
Volatility of Communication Edge to the Robustness of Trusted Spanning Forest

Apivadee Piyatumrong <apivadee.piyatumrong@uni.lu>
Guillaume-Jean Herbiet <guillaume.herbiet@uni.lu>

Keywords: Delay Tolerant, MANETs, spanning tree, stability of edge, robustness.

Description

Delay Tolerant Mobile Ad Hoc Networks (DTMs) [1] constitute an emerging subclass of mobile ad hoc networks (MANETs) that feature frequent and long duration partitions. In DTMs, many works such as path discovery, information routing and resource management are challenging tasks due to the dynamic nature of the topology. While the most important feature of DTMs are the flexibility and survivability of the whole system, the centralized approaches like a dedicated node do not work in this environment.

Greedy Trusted Spanning Tree (G-TRUST) algorithm [2] was proposed to construct a kind of backbone, Spanning Tree, used in trusted environment for further cooperate management to provide the availability of network such as DTMs. It avoids the selfish nodes or bad service nodes to be in an important location of the spanning tree. However, G-TRUST has no ability to re-organize the created structure unless the underlying topology have changed. G-TRUST BREAK algorithm [2] provides a mechanism to reorganize the established trees.

Considering the real world mobility of citizens, these motions occurs in variety of environments for example in shopping mall or on highway. The realistic networks of ‘Highway’ and ‘Shopping Mall’ models can be generated by Mad-hoc [3], an ad-hoc networks simulator. Within both mobility models, different characteristics can be found such as velocity, direction of motion, density of the citizens and etc. It is very interesting and convincing that some vital characteristics can be extracted from each of mobility model and be used to increase the survivability of network and, at the same time, to reduce the overhead occurring on the way.

One characteristic found in empirical study are the fault attempting to construct the backbone due to the short stability of communication edge or to reorganize the backbone as a cause of short breakage of the link. These fault attempts cause the high overhead in both communication and computation. In

[4], the usage of *stability threshold* has been proposed in considering the construction and/or re-organization of the backbone. From the problem description and available tools above, the objectives of the project are as follow.

Objectives

- Study the volatility characteristic over the communication edge based on each two given mobility models; ‘Highway’ and ‘Shopping Mall’. This analysis can use some of the metrics introduced in [5]
- Based on the cost functions provided to assess the quality or the robustness of the tree and forest, finding the stability threshold value of each specified mobility model to optimize the robustness of the constructed trusted spanning forest.

References

- [1] Apivadee Piyatumrong, Pascal Bouvry, Frederic Guinand, and Kittichai Lavangnananda. Trusted spanning trees for delay tolerant mobile ad hoc networks. In *2008 IEEE Conference on Soft Computing in Industrial Applications (SMCia/08)*, pages 131–136, June 2008.
- [2] Apivadee Piyatumrong, Pascal Bouvry, Frederic Guinand, and Kittichai Lavangnananda. Trusted spanning tree for delay tolerant manets. In *2008 IEEE/IFIP International Symposium on Trust, Security and Privacy for Pervasive Applications (TSP-08)*, volume 2, pages 293–299, December 2008.
- [3] Luc Hogie, Frederic Guinand, and Pascal Bouvry. The madhoc metropolitan adhoc network simulator. <http://litis.univ-lehavre.fr/~hogie/madhoc/>.
- [4] Adrian Andronache. *HyWerCs: A Middleware for Backbone Assisted Mobile Ad hoc Networks*. PhD thesis, University of Luxembourg, September 2008.
- [5] Yoann Pigné. *Modélisation et Traitement Décentralisé des Graphes Dynamiques - Application Aux Réseaux Mobiles Ad Hoc*. PhD thesis, L’Université du Harve, December 2008.