Enactment of dynamic programming tactic Formation of virtual topology on optical fiber

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ABSTRACT: Fiber optic networks- WDM technology - Construction of the virtual topology on the existing physical network-Dynamic programming model has developed to produce stage wise different traffic matrices for conventionally finding the shortest path from each source to different destinations- various number of optical transceivers. Experimental study on14 node (NSFNET) traffic matrices

Keywords: Fiber Optics, Dynamic programming, Virtual Topology, Transceivers, Stages

I. INTRODUCTION

Now a day’s computer networks are in constant fruition and Internet traffic is swiftly growing due to the fact of the influx of the latest styles of internet access technologies, bandwidth-intensive network applications and large-volume transmission traffic. The next generation networks need to be accessible, programmable, flexible and be adaptable to innovative ideas. Researchers continue to work on providing innovative solutions or modifications to the current network infrastructure. But such experiments cannot be just about carried out on present operational networks as these could be interrupt the operational traffic on networks. The experimentation and testing of new innovations and new protocols, which can also be solved by the virtual network infrastructure. [1,2,3]

Internet traffic has been increasing exponentially each year. From 2008 to 2012, Internet witnessed over 50% average annual growth for traffic. The increasing traffic also causes the growth the of Internet energy consumption. It was estimated that the Internet in 2007 consumed 1%of the electricity in broadband enabled countries with a 30 Mb/s average access bandwidth, and this proportion will exceed 4% when the average access bandwidth goes up to 300 Mb/s. Per the current upward trend, the network field in 2050 will consume 13 times electricity of the year in 2006 averagely. The rapid rise in energy consumption of Internet results in not only growing electricity bills but also everlasting greenhouse gas emissions. So, reducing the power consumption or improving the energy efficiency of Internet has been an important research topic. presently the hierarchy of networks is becoming flatter; accordingly, the Internet is evolving to the networks consisting of access networks and core networks. Due to the traffic aggregation from access networks, core networks tend to suffer a rapider traffic growth and energy consumption growth than access networks. [4]

WDM Optical fiber networking technologies brought a revolution in high-speed communication networks, which are now able to meet the high bandwidth demands of current voice and data traffic. The physical topology [5] consists of optical WDM routers interconnected by point-to-point fiber links and nodes in an arbitrary topology. In these types of networks, data transfer carried from one node to another node using light paths. A light path [6] is an all-optical path established between two nodes in the network by the allocation of same wavelength on all links of the path. The virtual topology is established logically through light paths, each identified by an independent wavelength, which provides end-to-end connectivity for transmission over the optical medium. The Virtual Topology is a logical arrangement with nodes as routers in the physical network topology and edges corresponding to the light paths between them.

Dynamic programming model for finding optimal solutions (minimum-cost paths) to network problems. The network represents the possible connections between decisions and expresses costs of going from one to another. The approach encompasses a value-iterative algorithm which successively congregates to the solution. The principle of optimality, which permits finding the minimum-cost (shortest) path as a function of the maximum number of arcs allowed, is: regardless of how a state was arrived at, the remaining decisions as to what path to take in route to the terminal must themselves constitute an optimal solution. The costs of traversing arcs may be input, recalled from other
files, or calculated by from input functions approach flexibility allows for testing the sensitivity of a decision process to changes in the terminal point.

The term *transceiver* is a network device, but rather an integrated technology embedded in devices such as network cards. Many types of transceivers: RF transceivers, fiber-optic transceivers, Ethernet transceivers, wireless (WAP) transceivers, and more. Though each of these media types is different, the function of the transceiver remains the same. Each kind of the transceiver used has different characteristics such as many ports available to connect to the network and full-duplex communication is supported. Fiber optic transmission systems (*data links*). Each one consists of a Opto eclectics transmitter on one end of a fiber and a receiver on the other end. Most systems operate by transmitting in one direction on one fiber and in the reverse direction on another fiber for full duplex operation.

