QOS based efficient segmented backup Routing Algorithm

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Abstract –The directed change of growth in high-speed networking has brought opportunities for a huge number of applications including real-time distributed computation, medical scanning (imaging), graphical visualization and many such applications with some of them demanding hard guarantees on message delivery latency and recovery delay from component failures. These demands cannot be met by traditional datagram services due to various reasons one such as IP experience varying delays because of varying queue size and packet drops at the router. Alternate schemes have been proposed to provide timely and efficient recovery for real-time communication in multi-node networks (multihop). Quality of Service (QoS) connection is required for such a routing method, which provides the path satisfying delay constraints such as end-to-end delay or path failure recovery delay. Producing fault tolerance with QoS guarantees in such a network is challenging. The guarantees have been agreed upon before creating the communication channel, which should not even fail even in a bursty traffic network, hardware failures (physical cable cuts, switch and router crashes) or even software bugs. This methods reserve spare resources (i.e additional resources). It is known that in distributed systems all application required guarantees of the message delivery with the shortest path in a short time. Without considering failures initially, to deliver a message from source to destination a primary path is selected which is shortest and advantageous. When this primary path broke down we have a backup path defined completely disjoint to the primary path. If by any means coincidentally, if this alternative end-to-end backup path also fails, the service failure occurs. Such fault tolerance can be brought by the segmented backup path. It is the shortest path from source to destination in a multi-node network where backup paths are present for partial segments of the primary path rather than completely disjoint. As some part of the same path is being used it saves time for reestablishing communication channel. In this paper, we propose an algorithm to get the segmented backup path.

Index terms: Multi-node network, Quality of Service(QoS), segmented backup channel, Resource reservation protocol (RSVP).

INTRODUCTION

Conventional applications in remote control systems, video conferencing, digital continuous media including audio and motion video, air traffic control. These demands guaranteed service, to ensure bounded message delays for applications, special schemes such as RSVP have been proposed, in which resources are preserved for a primary path for a session While it seems like QoS guarantees on the packet transmission latency, it lacks quick failure-recovery mechanisms. In RSVP when a channel fails new channel is established, where recovery might not be successful. Further, the channel re-establishment time could take a long time, especially when there is contention for resources among disrupted channels. In the case of live streaming time gaps ranging in minutes to hours is too costly. A backup path is a disjoint path which provides quick recovery. In case coincidental failure of both primary and backup path we use a segmented backup path with numerous advantages over end-to-end backup paths.

1. **Increased call acceptance rate**: It applies for primary paths which contains segmented backup path rather than source-to-destination backup.

2. **Improved network resource utilization**: This is because segmented backup paths have shorter length than end-to-end backups and need less resources. Moreover, shorter backup paths lead to more efficient resource aggregation through backup multiplexing.

3. **Better QoS guaranteed over end to end path:** A back up segmented path can comprise multiple backup paths, each of which uses a part of the primary route rather than its full length. This allows for less delayed failure recovery and finer control of fault tolerance for long paths over components with varying reliability. Also, the backups could be chosen so that they result in minimal increases in end-to-end delays over primary paths.

SCHEME

In our approach, we find backups for the primary path taken in parts. The primary path is viewed as made up of smaller contiguous paths, which we call primary segments. We find a backup path for each segment, which we call the backup segment, independently. In fig.1 we can see a primary channel (Source to Destination) with intermediate nodes (N1-N8) and links (1-9). The backup links are A-K. One can observe primary segments connectivity links 1->3, 2->6, 5->9 while their corresponding backup segments are A->C, D->G, H->K respectively. These three backup segments constitute to segmented backup, successive primary segments of a primary path overlap on at least one link. As a result, the shortest segmented path after activating backup is shown in fig1.

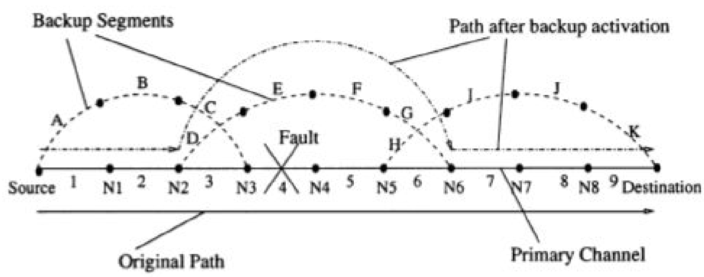


Figure 1

The primary path between source and destination is (S->N1->N2->N3->N4->N5->N6->N7->N8->D). Suppose the link between N3-N4 (link 4) fails, we can move to our segmented backup path. Thus the shortest segmented backup path after backup activation
is (S->N1->N2->D->E->F->G->N6->N7->N8->D), which is the fault-free shortest segmented path after back up activation.

The fig.2 consists of a multi-node network which consists of a mesh of size (6x5). The network in total consists of 30 nodes as (N1 to N30) as shown in fig.2. Consider N26 as source(S1) and N5 as destination(D1) and the primary path is routed as shown in the figure, along one of the many available shortest paths(which is obviously independent of the backup path). It can be seen that this S1-D1 channel has segmented backup paths as shown with the dotted line. We can generalize from here that call acceptance rate((fraction of requested calls accepted at a given state of the network) has been increased by our mechanism.

