On the Size and Computation Time of Maximal Regional Shared Risk Link Group Lists

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Due to natural disasters such as earthquakes, tornadoes, floods, or malicious human activities, backbone network components being physically close to each other have a high probability of failing together. To avoid serious performance degradations due to multiple network element failures, current backbone networks are designed to protect certain pre-defined lists of failures, called *Shared Risk Link Group*s (SRLGs). To be efficient, these lists of SRLGs should cover the most probable failure scenarios while having a manageable size. However, is not trivial how to compute efficient SRLG lists.

An SRLG is called *regional*, if it aims to protect failures damaging the network only in a certain physical area. This talk surveys proceedings on upper bounding the length and computation time of regional SRLG lists covering the most probable disasters.

Modeling the problem, in the simplest setting a backbone network can be considered as a graph $G(V, E)$ embedded in the plane, nodes having an exact position, and edges being considered as line segments between their endpoints. In the presented papers regional disasters are modeled to have a deterministic effect on the network: a disaster d destroys every network element, which has part in a certain geographic area belonging to d, and leaves the rest of the network untouched. One observation is that once a failure $f \subseteq E$ is listed as SRLG, there is no need to list any subset of f, since it does not improve the protection of the network. Based on this, it is enough to list the maximal SRLGs caused by disasters. On the other hand, by upper estimating the disaster areas with circular disks does not degrades the protection of the network. Using these ideas, disasters can be overestimated by circular disks with limited size according to various measures, such as radius, or number of edges or number of nodes having part inside the disk. It turns out that in all three mentioned cases, the size of maximal SRLG list is linear in the network size in practice, and can be computed in low polynomial time[1][2][3].

References

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