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An Approach to Dual-failure Survivability for Multi Quality Data Based On Double p-Cycle

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***Abstract* - We propose new method to provide dual failures survivability using Double p-cycle. A p-cycle is set up for each link. When link is failure, the system will on-line select the best route of p-cycles to react. In single failure or dual failure, data does not divert randomly in route of p-cycles. Data packets are switched based on priority criteria it means that the higher priority packets go through shortest distance route of p-cycles and lowest priority data packets go through longest distance route of p-cycles. Dual-failure problem has received attention recently due to the network scale. This paper introduces a method aiming to provide dual failures survivability using Double p-cycle. The key idea is that when any link is failure, the system will select the best route of p-cycles to react and the data packets are switched based on priority criteria.**

***Keywords* - Double p-cycle, MQD, Dual failure, Protection, network Survivability.**

1. INTRODUCTION

Dual-failure scenarios are a real possibility in today's optical networks and it is becoming more and more important for carriers and network operators to consider them when designing their networks.

The optical networks are carrying large traffic. The traffics are includes voice, video, data and various real time application services like remote monitoring and control, remote surgery etc. the internet has become most important part of almost every home and human life [1].

Survivability

Survivability is an important part of optical networks as large amount of data is being carried by these networks. Survivability is the ability to provide services during failures.

We known that the failures can be of two types, component failure and fiber cuts. Due to Component failures, the transmitter station or receiver's station may be fail, or it could result in complete node failure. The failure rate in terms of fiber cut, for long networks, is 3 cuts for 1000 of fiber annually, about one fiber cut days for network with 30,000 route-miles of fiber. [18]

The reasons of failure include all the causes like cable dig-ups, human errors in the form of wrong cuts during maintenance, rodents bite, vehicle damage and others. 160

Reported fiber optic cable cutes in 1990s were single-failure events in United States. The mean times to repair (MTTR) are 2 hours for equipment and 12 hours for cable cut. Therefore, the networks are affected hundreds to thousands times more due to cable cuts as compared to node failures. Hence, the network survivability issues are mostly dealt with cable cut i.e. span or link failure we will provide an algorithm for survivability during single and dual failures [2].

Protection and Restoration

In this section we explain, the network failure recovery schemes can be broadly classified into two Categories viz Protection and Restoration. Restoration schemes refer to dynamic recovery after the onset of failure. Protection is defined as pre provisioned failure recovery. These schemes can provide guaranteed protection since the demand set up completes only if the secondary path is also available. Despite the wide range of survivability mechanisms available and the ease with which our networks can be designed for 100% single-failure restorability, they are still highly vulnerable to failures, and outages are still frequent [3].

Dual-failure restorability is now becoming an issue to consider in designing today is optical networks and has begun to receive attention in the literature. In fact, dual failures are known to be the major contributor to service unavailability in modern networks. And can be caused by a number of factors. Among such causes are shared-risk link groups (SRLG) as well as simple cable cuts occurring in parallel with maintenance operations (which may result in situations almost indistinguishable from dual failures. Less predictable, however, but not as uncommon as we would wish, are two (or more) independent single-span failures overlapping in time [6]. Large network operators who need to deliver highly sensitive and/or critical applications to customers with a high level of quality of service must now consider designing their networks with at least some level of dual-failure restorability, at the very least to ensure minimum availability requirements laid out in their service level agreements [12]. As mentioned above there are a number of restoration and protection mechanisms that can be used to guarantee survivability for all single-failure and dual failure scenarios [18]. These mechanisms vary quite significantly in their approaches, and all have their own advantages and is advantages, so we will begin with a brief discussion of several of them. One of the earliest and simplest is 1+1 automatic protection switching (1+1 APS) [4]. 1+1 APS is a single end-to-end protection scheme that employs a head-end bridging mechanism to switch between a primary working channel and its corresponding dedicated spare channel (which generally also carries an active copy of the signal). Because the spare channel is fully dedicated, 1+1 APS will require at least 100% capacity redundancy, although its simplicity still makes it one of the leading choices in today's current networks. A related mechanism is 1:1 APS, which is virtually identical; the primary difference is that the spare channel does not carry an active copy of the working signal but rather is available to carry low-priority (and preemptible) traffic if needed. 1: *N* APS is also similar, but in this case, the protection channel is on standby and available as a backup for any of *N* working channels with the same end nodes. Usually the term 1: *N* APS is reserved for single-hop routes and demand-wise shared protection (DSP) is the preferred term for the multi hop equivalent in optical transport networks. Shared backup path protection (SBPP), also called failure- independent path protection (FIPP), is another similar mechanism that provides end-to-end protection. In SBPP, however, individual protection channels are shared among multiple preplanned backup routes that are assembled on demand upon failure, providing more efficient spare capacity utilization [2][3][10].

