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# SPLAYNET ALGORITHM USING SELF-ADJUSTING NETWORKS IN CLASSIC AND DISTRIBUTED MECHANISM

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**ABSTRACT**

A distribution on the source-destination requests, the expected path (route) length is an important measure for the performance, efficiency and power consumption of the network. In this work we initiate a study on self-adjusting networks: networks that use local-distributed mechanisms to adjust the position of the nodes in the network to best fit the route requests distribution. In the proposed system Shortest edge algorithm is used to dynamically optimize the lookup costs from a single node for Self-Adjusting Networks. Edge disjoint shortest pair algorithm is an algorithm in computer network routing. The algorithm is used for generating the shortest pair of edge disjoint paths between a given pair of vertices as follows: Run the shortest path algorithm for the given pair of vertices.

## 1. INTRODUCTION

The study of locally self-adjusting networks: networks whose topology adapts dynamically and in a decentralized manner, to the communication pattern As a first step, we study distributed binary search trees (BSTs), which are attractive for their support of greedy routing. These project introduce a simple model which captures the fundamental tradeoff between the benefits and costs of self-adjusting networks. We present the SplayNet algorithm and formally analyze its performance, and prove its optimality in specific case studies. We also introduce lower bound techniques based on interval cuts and edge expansion, to study the limitations of any demand-optimized network. Finally, we extend our study to multi-tree networks, and highlight an intriguing difference between classic and distributed splay trees.

The QOLSR is a multimedia protocol that was designed on top of the Optimized Link State Routing (OLSR) protocol. It considers the Quality of Service (QoS) of the nodes during the selection of the Multi-Point Relay (MPRs) nodes. The Optimized Link State Routing(OLSR) protocol is a proactive routing protocol designed for mobile ad hoc networks. It relies on a set of designated nodes to broadcast the network topology information and to forward traffic flows towards their destination. These nodes are known as the Multi-Point Relay(MPR) nodes.

One of the drawbacks of this protocol is the network lifetime, where nodes with high bandwidth but limited energy can be selected to serve as MPRs. Existing system would drain the nodes' residual energy and shorten the network lifetime.

In this paper, we consider the tradeoff between prolonging the ad hoc network lifetime and QoS assurance based on QOLSR routing protocol. This can be achieved by (1) reducing the number of Multi-Point Relay (MPR) nodes without sacrificing the QoS and (2) considering the residual energy level, connectivity index, and bandwidth of these relay nodes. These objectives can be reached by deploying the clustering concept to QOLSR. Therefore, we propose a novel clustering algorithm and a relay node selection based on different combinations of metrics, such as connectivity, residual energy, and bandwidth. Four cluster-based models are derived. The novel cluster-based QoS-OLSR model, based on energy and bandwidth metrics, can efficiently prolong the network lifetime, ensure QoS and decrease delay. Prolong the network lifetime by reducing the percentage of MPR nodes which eventually reduces the traffic overhead and channel collisions.

## 2. RELATED WORK

Discrete network design problem (DNDP) is generally formulated as a bilevel programming. Because of non-convexity of bi-level formulation of DNDP which stems from the equilibrium conditions, finding global optimal solutions are very demanding. In this paper new branch and bound algorithm being able to find exact solution of the problem is presented. A lower bound for the upper-level objective and its computation method are, a developed. The conducted experiments indicate that in most cases the first incumbent solution which is obtained within a few seconds is superior to the final solution of some of previous algorithms. Numerical experiments show that our algorithm is superior to previous algorithms in terms of both computation time and solution quality. The proposed algorithm can be easily adapted to non-deterministic traffic assignments. Total costs of the system are affected by decision variables of both system planners and users.

One of the main metrics to evaluate the performance of a self-adjusting network is the amortized cost: the worst-case communication cost over time and per request. Splay trees are the most prominent example of the self-adjustment concept in the context of classic data structures: in their seminal work, Sleator and Tarjan proposed self-adjusting binary search trees where popular items or nodes are moved closer to the root (where the lookups originate), exploiting potential non uniformity in the access patterns.

