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OPTIMIZED TRAFFIC FLOW OVER MULTIPATH IN OPTICAL NETWORKS

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Abstract: **In optical networks, the delivery of a traffic flow with a certain bandwidth demand over a single network path is either not possible or not cost-effective. In these cases, it is very often possible to improve the network's bandwidth utilization by splitting the traffic flow over multiple efficient paths. While using multiple paths for the same traffic flow increases the efficiency of the network, it consumes expensive forwarding resources from the network nodes such as wavelengths/light paths of optical networks. The problem of reducing forwarding cost can be defined in two cases such as Routing with Minimum Overhead and Decomposition with Minimum Overhead. For Routing with Minimum Overhead only the traffic demand must be given and for Decomposition with Minimum Overhead both the traffic demand and network flow will be given. For both the problems forwarding cost can be minimized by measuring the number of paths and the number of nodes traversed by these paths**

Keywords: **Multipath flows, optical networks, routing.**

1. INTRODUCTION

Networking is the practice of linking multiple computing devices together in order to share resources. These resources can be printers, CDs, files, or even electronic communications such as e-mails and instant messages. These networks can be created using several different methods, such as cables, telephone lines, satellites, radio waves, and infrared beams.

A computer network facilitates interpersonal communications allowing people to communicate efficiently and easily via email, instant messaging, chat rooms, telephone, video telephone calls, and video conferencing. Providing access to information on shared storage devices is an important feature of many networks. A network allows sharing of files, data, and other types of information giving authorized users the ability to access information stored on other computers on the network. A network allows sharing of network and computing resources. Users may access and use resources provided by devices on the network.

Without the ability to network, businesses, government agencies, and schools would be unable to operate as efficiently as they do today. Perhaps even more valuable is the ability to access the same data files from various computers throughout a building. This is incredibly useful for companies that may have files that require access by multiple employees daily. By utilizing networking, those same files could be made available to several employees on separate computers simultaneously, improving efficiency.

2. EXISTING SYSTEM

In Computer networks, a traffic flow is a flow of data packets sharing the same source and destination network nodes (switches or routers). A traffic flow can often be split into multiple traffic subflows, usually using information in the packet header, such as the IP/MAC addresses, the Port fields in the UDP/TCP header, or the VLAN number. Because these traffic sub flows are generated by different applications, or even by different hosts, it is possible to route each of them over a different network path.

Using multiple paths for a traffic flow is useful when routing over a single path is impossible or too expensive. In optical networks, each path is an optical,-switched, light path. Such light paths can be set up and taken down in real time. The dominating cost in the setup of a signals and vice versa. Therefore, network operators usually seek to minimize the number of established light paths.

In addition, every light path requires a wavelength on each optical link it traverses. Since wavelengths are also a scarce resource, it is often desirable to minimize not only the number of light paths, but also the number of nodes traversed by each one. This network flow is predetermined according to some bandwidth efficiency criterion, such as bandwidth cost,andthe problem is to break it into a set of simple paths between the source and destination nodes while minimizing the number of paths or the number of nodes they traverse.

3. PROPOSED SYSTEM

In Computer networks, using multiple paths for a traffic flow is useful when routing over a single path is impossible or too expensive. However it consumes expensive forwarding resources thus increases the forwarding cost. Hence it is required to split the traffic flow over multiple paths while minimizing the forwarding cost.In proposed system multipath traffic flow scheme with improved bandwidth utilization and reduced forwarding cost. The problem of reducing the forwarding cost is handled as two different cases. In the first case, called Routing with Minimum Overhead (RMO), given a traffic demand, a set of simple paths between the source and destination nodes over which the bandwidth demand can be delivered while minimizing the number of paths or the number of nodes they traverse is found.

In the second case, called Decomposition with Minimum Overhead (DMO), given a traffic demand and a network flow that satisfies the bandwidth demand between the source and destination nodes, the traffic flow is broken into a set of simple paths between the source and destination nodes while minimizing the number of paths or the number of nodes they traverse.