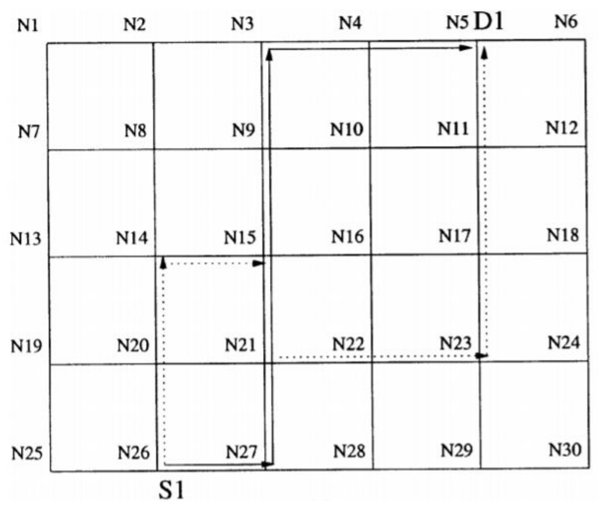
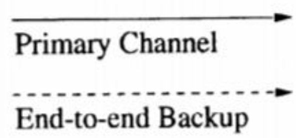


Figure 2



III. ALGORITHM

Let n be the number of nodes in the network and d[i][j] ={cost between the nodes i, j where i is not equal to j and i<n,j<n} ,src is the starting node in the network and dest is the destination node to be reached using segmented backup path algorithm.In

this implementation we use adjacency matrix to find the next node from the source and and dist to each node is stored in dist [i] array and to know whether a particular node is visited or not we use v[i] to keep track of all visited nodes.For a given i if v[i]=0 implies i th node is not visited.Now if (v[u] == 0 && dist[u] <= x) where x is the minimum distance from previous node then next node will be i and for all k, if(v[k]==0 && (d[u][k]!=0) && dist[u]+d[u][k]<dist[k]) then the parent of k is the node u and p[k]=u.By traversing through all the nodes and verifing above conditions we can find the shortest path between source and destination.Now if there is any failure in the link between any two nodes in the primary path we can find segmented backup just by using the failed nodes as the source and destination and using the above conditions we can find the backup path much faster than conventional end to end process and this provides much faster recovery and more reliable services

Results:

Given network with source ‘0’ and destination ‘3’

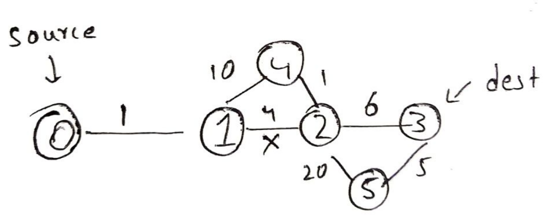


figure.3

Primary Path before finding backup path 0->1->2->3

```
C:\Users\SHRAVANI MAKKAPATI\Documents\gfg\dijk.exe
enter no of nodes  6
enter cost between 0 and  1 1
enter cost between 0 and  2 0
enter cost between 0 and  3 0
enter cost between 0 and  4 0
enter cost between 0 and  5 0
enter cost between 1 and  2 4
enter cost between 1 and  3 0
enter cost between 1 and  4 10
enter cost between 1 and  5 0
enter cost between 2 and  3 6
enter cost between 2 and  4 1
enter cost between 2 and  5 20
enter cost between 3 and  4 0
enter cost between 3 and  5 5
enter cost between 4 and  5 0
enter destination   3
parent of 0 th node is -1
parent of 1 th node is 0
parent of 2 th node is 1
parent of 3 th node is 2
parent of 4 th node is 2
parent of 5 th node is 3
total distance in the path is 11
path is
0   1  2  3
```

Figure. 4

Path after finding segmented path for the failured link between node 1->2 is 0->1->4->2->3

```
enter the starting and ending node of failured link
1
2
AFTER FINDING SEGMENTED PATH between failed link
parent of 0 th node is -1
parent of 1 th node is 0
parent of 2 th node is 4
parent of 3 th node is 2
parent of 4 th node is 1
parent of 5 th node is 3
total distance in the path is 18
path is
0   1  4  2  3
--------------------------------
Process exited after 41.47 seconds with return value 0
```

Fig.5

APPLICATIONS:

1. It can be used at the network level between the backbone routers by Internet backbone providers like UUNET or between the routers in a single autonomous system (AS) by any Internet service provider. It is well known that Internet backbone providers attempt to design their physical networks to ensure that there are disjoint paths between any two routers.
2. It can be used at the application level among a set of routers forming a logical network (overlay) over existing physical inter-network such as in resilient overlay networks (RON)
3. It is important to note that the scheme can be implemented in general on any multi-node network, in addition to the Internet, which can also include VPN(Virtually Private Network) based networks that are logically disassociated with the Internet, even if they depend on Internet in their lower layers. We also note that as computer communications become more mission critical, QoS-demanding, security conscious, and demand more real-time data support (due to new applications such as multimedia streaming), there is a growing interest in “private networks”, i.e multihop networks that are dedicated to a select set of users and which can provide the required levels of QoS and availability.

CONCLUSIONS

In this paper we have proposed segmented backups: a fault tolerant recovery scheme for real time communication in multi-node networks. This scheme is able to use one of the backup paths in case a node along the primary path fails. These backup paths are identified at about the time when primary path is identified . We were able to identify multiple backup paths, each of which protects breakdown of one or more nodes in on the primary path.In practice these may be selected based on QoS considerations. In this paper, we primarly took end-to-end delay as the QoS parameter .

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