**II. PROPOSED WORK**

Dynamic programming approach is for finding the shortest path between any two given two nodes. The input for the algorithm in a network \( G = \langle V, E \rangle \), and a set of weights \( w_{ij} \) for each \( (i, j) \in E \). Algorithm finds the shortest simple path from node \( s \) to node \( t \). input for the algorithm is an adjacency matrix of the graph \( G \). The cost \( (i, j) \) is computed as follows initially, the matrix \( D (0) \) is initialized as cost \( (i, j) \). Then, in subsequent iterations, up to full-fledged matrices computed

The shortest path between \( i \) and \( j \) is computed as follows

\[
D_{ij}(k) = \min \{D_{ij}(k-1), D_{ik}(k-1) + D_{kj}(k-1)\}
\]

In the above 14-Node(NSFNET) initialized traffic matrix, cost is assigned randomly and represented in a traffic matrix.

<table>
<thead>
<tr>
<th>14-node</th>
<th>node</th>
<th>trans</th>
<th>light</th>
<th>Wave lengths</th>
<th>p.hops</th>
<th>Hop wei</th>
<th>Tot hop</th>
<th>Avg hop</th>
<th>Max congests</th>
<th>Min congests</th>
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<td>13</td>
<td>0</td>
<td>13</td>
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<td>860</td>
<td>1</td>
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<td>7 -&gt;9(17)</td>
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<td>14</td>
<td>2</td>
<td>27</td>
<td>1</td>
<td>27</td>
<td>1567</td>
<td>1567</td>
<td>1</td>
<td>2 -&gt; 12 (98)</td>
<td>8 -&gt;3(12)</td>
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<td></td>
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<td>3</td>
<td>40</td>
<td>3</td>
<td>40</td>
<td>2025</td>
<td>2025</td>
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<td>8 -&gt; 5 (114)</td>
<td>12 -&gt;13(3)</td>
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<td>53</td>
<td>5</td>
<td>53</td>
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Table: 1 Dynamic programming on heuristics

The above table shows the several objective functions stage-1 to Stage-5 with comparison of the proposed heuristic of Dynamic programming approach. The objective functions utilization of Light paths, Wave Lengths, total number of Physical hops, Hop Weight, Total Hop weight, Average hop Weight, Maximum Congestion, and Minimum Congestion at each stage after Implementation of the Dynamic Programming approach on 14-Node (NSFNET) traffic matrix used up to 10 transceivers.

Fig: 1: Implementation of Dynamic programming traffic matrix on 14-Node (NSFNET) Network light paths VS transceivers. makes difference in the utilization of light paths when the transceivers are increased and complete matrix better utilization of light paths.

Fig: 2: Implementation of Dynamic programming traffic matrix on 14-Node (NSFNET) Network wave lengths VS transceivers. makes gradually difference in the utilization of wave lengths when the transceivers are increased and complete matrix better utilization of wave lengths.

Fig: 3: Implementation of Dynamic programming traffic matrix on 14-Node (NSFNET) Network physical hops VS transceivers. makes gradually difference in the usage of physical hops when the transceivers are increased and complete matrix better usage of physical hop weight.

Fig: 4: Implementation of Dynamic programming traffic matrix on 14-Node (NSFNET) Network hop weight VS transceivers. makes gradually difference in the usage of hop weight when the transceivers are increased and complete matrix better usage of hop weight.
IV. CONCLUSION

the aim of this paper is to find shortest path by using dynamic programming on stage wise traffic matrices and formation of virtual topology using proposed heuristics. Experimental is made on 14 node (NSFNET) up to 10 transceivers. fig 1 to 6 shows the utilization of light paths, wave lengths, usage of physical hops, hop weight, total hop weight, and average hop weight correspondingly. Observation is made that in all cases stage-5 transceivers grow and slight differences are also observed in effect on certain stages

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