



## Recover link failure using ARTCP mechanism

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### ABSTRACT

*Wireless mesh networks (WMNs) experience frequent link failures caused by channel interference, bandwidth demands causes severe performance degradation in WMNs. Link failure will lead to produce a sequence of disruptions to deliver the packets to the destination. To overcome this ART rerouting the traffic via an alternative path from a node whose local link is down without the need to wait until the source node knows about the failure. This is achieved by creating a new backup routing table based on the original routing table which is computed by the dijkstra algorithm. The goal of these algorithms is to reduce loss of packets, end-to-end delay time, improve throughput.*

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### Introduction

Wireless mesh networks are being actively and deployed widely for a variety of applications. WMN may experience significant channel interference from other coexisting wireless networks. Some parts of networks might not be able to meet increasing bandwidth demands from new mobile users and applications.

The LS Protocol has been successful over the past few years, because it provides networks with numerous optimization techniques which lead to fast convergence enhancements. In case of failure, the LS protocol needs to re-update the routing table to divert the failure affected traffic along another path around the failure to destination which takes seconds.

The recovery mechanism comes with appropriate solutions to avoid local loop in the network between nodes by finding an alternative backup path for delivering packets to their destination.

By pre-computing an alternative backup path, traffic can pass through in case any link on the primary path fails without having to wait for updating of the routing table. Algorithm called an Alternative Routing Table Connected Path (ARTCP), which re-routes the traffic from the node where it is connected directly to the failure on the primary path, and it can reroute the traffic through the backup routing table to the destination. The original routing table, which is constructed by the LS protocol to create the backup routing table in order to find all possible alternative routes to the destination excluding all primary routes between source and destination for each node on the topology.

The rest of the paper is organized as section 2 explains the related work. Section 3 explains the problem description. Section 4 describes the algorithm steps. Section 5 explains the mechanism of ARTCP. Section 6 ends with the conclusion and future work.

### Related Work

Resource-allocation algorithms [1] can provide (theoretical) guidelines for initial network resource planning. This approach provides a comprehensive and optimal network configuration plan; they often require “global” configuration changes, which are undesirable in case of frequent local link failures.

Next, a greedy channel-assignment algorithm[2] can reduce the requirement of network changes by changing settings of only the faulty link(s). This greedy change might not be able to realize full improvements, which can only be achieved by considering configurations of neighboring mesh routers in addition to the faulty link(s). Fault-tolerant routing protocols,[3] such as local rerouting multipath routing can be adopted to use network-level path diversity for avoiding the faulty links. However, they rely on detour paths or redundant transmissions, which may require more network resources than link-level network reconfiguration.

Traditional routing protocol schemes allow traffic to pass via a single shortest path. In current networks, nodes or link failures produce factors that cause a disruption to the flow of traffic until the routing protocol recalculates their routing tables and computes a new primary path to the destination. An alternative path aims to alleviate these disruptions by making the source node pass the traffic through it when the primary path goes down.

There are two types of recovery mechanisms: the protection and restoration. The protection schema is a proactive mechanism, which calculates backup routes in advance while the restoration schema is reactive by calculating the backup routes when failure has been detected. The restoration schema considers more flexibility with regard to the location of failures, because the recovery mechanism will take action based on their locations. The disjoint path between source and destination considers a best solution to recover the network regardless of the location of the failure and the number of nodes affected by the malfunction. This kind of mechanism guarantees that the traffic arrives through it to the destination with loop free in the network.

The Open Shortest Path First protocol (OSPF) [6] based on the Dijkstra algorithm computes the shortest path. The minimum path cost will be determined by comparing it with the other candidate paths. The routing protocol will re-route packets from a backup path when any link on the primary one fails. There are two kinds of the Dijkstra algorithms. Firstly, there is a Dijkstra algorithm to compute the best path by removing the links with

bandwidths less than a threshold. Secondly,[7] there is an on demand Dijkstra algorithm, which generates the shortest path tree to the pre-computation node.

#### Problem Description

An Autonomous Network Reconfiguration System(ARS) that allow sa multi radio WMN (mr-WMN) to autonomously reconfigure its local network settings—channel, radio, and route assignment—for real-time recovery from link failures. In its core, ARS is equipped with a reconfiguration planning algorithm that identifies local configuration changes for the recovery while minimizing changes of healthy network settings.

ARS also includes a monitoring protocol that enables a WMN to perform real-time failure recovery in conjunction with the planning algorithm. The accurate link-quality information from the monitoring protocol is used to identify network changes that satisfy applications' new QoS demands or that avoid propagation of QoS failures to neighboring links (or "ripple effects"). Running in every mesh node, the monitoring protocol periodically measures wireless link conditions via a hybrid link-quality measurement technique, ARS detects link failures and/or generates QoS-aware network reconfiguration plans upon detection of a link failure. Monitoring period ARS incurs bandwidth problem. During planning ARS occurs Computational overhead.

#### Algorithm Steps

1. All nodes send packets to all adjacent nodes not connected to the primary path on the topology. The nodes will receive packets to check if there are any possible alternative routes to the destination not connected to the primary path.
- 2.If the answer coming from an adjacent node is "No", then the algorithm will send another packet to enquire if there is any route from the adjacent node to the adjacent source node.
3. when the source receives a "Yes" answer from the adjacent node, it should select a loop free node next hop then will add this node as first backup next hop in case of failure.
- 4.If the node adjacent to the source has a disjoint route to the destination then the node will add her adjacent node as a first next backup hop and her neighbor as a second backup hop.
- 5.ART algorithms will repeat these steps until the new backup routing table is completed for each node on the topology.

It is assumed that each node has at least one adjacent node that can act as a backup in case of failure. The ARTCP algorithms are involved in choosing one of them as a backup node to re-route a packet through it when a failure occurs. In the network, the protocol starts to converge along the network and then ARTCP algorithms will begin to operate when the routing protocol builds the routing table for each node on the topology.

#### Artcp Mechanism

Each node on the primary path re-routes traffic without waiting for the source node to receive a notification about the failure. In this algorithm, each node which is associated with a failure will re-route its traffic through its backup routing table, which is computed in advance. When a failure occurs, the node

that is connected to the failed link will notice the malfunction. This node will directly re-route its traffic to the destination.

In ARTCP, each node on the primary path will seek for an adjacent node that can pass packets to the destination without returning the packets to any previous hop to avoid loop in the network. Each node on the primary path will send small packets to enquire from her adjacent if it has an available route to destination. The route should not have any node that has already passed the traffic or is connected with any previous hop on the primary path.

Link State Protocols will re-compute a new routing table for each node on the topology in order to make the source node re-route its traffic through new shortest path. During that time, the node that is connected to the failure will have a disjoint path to the destination with a guaranteed loop free in the network.

#### Conclusion and Future Work

The ARTCP algorithm computed link state protocol to find an alternative disjoint path to the destination by creating a new backup routing table. Although ARTCP algorithms can build a new backup routing table with shortest path, shortest path as in the new routing table. For real traffic, the result shows that our algorithm reduces the loss of packets and delay between source and destination node. In the future work, make the backup routing table contain both first and second shortest paths to the destination by choosing paths with minimum cost in order to create an optimal backup routing table.

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