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PROVIDING THE BOUNDARY LINE CONTROLLED REQUEST WITH ADAPTABLE TRANSMISSION RATES IN WDM MESH NETWORKS

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Abstract - The mixture of applications increases and supported over optical networks, to the network customers new service guarantees must be offered. The partitioning the data into multiple segments which can be processed independently the useful data to be transferred before a predefined deadline. This is a deadline driven request. To provide the request the customer chooses the bandwidth. DDRs provide scheduling flexibility for the service providers. It chooses bandwidth while achieving two objectives: 1. satisfying the guaranteed deadline 2. decreasing network resource utilization. By using bandwidth allocation policies improve the network performance and by using mixed integer linear program allows choosing flexible transmission rates.

Keywords - Bandwidth-on-demand; deadline-driven request (DDR); flexible transmission rate; large data transfers; wavelength division multiplexing (WDM) network.

I. INTRODUCTION

Now a day's telecommunications networks are trying to increase the bandwidth by their users as well as different of services they must support. Grid computing, eScience applications (bandwidth-hungry applications) these require adaptable bandwidth reservation and need strict quality-of-service (QoS) guarantees. The new application requirements is – large bandwidth, dynamism, and flexibility—can be well accommodated by optical networks using wavelength-division multiplexing.

This explains about understanding problems caused due to bandwidth allocation for improving new services by telecommunication networks to provide new services like IPTV grid computing ...etc which need accurate and consistent bandwidth. This can be solved by implementing wave length division multiplexing which works on optical networks. This technology uses optical cross connections and protocols like ASON/GMPLS which are used for controlling automatic and dynamic provision of light paths. In an Automatically switched optical network (ASON) the customer defines a new path by its start and end point, the bandwidth needed; the path itself is not specified by the customer.

II. PROBLEM STATEMENT

Capacity measures for a network connection across the Internet are useful to many applications. Its applicability encompasses QoS guarantees, congestion control and other related areas. In this paper we define and measure the available capacity of a connection, through observations at endpoints only. Our measurements account for the variability of cross traffic that passes through the routers handling this

connection. Related to the estimation of available capacity, we suggest modifications to current techniques to measure the packet service time of the “bottleneck” router of the connection. Finally, we present estimation results on wide-area network connections from our experiments to multiple sites.

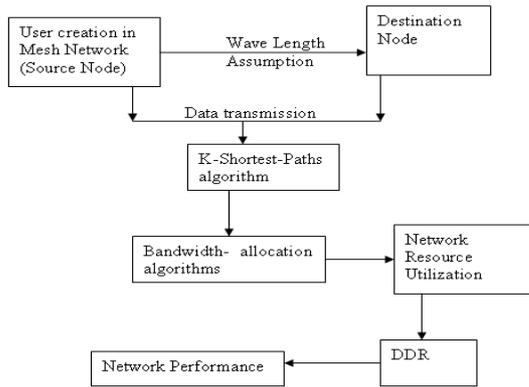
III. PROPOSED SYSTEM

Hence, the service provider can choose the bandwidth (transmission rate) to provide the request. In this case, even though DDRs impose a deadline constraint, they provide scheduling flexibility for the service provider since it can choose the transmission rate while achieving two objectives: 1) satisfying the guaranteed deadline; and 2) optimizing the network's resource utilization.

We investigate the problem of provisioning DDRs with flexible transmission rates in wavelength-division multiplexing (WDM) mesh networks, although this approach is generalizable to other networks also. We investigate several (fixed and adaptive to network state) bandwidth-allocation policies and study the benefit of allowing dynamic bandwidth adjustment, which is found to generally improve network performance.

We show that the performance of the bandwidth-allocation algorithms depends on the DDR traffic distribution and on the node architecture and its parameters. In addition, we develop a mathematical formulation for our problem as a mixed integer linear program (MILP), which allows choosing flexible transmission rates and provides a lower for our provisioning algorithms.

