Fault Isolation In Networks With Partial Information

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Motivation and Objective

Active Monitoring:

-Uses active measurements (probes) in the network to localize the fault. **Accurate**, but too invasive resulting in **high overhead**.

Passive Monitoring:

-Uses passive end-to-end measurements and network topology to localize faults. **Not very accurate**, but incurs **less overhead**. Extensively used in network tomography.

Hybrid Monitoring:

-To increase the accuracy and decrease the overhead, hybrid monitoring can be employed.

Partial information in Networks:

-Assuming complete information of network topology is practically not feasible because of various reasons.

-Implications of partial information in networks should be analyzed for the validation of proposed fault localization algorithm.

Objective:

-To find the possible combination of links that can cause the given fault scenario using end-to-end measurements and topology.

-To localize the fault exactly using active probes in the network.

-Analyze this result in the case of partial information in networks.

Fault Localization Algorithm

-Uses the information of connected and disconnected sites (destinations) either from a single source or multiple sources.

-Assumes that we know all paths from sources to different destinations (both single and multiple paths).

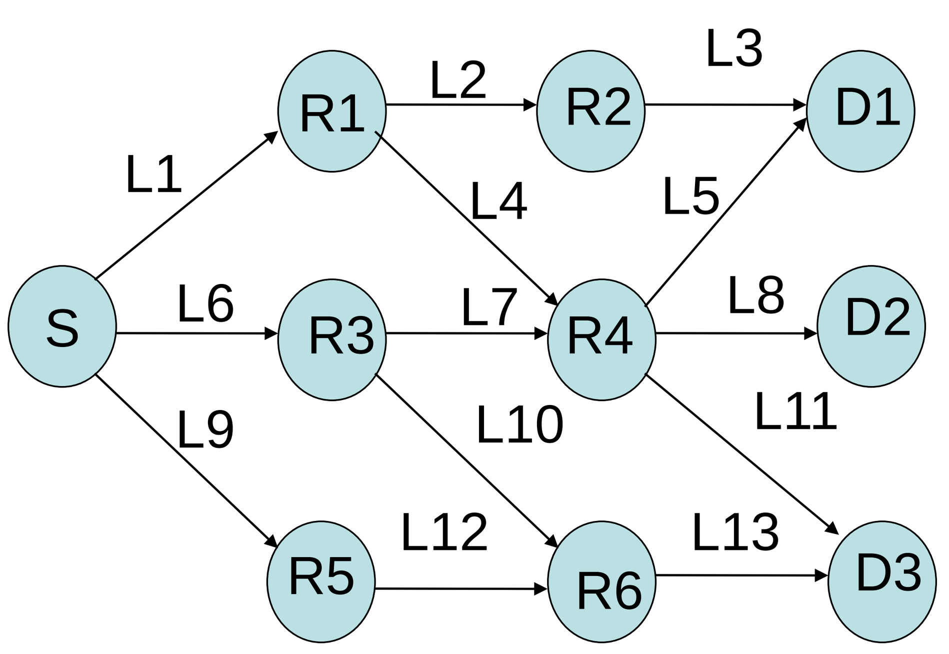
-Checks every possible faulty link combination. Eliminates several possibilities using end-to-end measurements and other optimization schemes.

-Implements intelligent probing strategy on the resulting possibilities from the passive monitoring part.

Pseudo Code

```
for( i = 1 to num_discon_sites)
        for( j = 1 to num_links_source_to_site )
                add link[i][j] to possible_faulty_links
list;
possible_comb[all] = 1;
for ( i = 1 to poss_faulty_link_combinations)
{
if ( possible_comb[i] == 0 )
break;
for ( j = 1 to num_sites)
{
if( faulty_link_combination[i] disconnects site[j] )
if( connected[j] == 1 )
possible_comb[i] = 0;
super_set ( possible_comb[i] ) = 0;
break;
else
continue;
}
}
possible_comb[] == set of possible
```

Illustration



example:

Partial Information in Networks

-Acquiring the information of all paths from different source to destinations is termed as **Dependency Discovery**.

-In practical scenarios, dependency discovery is not complete and efficient. Reasons can be limited management-plane bandwidth, frequent network topology changes etc.

-Implications of partial information in networks on the proposed fault localization algorithm is analyzed.

Metric for partial information:

-A quantitative metric is proposed for the completeness of the partial dependency information. We represent the incomplete information of a path p with the metric I_p.

-Main challenge is to know the ground truth (complete information) to represent the metric. So, we **estimate the complete information** using partial information.

Results

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