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Developing a Sample for the Analysis of Path Service Availability in Mesh Networks with Dynamic Path Restoration

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***Abstract*—A mesh network technique based on importance sampling is developed for the analysis of path service availability in mesh networks with dynamic path restoration. The method combines the simulation of the path rerouting algorithm with a "dynamic path failure importance sampling" (DPFS) scheme to estimate path availabilities efficiently. The simulated model uses "failure equivalence groups," node failures, and more general geographically distributed failure. The analysis of a large mesh network example demonstrates the practicality of the technique.**

***Keywords* —Availability, biasing, failure, importance, mesh, model, network, path, restoration, risk, sampling, simulation**

I INTRODUCTION

The concept of mesh network architecture is being adopted increasingly in the field in the development anddeployment of new networks or in the replacement, migration, or evolution of existing networks. In a generic mesh network, a set of nodes is interconnected with links following an arbitrary topology. The routes of end-to-end "paths" (i.e., end-to-end physical or virtual circuits) over the links can be arbitrary. The routes of backup or protection paths can also be arbitrary and even be generated dynamically. This generality is in contrast to traditional network architectures that are typically more rigid in form with fault tolerance provided using, for example, rings, extra dedicated protection links, or pre-established protection connections. Advantages of mesh networking include the enabling of more general routing schemes, more flexible traffic engineering, simplification of network operations and management functions, more cost-effective use of redundant network capacity, the enabling of more general self-configuration and self-healing mechanisms, and potentially higher levels of service availability. The mesh networking concept is also general in scope, so it can be applied *physically* in different physical parts of networks as well as *logically* in different logical layers.

A.DYNAMIC PATH RESTORATION:

The failure of a particular link results in the failure of all circuits that use the link. The failure of a circuit can lead to the possible failure of a path. When a path experiences a circuit failure, the dynamic mesh network will attempt to reroute the affected path over circuits that are operational.

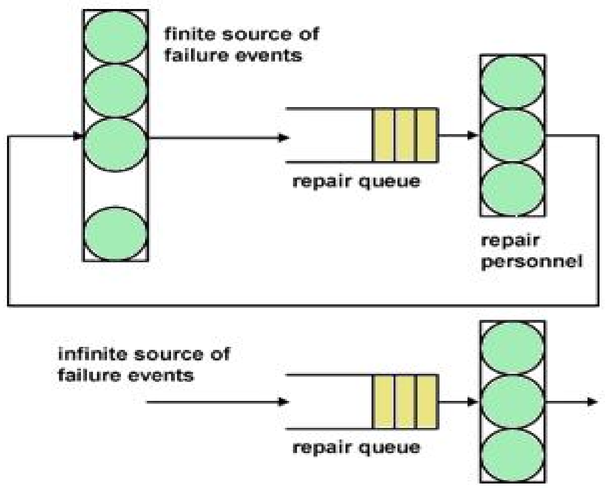

Fig1. Failures and repairs in a failure equivalence group.

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The process of rerouting a failed path in response to a failed circuit is called *dynamic path restoration.* The type of restoration method assumed here is quite general. It may be one that finds the next shortest route in terms of working circuits, subject to the prevailing circuit band-width constraints.

It may be one that finds a route that maximizes the minimum remaining capacity over all working circuits in the network. The restoration method could also reroute some or all paths in the network ("network repacking") to maximize some objective function. The method could also reroute paths in response to the completion of link repairs.

The FEG construct also enables one to model the possibility in practice of having multiple simultaneous cuts in *series* in a particular unidirectional or bidirectional link. That is, due to the fact of it being physically distributed, a second or third cut, or even more cuts, may occur in a particular link before a first cut and any other subsequent cuts are repaired. This can be modeled by using a FEG with an infinite source of failure events. The assumed population of the repair personnel may be finite, as is of course always the case in reality, or infinite for the sake of modeling simplicity.

The construct also enables the modeling of the failure and re-pair of optical amplifiers (e.g., EDFA) that are typically spaced along fibers to boost optical signal levels.

[1] DYNAMICPATH-FAILURE SAMPLING:

The DIS simulation method developed here for estimating path availabilities in mesh networks with dynamic path restoration is called *dynamic path-failure importance sampling*

(DPFS). In DPFS, the goal is to bias the system state trajectory specifically toward path failures that the restoration algorithm is *unable* to restore. This is achieved by setting the failure rates λ in the FEG at an increased level until path failures are observed to occur (or state $\mathbf{n}=\mathbf{0}$ is reached). Once a path failure is realized, the group failure rates are set back to their original values. Note that if we simply biased failure rates until a group failure occurred, then this would not be effective in general since, under dynamic path restoration, the failure of a group does not always necessarily lead to the failure of paths.