IV. SYSTEM ARCHITECTURE



Source node acts as a mesh network and wavelength is assumption takes place between the source node and destination node and data is transferring between the two nodes and transferring the data chooses the shortest path and also assigning the bandwidth allocation algorithm between the two nodes nodes gives the bandwidth how much is their and by using the network resources the data can easily reach the deadline called DDR and gives network performance. Each router and gateway within the mesh is typically connected through two or more devices ,which provides number of different path available for network communication .the route between two end devices often goes through multi “hops” communication passes through other devices to cover long distances. If an intermediary device fails is offline or busy , the message can still get through via an alternative path .mesh network look for the most efficient path available and will automatically re-route messages to avoid any failures.

V. LITERATURE SURVEY

A. Advanced Wavelength Reservation Method Based on Deadline-Aware Scheduling for Lambda Grid Networks

The increase of network technologies and high performance computing, research on grid computing is very popular using a high-performance virtual machine made by grid computing makes it possible to execute large-scale jobs. Such jobs include large-scale scientific and engineering calculations and the high-speed processing of large amounts of data this trend only reinforces the understanding that computing grid service users have different performance requirements. The fees charged to users are high if the job is to be completed in the shortest time and low otherwise. Many users are prepared to accept some delay in job completion, provided that the job is completed within a deadline, in return for a lower service fee. Different users will have different job priorities and different deadlines, so job scheduling that satisfies all job deadlines is essential. Since it is necessary to transfer all input data to job-execution nodes before job execution can commence,

it is important to efficiently assign wavelengths in lambda grid networks. The conventional job scheduling approach assigns a lot of time slots to a new call in order to finish a job as fast as possible, regardless of its deadline. Hence, the probability of a short deadline call being assigned time slots is low, which raises the blocking probability of such calls.

Fig. 1 shows the basic model of a lambda grid system. Each node has a scheduler, which is called “master,” to manage the computing resources. The masters exchange information on a regular basis. This information includes the load, the computational capacity, the amount of free space of data storage, and the devices available. When a user has a job to execute, the user submits it to the local master. The local master divides the job into several sub jobs. It then schedules the sub jobs and distributes them to the remote sites via optical links. Job distribution follows the policy of job scheduling. For example, if the policy is to complete the job as rapidly as possible, the sub jobs may be distributed to one or remote sites that have high capacity. Each remote site receives the sub jobs, executes them, and returns the results to the local site. The local site combines the results into a single result and returns the result to the user. The requests for data transmission (hereafter, “calls”)requests for data transmission (hereafter, “calls”) are generated with job execution of time slots

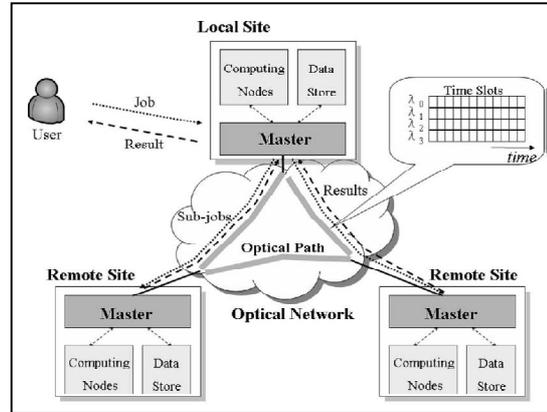


Fig. 1 : Lambda grid system based on grid computing through optical WDM paths.

Fig. 1. Lambda grid system based on grid computing through optical WDM paths Since the input data needed for job execution are geographically dispersed. The user specifies the job’s deadline when accessing the local master. The computing node sends a call to the local master that includes data size, job deadline, and destination of the job-execution node. The master decides the deadline of data transmission based on the job’s deadline Advanced reservation methods were introduced to the grid systems to guarantee resource availability at the time when an application was executed. Advanced multiple resource reservation methods ensure that all resources

are available when needed by the application. The reservation of data transmission time slots is often needed to guarantee that job completion occurs within the deadline. For data transmission, calls that specify, among other details, data size, start time, and deadline are issued to reserve time slots. With the conventional advanced reservation method, a new request may make it necessary to reschedule the reserved times. stated that ideal resource reservation scheduling with a consideration of data size, start time, and deadline is an NP-hard problem. That is, it is not possible to design an algorithm that can always give the optimal reservation schedule. One solution is to make locally optimal decisions. The lambda grid, which employs wavelength division multiplexing(WDM) and optical paths, is an attractive candidate The WDM(wave length division multiplexing) offers large network capacity, so high speed data transfer is possible. The optical paths guarantee network availability for job-execution assurances, so data transfer is reliable. The grid environment requires that wavelength information, such as bandwidth and the utilization of wavelengths, be managed as resource information.