2. BACKGROUND AND RELATED WORK

The method of *p*-cycles is a now widely studied pre-cross-connected span-protecting architecture for network survivability. A conventional *p*-cycle protected network consists of a set of cyclical structures of spare capacity, which provides 100% restorability against single span failures [13].

The explosive growth of data due to the advancement in the internet has created important emerging network requirements on today telecommunicationnetwork.

Most of the information‘s are carried on a world wide network of public telecommunication transport networks. The advent of high capacity digital technologies permitted increasing quantities of communication traffic to be carried in a economic and Efficient manner. The large carrying capacity of these Technologies, which is there greatest advantage, also increasing the transport networks vulnerability to a single failure. These are two Approaches available for data survivability [10].

In **dedicated** spare capacity routing methods, such as automatic protection switching (APS) and self-healing rings (SHRs), a telecom network will have spare capacity added to the network, which is dedicated to the restoration of specific working traffic flows. When a network span fails, the switching equipment automatically reroutes the working traffic by switching the working flow from the failed span to the preset spare alternate route [1] [2][11].

In **undedicated** (also generically called "mesh") Spare capacity routing methods, pare capacity is distributed throughout the network on each network span and is not dedicated to the restoration of any particular span failure. In the event of a failure, workings flows are rerouted over paths, which are dynamically computed n demand using the networks for distributed spare capacity [1] [14] [16].

Survivable rings are another form of simple and double survivability mechanism. There are two main types, unidirectional path-switch rings (UPSRs) and bidirectional lines witch rings BLSRs). Rings are preconnected cyclic structures of transmission systems. Protection is performed by switching working channels on a failed span to the spare channels around the surviving portion of the ring through the use of add–drop multiplexers (ADMs) at the nodes. Rings are more commonly used in metro area networks where shorter span distances mean network costs are generally dominated by nodal equipment costs (ADMs are relatively inexpensive). In span restoration, shared spare capacity is distributed throughout the network, and restoration routes are formed between the end nodes of the failed span itself Shared spare capacity is also distributed throughout the network in shared path restoration (SPR), also called failure-dependent path protection (FDPP). However, here, restoration routes are formed between the origin and destination end nodes of the working signal. Span restoration is generally more localized in the sense that restoration paths tend to be shorter than in path restoration, enabling span restoration to recover relatively faster in the event of failure. On the other hand, path restoration has the advantage of more efficient spare capacity utilization [1] [2] [4] [8].

2.1. Pre-configuration cycle (p-Cycle)

The p-cycle is a recently proposed transport network survivability scheme, combining the speed of ring network with the capacity efficiency of mesh network. P-cycles are ring-like pre-configured structures of spare capacity used to protect against failure of on-cycle links and straddle links On-cycle links means those links that are a part of the p-cycle. Straddle links means those links whose end-nodes are both on the p-cycle, but which are not actually a part of the p-cycle itself. The p-cycle can provide various types of protection link or span failure. The figure 1 is show the double p-cycle. In a p-cycle X and Y are represented p-cycle name and with the capacity of links and also show the working path. Hare R1, R2 and Rn are represented path when the link failures, Date transfer through following path. In This paper we deign an Algorithm for double p-cycle. A p-cycle is set up for each link. When Link is failure, the system will on-line select the best route of p-cycles to react. [5] [6] [7] [18].

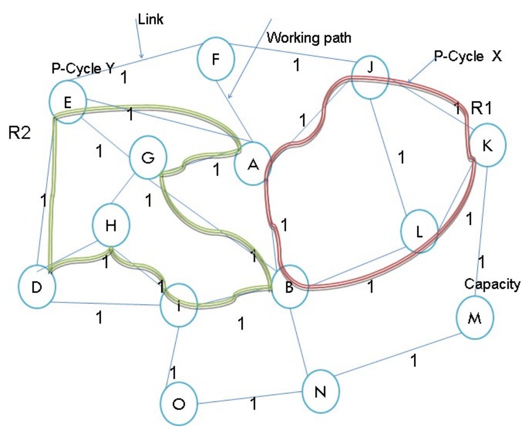

Fig1 Double p-cycle

3. PROBLEM STETMENT OF EXITING SYSTEM

When, the data is being transferred between source and destination node, if at this time Straddle links fail, Straddle node switch data randomly in a double p-cycles path with out checking priority of data packets. Double p-cycle has more than two paths (routes) for data packets switch. when link is failure So the main problem is that straddle node does not switch data based on priority of data packets. It may be possible that the lowest priority data packets go through smallest path and takes small time as compared to higher priority data packet.

