resource utilization by using channel reuse method, here also proposed heuristics algorithm of demand policies and by using different network compare which policy is best for scheduling the request.

2. Related work

2.1 Scheduled Lightpath Demand

SLD means how many requests arrive on a given network in a given amount of time. IN SLDs' according to set-up and tear-down time requests arrived .SLD is a demand for a set of lightpaths (connections), defined by a tuple (s,d,n,α,ω) where s and d are the source and destination nodes of the lightpaths, n is the number of requested lightpaths α,ω and are the set-up and tear-down times of the lightpaths. In SLD on a single lightpath more than one no of requests has arrived, if request rate is higher than the nominal rate of single lightpath [5].To minimize the amount of channels required to instantiate the demanded lightpaths. Indeed, a same channel can be allocated to multiple lightpaths. Clearly, the more a channel is shared, the smaller the total amount of required channels is [5]. In recent years there has been an increasing number of applications that require periodic use of lightpaths (e.g. once per day, or once per week) at predefined times. For example, an online "class" with one two hour lecture per week on a specified day and at a specified time, or a bank transferring its data to a central location every night between 2 am and 4 am..[2]

2.2 Traffic Models

Static traffic:-

The traffic model based on SLDs is different from the static and dynamic-random lightpath traffic models .Static traffic means that all the demands are known in advance and do not change over time, whereas dynamic-random traffic means that the arrival and holding times of demands are random. The SLD traffic model is deterministic because all the demands are known in advance and is dynamic because it takes into account the evolution of the traffic load in the network over time [3].In this paper we are working on Static Traffic, it is fixed and do not change over time .In static traffic all the demands known in advance .In various networks and their requests(no. of request arrived and no. of request accepted) if timing (set-up and tear-down) is fixed then we can reduce the blocking probability(It is defined as the number of connections rejected to the total number of connection request arrived ,this case number of wavelength per fiber-link is assumed to be fixed) and resource utilization ratio(It is the ratio of total network capacity used to the number of requests are accepted in the network) decreased [3].

3. Demand Scheduling Policies

Demand based on chosen scheduling policies which result in a scheduling order of demands. Scheduling always based on set-up and tear-down time of demand (set-up time when request is arrive and tear-down time, when the request is reached between source to destination).Different scheduling policies are proposed below and their impact will also studied.

3.1 Earliest-setup Demand First (ESDF):-

- This policy schedules demands in increasing order of their set-up time.
- The demand with the same set-up time ,the demand with an earlier tear-down time will be scheduled first.[6]

In Earliest-setup Demand First all the requests which arrived, we arrange them increasing order of their set-up time. It means, which request come earlier we put that request in first, then another bigger than that in this type process will be scheduled.

For example: there are 4 requests (with their set-up and tear-down time) given.

First request 4 ——— 8

Second request 3 ——— 5

Third request 4 ——— 10

Fourth request 2 —— 4

Then we arrange them requests as according to their set-up time in increasing order, so arrangement will be below

Set-up time: - 2 3 4 4

3.2 Earliest-Teardown Demand First (ESDF):-

- This policy schedules demands in increasing order of their tear-down time.
- The earlier demand ends, the earlier it will be scheduled.
- The demand with the same tear-down time ,the demand with an earlier set-up time will be scheduled first.[6]

For example: there are 4 requests (with their set-up and tear-down time) given.

First request 4 —— 8

Second request 3 —— 5

Third request 4 —— 10

Fourth request 2 —— 4

Then we arrange them requests as according to their tear-down time in decreasing order, so arrangement will be below

Tear-down time: 10 8 5 4

3.3 Most Conflicting Demand First (MCDF):-

- This policy schedules demands in decreasing order of their time conflict indices.
- That is more demand overlaps in time with other demand the earlier it will be processed .for the same time conflict index policies ESDF and ETDF will be applied in order .[6]
- In this demand policy ,if 4 requests is given then according to their timing(set-up and tear-down)we compare each request and find which request is conflict more to another request then ,that request will be process first than another conflict requests process as order of their confliction.

For example: there are 4 requests (with their set-up and tear-down time) given.