B. On Traffic Grooming Choices for IP over WDM network

Traffic grooming continues to be a rich area of research in the context of WDM optical networks. We provide an overview of the optical and electronic grooming techniques available with focus on IP as the client layer We discuss the various architectural alternatives available: peer, overlay and augmented models. We first provide a survey on the research work in the area of traffic grooming in optical circuit switched networks. We then identify problems with electronic grooming in terms of high speed router design and bring out the merits of optical grooming. Next, we describe the shared wavelength optical network technology called light-trails and compare its performance with electronic grooming networks for both the peer and overlay models. Based on our simulations on random graphs of various diameters, we identify the threshold router speeds at which light-trails can compete with the electronic grooming solution for a given network scenario. We conclude that since the present router capacities are below the threshold speed or such routers are likely to remain expensive for some time, light-trails is an appealing candidate solution. ILP based techniques work in the static grooming problem with an objective to maximize network throughput. An ILP based mathematical formulation is presented for single hop and multi-hop grooming for multi granularity connection with non bifurcation constraints. Two heuristics with one that maximizes single-hop traffic (MST) and the other that maximizes resource utilization (MRU) are presented. Simulations were performed to observe the throughput with limited number of transceivers and wavelengths and were

compared with the optimal solution. The paper concludes that MRU performs better if tunable transceivers are used and MST performs better if fixed transceivers are used. Auxiliary graph based techniques Online approaches for provisioning connections of different bandwidth granularities were dealt with in. For a connection to be established between an existing light path and if that fails to use a series of light paths. If the connection has not been accommodated yet, a new direct light path is set up or a mix of old and new light paths are used in propose a simple model for routing in peer model by assigning different weights to already existing circuits and new wavelength links. The special emphasis in the paper is on the signaling and protocol implementation aspects of the grooming scheme. A generic graph model for grooming traffic in a heterogeneous Grooming network environment is presented in the algorithm takes into account the heterogeneities in the network in terms of wavelengths, transceivers, and conversion and grooming capabilities. Besides, it solves the grooming problem in a combined way instead of splitting it into multiple sub problems and solving them independently. Three different policies were introduced, edge weight assignment principles were discussed and three traffic selection schemes were analyzed. The basic model can be used for static traffic as well Network flow based techniques the study the problem of traffic grooming to reduce the number of transceivers in optical networks. This problem is shown to be equivalent to a certain traffic maximization problem. An ILP formulation is presented and a greedy heuristic that uses the min cost flow problem is described. Simulation and ILP results were compared for uniform and random traffic pattern for small networks. An algorithm for integrated routing for the peer model. It uses a graph based approach that contains both the virtual and physical links. The model identifies all the min cuts for every possible ingress-egress pair and considers a link to be critical for this pair, if this link appears in at least one of its cuts. Each link is assigned a cost based on the number of LSR pairs for which this link is considered critical. By discouraging a new flow from using these links, the amount of residual capacity in the network can be maximized at every iteration. However, the complexity of this heuristic is pairs. is high since it has to compute max flow for all node pairs. Augmented Model most significant contribution of the work in is to identify a specific type of control information that could be exchanged along the IP and optical networks for the augmented model. The paper suggests that the WDM layer pass Lij, the number of light paths that can be established between LSRs i and j, to the IP/MPLS layer. Lij could be the number of common free wavelengths available on every link of the path identified by the routing algorithm. It is approximated that the amount of capacity available between i and j is the sum of residual capacities on the existing logical topology

and the amount that could ring and mesh networks. E-grooming is inherently a hard problem. This can be seen from the fact that e-grooming problem in path, star and tree topologies are NP-Complete. Since the RWA for such topologies are trivial, this result be used in the future (Lij).