4. PROPOSED SYSTEM

In This section we introduce an algorithm to provide single or dual failures survivability in double p-cycle. A p-cycle is set up for each link. When Link is failure, the system will on-line select the best route of p-cycles to react. In single failure or dual failure, data does not divert randomly in routes of p-cycle. Data packets are switched based on priority criteria it means that the higher priority data packets go through shortest distance route of p-cycle and lowest priority data packets go through longest distance route of p-cycle.

4.1 Proposed Algorithm for Double p-Cycle case:

Step1*. d_i £ D, D is a data set. d_i i {d1, d2 dn}*

Where i =1, 2…..n.

Step2*.Calculate the shortest path between Ns and Nd.*

Step3*. Now Ns will send data di to neighbor node.*

Step4. *Calculate distance from straddle Node Nk-1 to all different routes R1, R2…Rn respectively by using dijkastra Algorithm. Then store calculated route information of both p-cycles at Nk-1th straddle node in network.*

Step5. *When link is failure in a network. The node is check data priority.*

Case I: When straddle link failure between Nk-1 to Nk.

Run time only check following condition in a both P-cycles.

If R2≥R1

1. *Higher priority data go through route R1 or Rn (say)*
2. *Lower priority data go through the routeR2 or R1 (say). else*
3. *Otherwise use fee route of p-cycles (say)*

Case II: When On cycle and Straddle both link are failures.

1. *Nk-1 to Nk. (say straddle link).*
2. *Nj-1 to Nj (say on cycle).*

In Double p-cycle case, we will get two or more routes to transfer the packets. So that higher priority data will get advantage over lower priority data. Straddle node Nk-1 transfer data to according following condition.

If R1≤Rn

1. *Higher priority data go through route R1 (say).*
2. *Lower priority data go through the route R2*
3. *Otherwise use fee route of p-cycles Rn (say).*

4.2 Working of Proposed Algorithm for Double p-Cycle

Dual failure means both on-cycle and straddling failure. We can exploit for dual failure protection is based on simply not to fully loading the straddling spans with two protected paths of the top priority on a straddling span. A p-cycle always offers two diversely routes (R1, R2) protection paths per unit of its own capacity to each straddling span it protects. Normally these are used to protect two different working paths on the straddling span.

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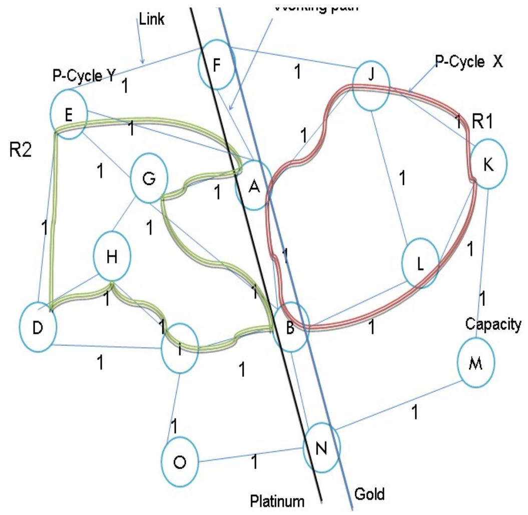

Fig: 2(a) working Path of Double p-Cycle

4.3 Case I: Straddle link failure in double p-Cycle.

Here straddle link failures then one or more case possible in double p-cycle.

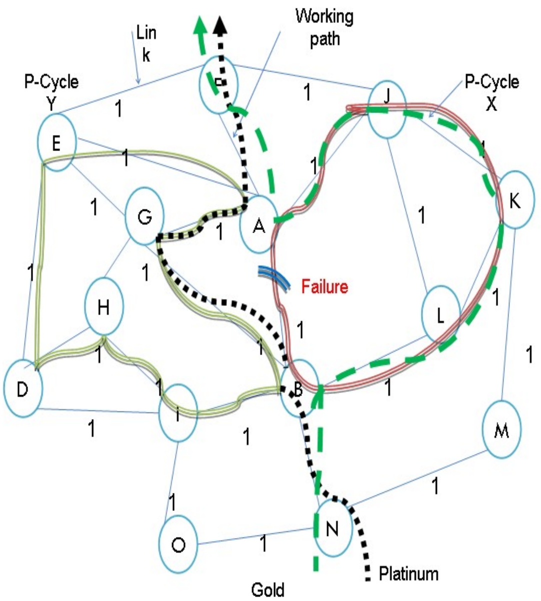

Fig. 2(b) Straddle link (say node A and B).