4. SYSTEM DESIGN

The overview of the proposed system architecture is given as follows

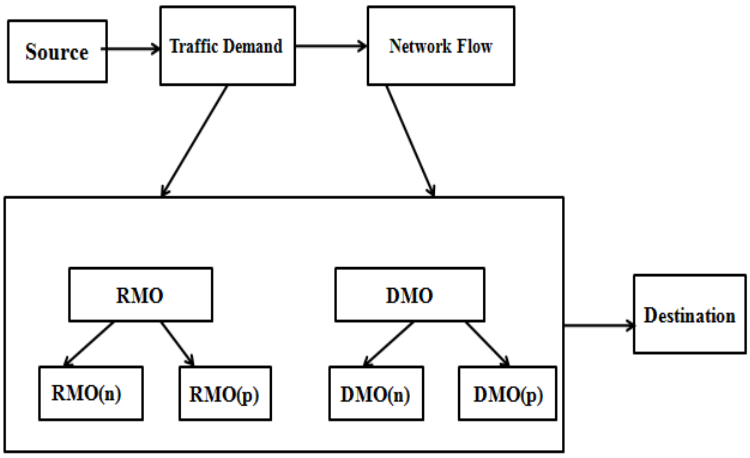

Fig 4.1 Architecture for proposed system

Fig 4.1 shows that splitting a traffic flow over multipath consumes extra forwarding resources. These resources are related to number of paths and nodes. so the source can use the traffic demand as input to RMO and this solution minimizes the both the number of paths and nodes but the bandwidth cost will be higher so the minimum cost network flow will be find and this network flow along with the traffic demand will be given as an input to DMO in order to decompose it into a set of paths which minimizes the forwarding cost.

Then compare the performance of the RMO and DMO. The purpose of this comparison is to better understand the tradeoff between bandwidth efficiency and forwarding cost. This comparison allows us to identify an algorithm that has the best performance for both objectives.

5. MODULES DESCRIPTION

There are four modules:

5.1 Data owner:

Data owner module creates the nodes in the optical network. The data owner manager performs the process of monitoring and controlling the network devices to find where the nodes are located. This module organize and maintain the details about all components of the network. This component collects the packets from the networks, which are in-turn specified by the user and transfer it to the destination. This also identifies the source and destination to transfer the data. Data owner module implements policies, procedures, techniques and tools that are required to manage evaluate the changes, track the status of change and to maintain an inventory of system and support documents as the system changes.

5.2 Routing with minimum overhead:

In routing with minimum overhead only a traffic demand must (source, destination, and bandwidth demand) is given and the problem is to find a set of simple paths between the source and the destination nodes over which the bandwidth demand can be delivered while minimizing the number of paths or the number of nodes they traverse.

RMO should be solved using a solution for DMO as a subroutine. To solve RMO first a feasible network flow that satisfies the bandwidth demand is to be constructed. After the flow is constructed, it is decomposed into paths.

$$\sum_{i=0}^{k*} \alpha \left[\frac{wi}{\alpha}\right] \leq \alpha \left[\frac{B}{\alpha}\right] \qquad (5.1)$$

Let α[B/α] is the value of the flow. Scaling algorithm uses a parameter α for the scaling process. The algorithm finds a network flow whose value is slightly less than B using no more than [B/α] paths. Choosing a larger α would yield fewer paths whose total bandwidth is smaller. The algorithm used here is scaling algorithm that is used to finds a network flow whose value is slightly less than the bandwidth. The overhead should be measured by RMO using path and RMO using node. In RMO(P) for a given traffic demand(source, destination and bandwidth demand) find a minimum set of paths which satisfies it. In RMO(N) for a given traffic demand source, destination and bandwidth demand) find a set of paths which satisfies this flow while traversing a minimum number of nodes.

5.3 Decomposition with minimum overhead:

In decomposition with minimum overhead both the traffic demand (source, destination, and bandwidth demand) and network flow that satisfies the bandwidth demand between the source and the destination must be must be given.This network flow is predetermined according to some bandwidth efficiency criteria such as bandwidth cost, and the problem is to break into a set of simple paths between the source and the destination nodes over which the bandwidth demand can be delivered while minimizing the number of paths or the number of nodes they traverse.

The input network flow for DMO is f, while f(e) is the value of f carried over edge e. Let f(p) denote the value of a single path flow carried over p.

$$\text{f(p)} = min_{e\varepsilon p\{f(e)\}} \qquad (5.2)$$

$$f^{i(p_i)} \geq f^{i(p_j)} \qquad (5.3)$$

The right handside in equation (5.2) denotes the entire set of optimal paths can decompose the network flow f .The left handside in equation (5.3) denotes the cost of each b bandwidth units routed by p_i.Let Let p_i be the path chosen by the algorithm in the the ith iteration and p_j denotes the path in the optimal solution.