By assigning a cost to the link that is inversely proportional to the total residual capacity, the algorithm achieves an order of magnitude improvement in results than provided. E-grooming has been studied for various topologies like path, star, tree, brings out the hardness of the 'grooming' aspect of the problem. The objective of the e-grooming problem is to optimize a cost function that is typically one of the following:

--- Minimize equipment requirements

VI. MATHEMATICAL MODEL

So far, we have examined RWA and bandwidth-allocation algorithms for DDRs. In order to better understand our problem we state it as a MILP, which can solve the RWA and bandwidth-allocation sub problems together. There are three variations of our MILP. The first allocates flexible bandwidth to the requests; hence, it is named Adaptive_ILP. The other two allocate fixed bandwidth to the requests and are named Min_ILP and Max_ILP. since they use the Min and Max bandwidth-allocation policies. These MILP formulations can be used as benchmarks for our heuristic provisioning approaches. Our MILP model assumes that all DDR arrivals and deadlines are known; hence they are based on static traffic. However, the solution of the MILP constitutes a valid lower bound on the performance of our provisioning approaches (which consider a dynamic traffic environment). Our MILPs can provision DDRs in a network equipped with Opaque OXCs. The three MILP formulations are computationally Complex, especially Adaptive_ILP, as it includes: 1) selection of the appropriate bandwidth for DDR, which can be translated into a flexible finish time for the transmission of data; 2) RWA and grooming; and 3) constraints for time-disjointness of requests that share common resources. That is why we simplify the routing, by considering only K alternate routes for each DDR, an approach utilized in other works that consider time-domain scheduling

- 1) maximize the number of accepted requests

$$\text{Maximize: } \sum_{i=1}^m \sum_{k=1}^k p^{i,k} \quad (1)$$

count the number of accepted request by considering which request count path for their file transfer

- 2) maximize total network through put

$$\text{Maximize: } \sum_{k=1}^{m(\text{Fix} \times k \sum p_i, k)}$$

Considers total data transferred for each DDR and provision the request that provide maximum throughput. RWA for Hybrid Architecture We can either use existing light paths or create new ones by using free physical resources. Depending on the grooming policy used, different weights are assigned to the edges in the auxiliary graph G'' . Minimum weight path algorithms are then applied on G'' . KSP in Algorithm 1 is the K-Shortest-Paths algorithm. The paths P obtained from applying KSP on G'' are a sequence of existing light paths and/or physical links.

VII. SIMULATION RESULTS

Fig 2 Performance of the bandwidth-allocation policies for BD2 and BD3 (a) Fraction of unprovisioned bytes for BD2 Fig.2(a) shows the fraction of unprovisioned bytes for .Among the fixed allocation policies, Max_H rejects significantly more bandwidth than Min_H . As expected, the $1.5 * \text{Min}_H$ policy has intermediate performance between Min_H and Max_H . Considering the adaptive bandwidth-allocation policies both AdaptiveH and ProportionalH perform slightly better than, which is expected because they utilize more information (i.e., the network state). Both flavors of Change Rates improve performance over the other bandwidth-allocation approaches (same as for BD1, ChangeRates_{LP} provisions slightly more bandwidth than Change Rates). Overall, for, BD2 the performance can be improved if we utilize the adaptive policies over the fixed ones; further improvement is possible if Change Rates approaches are used. Fig 2(b) Fraction of unprovisioned requests for BD3 and effect of allowing limited number of rate c changes. Fig2(b) shows the performance of the allocation policies for BD3 and performs a sensitivity analysis on the Changing Rates with Time Limitations policy, which may be preferred in practice as it involves less signaling overhead compared with the standard Changing Rates. Time T (shown in brackets) is the minimum time between two possible consecutive rate changes in the lifetime of a DDR. Fig. 2(b) shows that, for time periods of 10, 20, and 30 s between rate changes, $\text{Changing Rates}_{HLP}$ still outperforms Min. For 40 s, however, rate changes are no longer applied because the period between allowed changes is too long (compared with holding time), and the performance is closer to Max (recall that Changing Rates_H policy H: Holding rates) We compare the performance of provisioning DDRs in Opaque and Hybrid networks (Opaque results are subscripted with O, Max_O e.g.,). The fraction of unprovisioned bytes for BD1. In the case of Max_H and Max_O , the type of OXC is not as important, because Max does not groom requests (hence, the difference in's performance is mainly due to the different RWA algorithms being used for Hybrid and Opaque). We observe that Min_O performs significantly better than Max_O . In addition, Mi_{no} is able to provision more