N* is a source node. F is a destination node. A node A and node B is a neighbor node of failure link. Find shortest Distance of R1, R2 and Rn according to priority criteria of data packet. Each straddle nodes are store distance of R1, R2 and Rn. When straddle link failure between N_{k-1} to N_k node.

protection through Double p-cycle.

When both On cycle and Straddle link Failure. According to figure 2(a) p-cycles that protect span AB as a straddling span. Both p-cycles offer two more disjoint protection routes to span AB shown by two Arrow-tripped thin lines. In figure 2(b), span AB fails. The gold channel on span AB is protected using the route shown by the dashed line and platinum channel is protected using the route along the dotted line. In figure 2(c) when straddle link (span AB fail). Node B switch a packets to p-cycle based on priority criteria. Node A, switch a packets to working path.

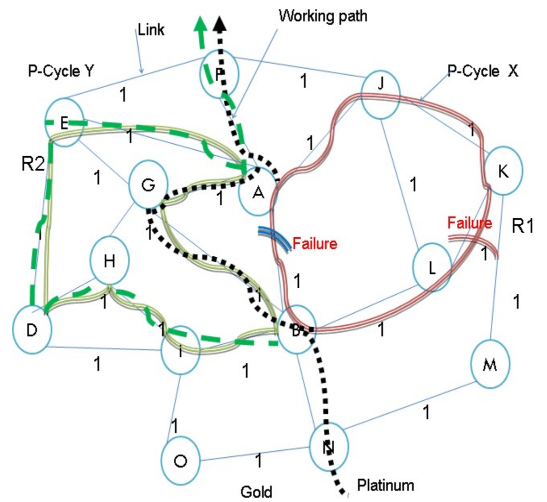

Fig: 2 (c) Dual failures

Case III. Other Solution for Gold and platinum survivable.

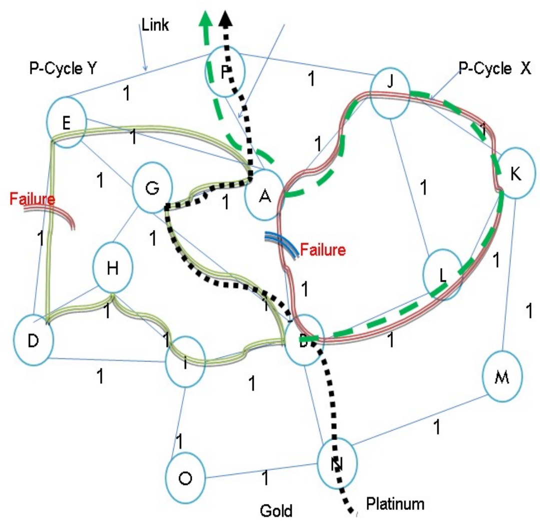

Fig: 2 (d) Other Solution for data survivability.

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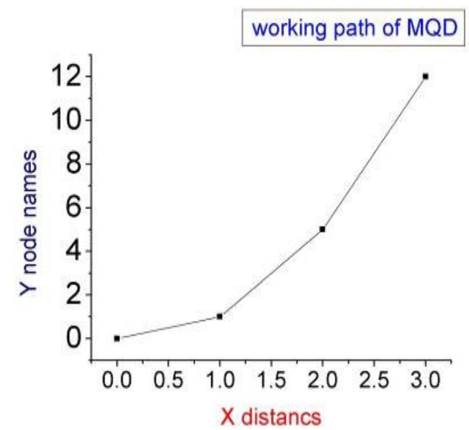
has been measured through simulation studies. In This section compares the performance of our proposed approach Dual-Failure Survivability, with the Straddling and dispersal approach used in [13]. All simulation results are computed base on revenue of data packet. Following simulation parameters are considered to test the validity of our approach and the results are computed by tracing the output files generated by ns-2 simulator during simulation.