First request 4 —— 7

Second request 3 —— 5

Third request 4 —— 6

Fourth request 2 —— 4

Here, we compare all requests each other and find that request 2^{nd} (3,5)is conflicted more than another requests ,that's why request 2^{nd} (3,5) request will schedule first another requests will also schedule.

3.4 Least Conflicting Demand First (LCDF):-

- In contrast to MCDF ,this policy schedules demand in increasing order of their time conflict indices
- In LCDF ,which demand conflicting less ,first schedule that demand, then after another less conflicting demand will be scheduling[6]

For example: there are 4 requests (with their set-up and tear-down time) given.

First request 3 —— 8

Second request 1 —— 6

Third request 2 —— 5

Fourth request 7 —— 10

Here, we compare all requests each other and find that request 4^{th}(7,10)is conflicted less than another requests ,that's why request 4^{th}(7,10) request will schedule first another requests will also schedule. This is the process how Demand policies are working

4. Experimental Evaluation

In this section, we first evaluate the performance of the proposed demand policies algorithm described in previous section by comparing it with COST239 network .COST239 network has 11 nodes and 23 links and all the nodes connected in the network by bidirectional links, to reach one node to another node, we can choose many routes, but we follow the shortest route path for remove the congestion (It is defined as the maximum wavelength used on the link in the network. For the good scheduling policy the value of all the network parameters should be minimum), that the reason behind We have always choose that route which has less congestion by using more available wavelengths**.** In Cost 239 network by using different demand policies, we summarize that Most Conflicting Demand First performing better as compare to another demand policies (ESDF, ETDF, LCDF).Most Conflicting Demand first accepted more request which is arrived as compare to another demand policies, this is the basic reason to using most conflicting demand first for every network, because if no of accepted request increases than our network performance also increases. The simulator is developed in MATLAB, it requires some input parameters such as the number of nodes in the network, number of wavelengths per link, connection requests, etc. It also requires to compare all the strategies in the Cost 239 network and to find one of the best on them.