bandwidth than Min_H . This is because Opaque OXCs do full OEO conversion, so they can do better grooming than Hybrid OXCs. To evaluate the efficiency of our DDR provisioning approaches, we studied the utilization of network utilization) for both the Hybrid and the Opaque cases. Because of space considerations, in we only show the average transceiver utilization, computed as the average $(Tx+Rx)/2$ (with Tx and Rx being the number of utilized transmitters and receivers)

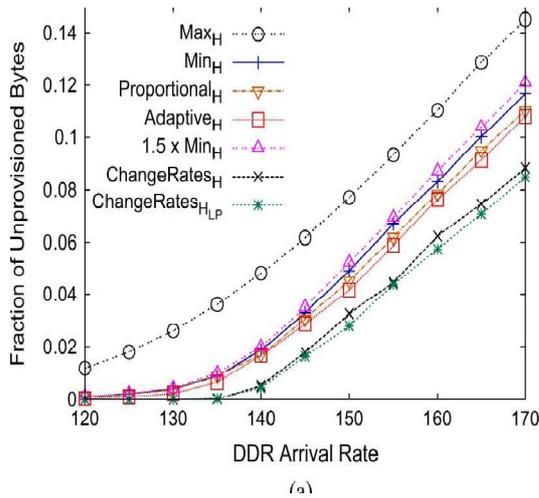


Fig. 2 : Performance of the bandwidth-allocation BD3and policies forBD2andBD3. rate changes

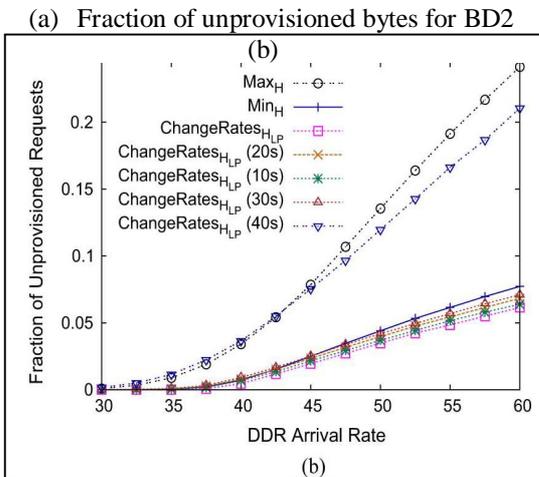


Fig 2(b) Fraction of unprovisioned requests for Effect of allowing a limited number of interval of time between two consecutive events.

We use bidirectional transceiver slots. Since today’s networks are often over provisioned, for this experiment, we assume that the capacity of the links (i.e., number of wavelengths) is large enough to satisfy all requests. This way, we can compare the transceiver utilizations fairly, with a constant value (e.g., zero) of unprovisioned bandwidth for all our approaches. in this system architecture the mesh networks acts as a source node and wave length assumption is taken between source and destination node source and destination is transferring data by checking the k-shortest path its send data which path

is shortest and bandwidth allocation algorithm used for giving bandwidth between the two nodes and uses network resources utilization by using this the data is reaching DDR and shows the network performance.

VIII.CONCLUSION

In this paper we studied the problem of provisioning DDR over WDM mesh networks by allowing flexible transfer rates. we are proposing the bandwidth allocation policies i.e. fixed, adaptive, changing rates . Allocate a fixed amount of bandwidth to request depending on its MinRate. Adaptive improve the performance of band width allocation algorithm. Changing rates allow the transmission rate of existing requests to change over time to accommodate new request that cannot be provisioned.

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