Parameters	Range of values
Traffic	TCP
Simulation Time	150 seconds
Packet size	512 Byte
Data rate	40 mbps
Routes (R1…Rn) distances	10 to 40 hop
Number of nodes in topology	100 to 1000
Behavior of the links in the topology	Dynamic /static
Number of P-cycle	2 (Double)
Average nodal degree of the network	2.0 b/w 5.0
Number of Failure	Single and dual
Simulation Grid size	500m X500m

Table 1: Simulation parameters

5.1. Result for working path representation

Figure [3(a)] show is working path of Multiple Quality of data. In This figure X coordinate and Y coordinate are distance & nodes Numbers.



Cycle

Figure [3(b)] show the comparison of Platinum data (Higher priority) to different approach. The source and destination node are same but route different in both approaches. Our approach performs better than original approach. According our higher priority data packets are go through smallest distances to destination.

Case I for double p-cycle (Straddle link failure)

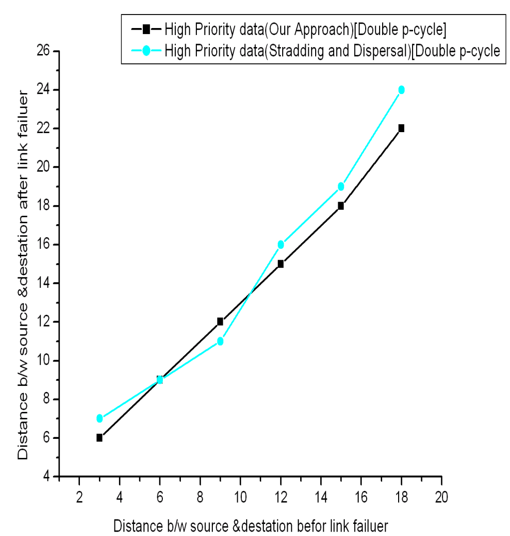


Fig: 3(b) Higher Priority data Survivable Using Double p-cycle.

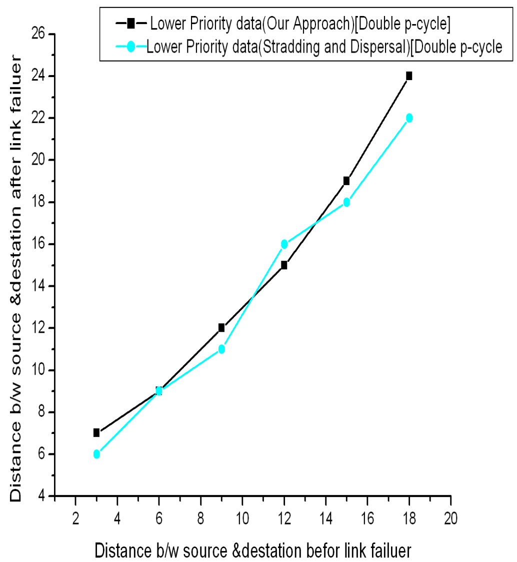


Fig: 3(c) Lower Priority data Survivable

Case II: On cycle and Straddle link failure in double P-cycle.

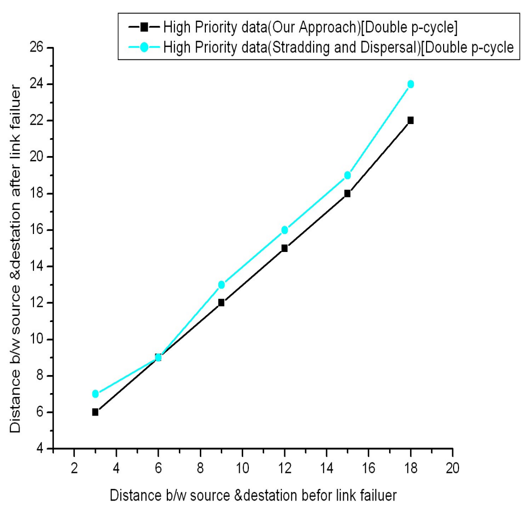


Fig: 3(d) on cycle and Straddle link Failure.

6. CONCLUSION

We introduce an Algorithm to provide dual failures survivability using Double p-Cycles. Because Dual-failure scenarios are a real possibility in today's optical networks and it is becoming more and more important for carriers and network operators to consider them when designing their networks. A p-Cycle is set up for each link. When Link is failure, the system will on-line select the best route of p-cycles to react. In single failures or dual failure, data does not divert randomly in routes of p-Cycle.

Dual-failure problem has received attention recently due to the network scale. This paper introduces a method aiming to provide dual failures survivability using Double p-Cycle. The key idea is that when any link is failure, the system will select the best route of p-Cycles to react and the data packets are switched based on priority criteria.

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