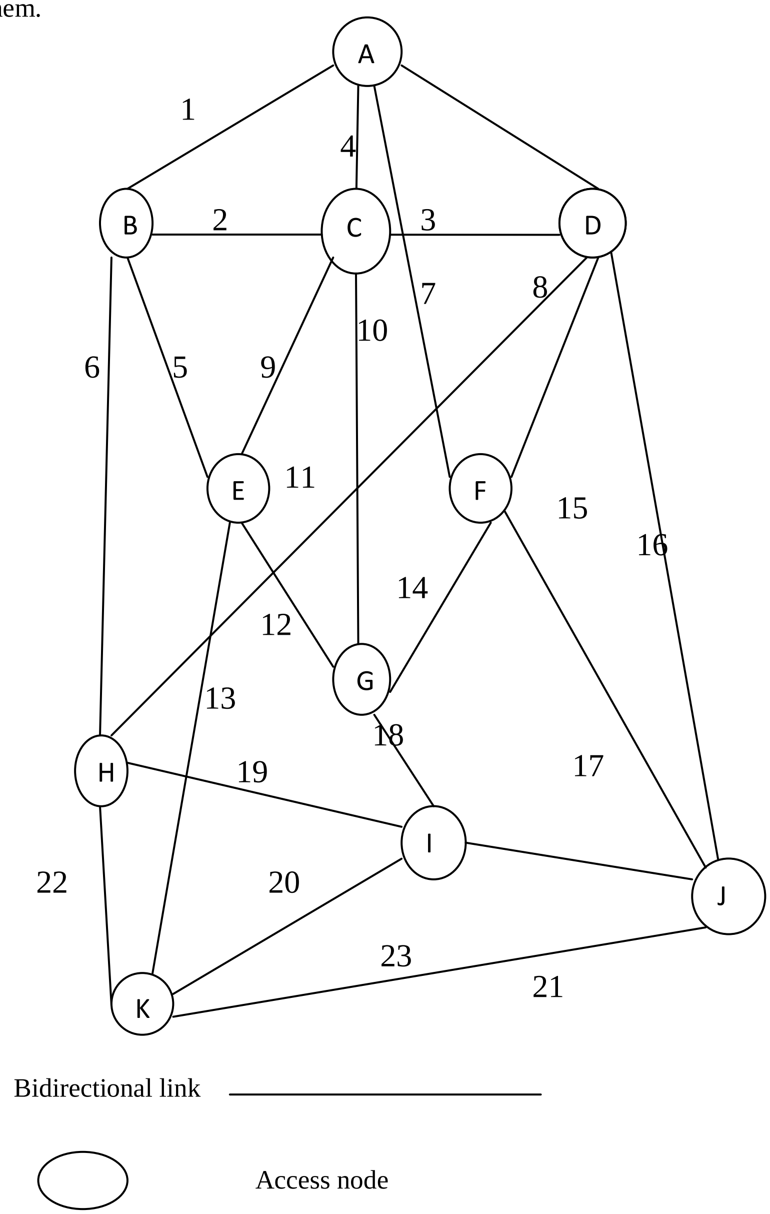

Figure 4.1: COST 239 Network

5. Results

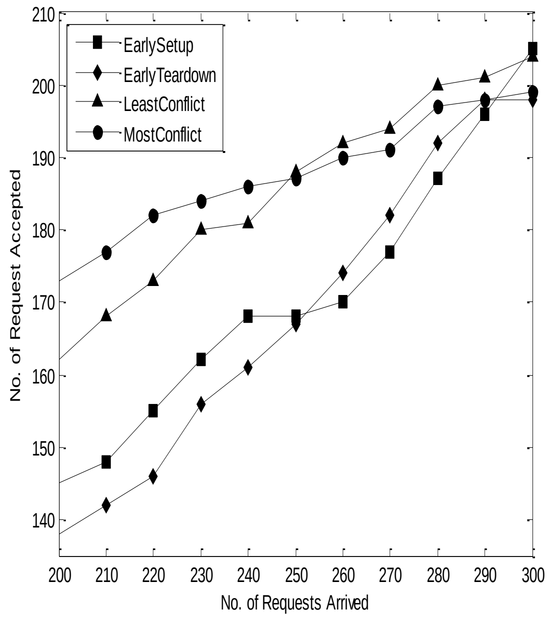

Figure5.1: Graph between total no. of requests arrived and no. of requests accepted, in COST239 network, it shows most conflict accepts more request as compare to others strategies.

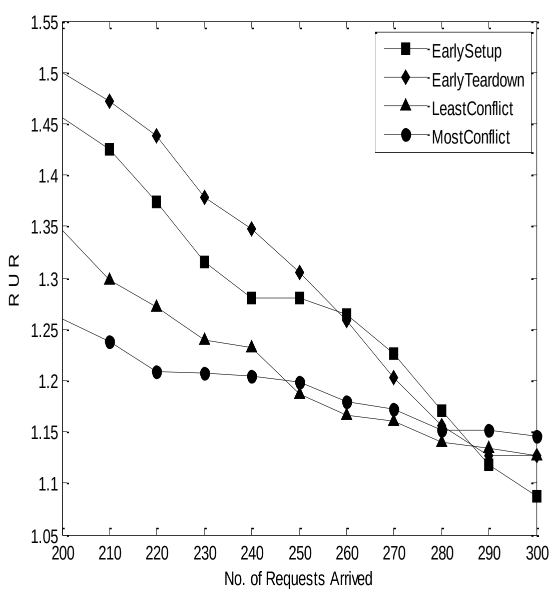

Figure 5.2:-Graph between no. of request arrived and resource utilization ratio, in COST239 network, it shows most conflict accepts more request as compare to others strategies.

6. Conclusion

In this paper we comparatively study of different scheduling strategies by using Matlab and simulate in Matlab .We have find out the result after comparing (four strategies ESDF, ETDF, MCDF, LCDF) in all of them. MCDF (most conflict demand first policy) is best for congestion and RUR. MCDF is best we showing in graph. Graphs are shown above for total no. of requests arrived and no. of requests accepted and no. of request arrived and recourses utilization ratio. Graphs represents, if no of requests accepted more by any strategy then it maximize resource utilization and MCDF is performing best as compare to other strategies.

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