## 3. EXISTING SYSTEM

In existing system distributed generalization of self-optimizing data structures. This is a non-trivial generalization of the classic splay tree concept: While in classic BSTs, a lookup request always originates from the same node, the tree root, distributed data structures and networks such as skip graphs have to support routing requests between arbitrary pairs (or peers) of communicating nodes; in other words, both the source as well as the destination of the requests become variable. The SplayNet algorithm and formally analyze its performance, and prove its optimality in specific case studies. It also introduces lower bound techniques based on interval cuts and edge expansion, to study the limitations of any demand-optimized network.

### Disadvantages

Existing model is simple but captures the fundamental trade off between the benefits of self-adjustments (namely shorter routing paths) and their costs (namely reconfigurations).

### Existing Methods

**Algorithm:** SplayNet algorithm

**Technique:** Binary Search Tree

## 4. PROPOSED SYSTEM

In the proposed system Shortest edge algorithm is used to dynamically optimize the lookup costs from a single node. Edge disjoint shortest pair algorithm is an algorithm in computer network routing. The algorithm is used for generating the shortest pair of edge disjoint paths between a given pair of vertices as follows: Run the shortest path algorithm for the given pair of vertices.

**Advantages**

Proposed work highlight that self-adjustment benefits can indeed be reaped also in the context of networks; for multi-tree networks, these benefits can even be significantly higher than in classic data structures.

**Proposed Method**

**Algorithm:** Shortest edge algorithm

**Technique:** hierarchical search trees

## 5. SYSTEM MODULES

1. Reliable Automatic Reconfiguration
2. Tracking membership Service
3. Byzantine Fault Tolerance
4. Dynamic Replication

**Reliable Automatic Reconfiguration**

In this Module, it provides the abstraction of a globally consistent view of the system membership. This abstraction simplifies the design of applications that use it, since it allows different nodes to agree on which servers are responsible for which subset of the service. It is designed to work at large scale, e.g., tens or hundreds of thousands of servers. Support for large scale is essential since systems today are already large and we can expect them to scale further. It is secure against Byzantine (arbitrary) faults. Handling Byzantine faults is important because it captures the kinds of complex failure modes that have been reported for our target deployments.

**Tracking membership Service**

In this Module, is only part of what is needed for automatic reconfiguration. We assume nodes are connected by an unreliable asynchronous network like the Internet, where messages may be lost, corrupted, delayed, duplicated, or delivered out of order. While we make no synchrony assumptions for the system to meet its safety guarantees, it is necessary to make partial synchrony assumptions for liveness. The MS describes membership changes by producing a configuration, which identifies the set of servers currently in the system, and sending it to all servers. To allow the configuration to be exchanged among nodes without possibility of forgery, the MS authenticates it using a signature that can be verified with a well-known public key.

**Byzantine Fault Tolerance**

In this Module, to provide Byzantine fault tolerance for the MS, we implement it with group replicas executing the PBFT state machine replication protocol. These MS replicas can run on server nodes, but the size of the MS group is small and independent of the system size. So, to implement from tracking service,

1. Add – It takes a certificate signed by the trusted authority describing the node adds the node to the set of system members.
2. Remove – It also takes a certificate signed by the trusted authority that identifies the node to be removed. And removes this node from the current set of members.
3. Freshness – It receives a freshness challenge, the reply contains the nonce and current epoch number signed by the MS.
4. Probe – The MS sends probes to servers periodically. It serves respond with a simple ack, or, when a nonce is sent, by repeating the nonce and signing the response.
5. New EPOCH – It informs nodes of a new epoch. Here certificate vouching for the configuration and changes represents the delta in the membership.

**Dynamic Replication**

In this Module, to prevent attacker from predicting

1. Choose the random number.
2. Sign the configuration using the old shares
3. Carry out a resharing of the MS keys with the new MS members.
4. Discard the old shares

**CONCLUSION**

Our work as a first step towards the design of novel distributed data structures and networks which adapt dynamically to the demand. In order to focus on the fundamental tradeoff between benefit and cost of self-adjustments, we purposefully presented our model in a general and abstract form and many additional and application-specific aspects need to be addressed before our approach can be tested in the wild. The main theoretical simplification made in this paper regards there striation to the tree topology, and the generalization to more complex and redundant networks is an open question. To have focused on the amortized costs of SplayNets, and an interesting direction for future research regards the study of the achievable competitive ratio under arbitrary communication patterns.

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