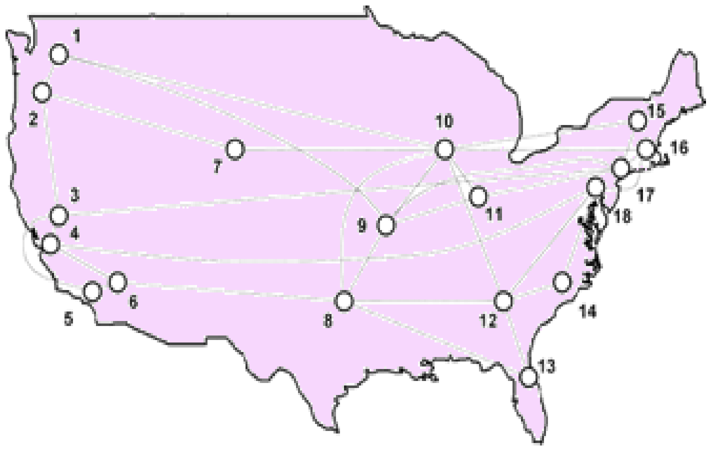

Fig 2.Dynamic path-failure importance sampling

We present two mesh network examples. The first is a small test network to validate the theory and demonstrate the efficiency of DPFS. The second is a larger network example to illustrate the practical application of DPFS to a modeling problem of a size that can typically be encountered in practice. In both examples, we assume that the initial paths are the shortest paths and that the dynamic path restoration algorithm reroutes a path by determining the next shortest operational route using Dijkstra's, subject to the prevailing circuit bandwidth constraints.

As we assume that all paths return to the initial paths once all links become operational, i.e., when the group process returns to the regenerative.

During the time that at least one link is in a failed state, we assume in the examples that a working path is rerouted to an alternate working route only when there is a circuit failure in the current route of the working path. Before a path i is rerouted, the bandwidth is released in each of the working circuits along the current route of the path. Working paths that have no circuit failures in their current route are not rerouted. Also, working paths are not rerouted in response to link re-pairs, at least until all links become operational. These assumptions reflect what may typically, though not necessarily, be done in practice to avoid potential unnecessary operational errors in available paths in mesh net-works with dynamic path restoration.

CONCLUDING REMARKS

The DPFS simulation technique developed here is a practical and effective method for estimating service availability in mesh networks with dynamic path restoration. It enables one to obtain useful confidence interval widths on path service availabilities in reasonable simulation run times. The developed failure and repair modeling with FEG is sufficiently general so that it can be used to faithfully represent many of the types of failure and repair mechanisms that appear in practice. The assumed path restoration algorithm is sufficiently general to accommodate al-most any algorithm, at least ones that return paths to their initial paths once all element repairs have been made.

ACKNOWLEDGMENT

There are several directions in which the present work can be extended. The formulation of the simulation could be recast in terms of independent replications to accommodate restoration algorithms that do not necessarily return paths to their initial paths. The DPFS method could be modified to turn the failure biasing off only in response to specific path failures.

This could be useful when only a specific path, or a subset of paths, is of interest. The DPFS method could also be modified to turn the failure biasing off in response to particular path failures, where the particular path is chosen by cycling through all the paths in the network. Such a “*stratified* DPFS” sampling scheme could be beneficial in cases where the path availabilities are highly imbalanced. The formulation of the simulation could also be simplified in the degenerate case where the path restoration method is simply one that uses dedicated or shared failover paths that have been predetermined “offline.” The failure and repair modeling could also be extended to accommodate dependencies between the FEG queues to model, for example, shared pools of repair personnel. However, with such generalizations, an explicit expression for may not be available and would have to be computed or at least estimated.

REFERENCES

[1] M. M. Campista*et al.*, “Routing metrics and protocols for wireless mesh networks,” *IEEE Netw.*, vol. 22, no. 1, pp. 6–12,Jan./Feb. 2008.

[2] I. Pefkianakis, S. H. Y. Wong, and S. Lu, “SAMER: Spectrum aware mesh routing in cognitive radio networks,” in *Proc. 3rd IEEE DySPAN*, Oct. 2008, pp. 1–5.

[3] M. Xia, J. H. Choi, and T. Wang, “Risk assessment in SLA-based WDM backbone networks,” in *Proc. OFC*, Mar. 2009, pp. 1–3.

[4] H. Naser and H. T. Mouftah, “Availability analysis and simulation of mesh restoration networks,” in *Proc. 9th ISCC*, 2004, vol. 2, pp. 779–785.

[5] L. Song and B. Mukherjee, “New approaches for dynamic routing with availability guarantee for differentiated services in survivable mesh net-works: The roles of primary-backup link sharing and multiple backup paths,” in *Proc. IEEE Globecom*,2006, OPN07-6.

[6] L. Song, J. Zhang, and B. Mukherjee, “Dynamic provisioning with availability guarantee for differentiated services in survivable mesh net-works,” *IEEE J. Sel. Areas Commun.*, vol. 25, no. 3, pt. supplement, pp. 35–43, Apr. 2007.

[7] L. Song and B. Mukherjee, “On the study of multiple backups and pri-mary-backup link sharing for dynamic service

[8] provisioning in survivable WDM mesh networks,” *IEEE J.Sel. Areas Commun.*, vol. 26, no.6, pt. supplement, pp. 84–91, Aug. 2008.