Now equation (4.3) becomes

$$\text{OPT}.f^{i\,(p_i)} \geq \sum_{J=1}^{OPT} f^{i\,(p_j)} \geq B^i/b \qquad (5.4)$$

Let OPT denotes the number of paths in the optimal solution and the value of j ranges from one to OPT and b denotes the edges capacities. The algorithm used here is greedy algorithm that is used to finds a single path flow whose bandwidth is maximum until it reaches a total bandwidth of B. The overhead should be measured by DMO using path and DMO using node.

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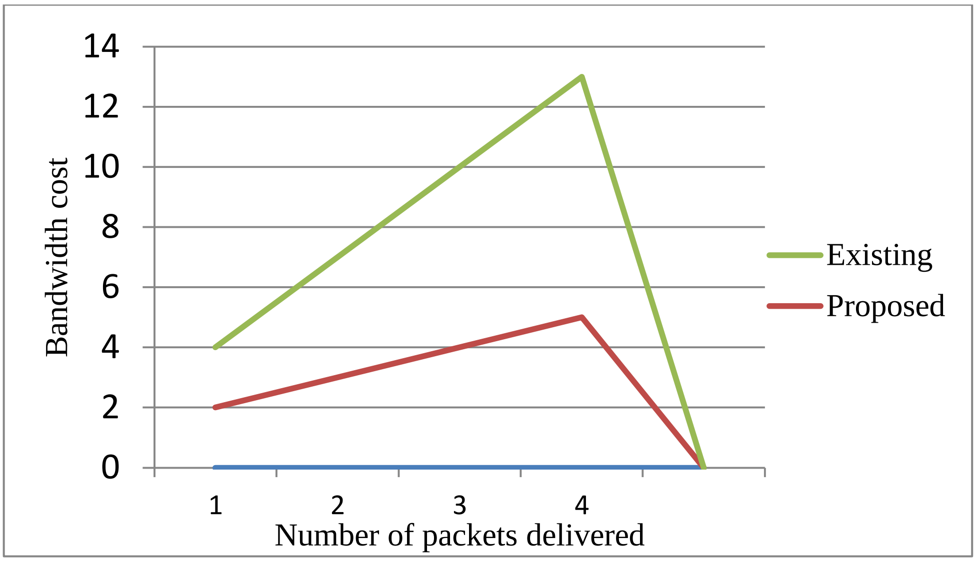
In DMO(P) decomposing a given network flow into a minimum number of paths which satisfies it. In DMO(N) decomposing a given network flow into a minimum number of paths while traversing a minimum number of nodes.

6. PERFORMANCE ANALYSIS

The multipath data transmission provided by our cost effective system are analyzed.The limitations associated with the proposed approaches are pointed out.

6.1 Bandwidth cost analysis:



Bandwidth cost is the cost taken by the packets to deliver in a destination node.
Number of packets delivered is given as x and bandwidth cost is given as y.
Bandwidth cost = Number of packets delivered*Number of edges in the path

7. CONCLUSION

In Computer networks, using multiple paths for a traffic flow is useful when routing over a single path is impossible or too expensive. However it consumes expensive forwarding resources, thus increases the forwarding cost. These resources are proportional to number of paths and number of nodes. Hence it is required to split the traffic flow over multiple paths. To improve bandwidth utilization, it is often desirable to split one traffic flow over multiple paths while minimizing the associated forwarding cost. Two important optimization problems results namely Decomposition with Minimum forwarding Overhead (DMO) and Routing with Minimum forwarding Overhead (RMO). It showed that both problems are NP-hard and presented approximation algorithms. It present efficient practical heuristics for RMO. These heuristics first find an initial network flow and then decompose it using the DMO approximation. The procedure for selecting the initial network flow was shown to have a critical impact on the performance of the algorithm. WID/LEN gave the best tradeoff between bandwidth cost and forwarding overhead.

8. FUTURE WORK

The main objective is to break the network traffic flow into a set of simple paths between the source and destination nodes. It also aims to find a set of simple paths between the source and destination nodes over which the bandwidth demand can be delivered while minimizing the number of paths or the number of nodes they traverse. In future it can be extended by introducing a mechanism for filtering highly distributed denial-of-service attacks. It can block a thousand of undesired flows, while only requiring a hundred filters. It also prevents malicious nodes seeking to disrupt the communications of other nodes. Multipath flow has the capability of blocking unwanted flows from the same source from different paths, even before they can occur.Thus the process will overcome the attacks. It focuses on dropping or removing all data packets and/or all ACK packets passing is overcome by the proposed model.

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