



HAL
open science

Analysis of Link Reversal Routing Algorithms for Mobile Ad Hoc Networks

Christian Lavault

► **To cite this version:**

Christian Lavault. Analysis of Link Reversal Routing Algorithms for Mobile Ad Hoc Networks. 1st Advanced Research Workshop on Information Security in Wireless Networks. NATO-ARW 2006 (Tutorial), 2006, Suceava, Romania. hal-00463589

HAL Id: hal-00463589

<https://hal.science/hal-00463589>

Submitted on 12 Mar 2010

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Analysis of Link Reversal Routing Algorithms for Mobile Ad Hoc Networks

Christian Lavault

LIPN (CNRS UMR 7030) – Un. Paris 13, France

Abstract

Link reversal (*LR*) algorithms provide a simple mechanism for routing in communication networks whose topology is frequently changing, such as in mobile and ad hoc networks. A *LR* algorithm routes by imposing a direction on each network link such that the resulting graph is destination oriented (DAG). Whenever a node loses routes to the destination, it reacts by reversing some (or all) of its incident links.

This survey presents the worst-case performance analysis of *LR* algorithms from the excellent work of Costas Busch and Srikanta Tirthapura (*SIAM J. on Computing*, **35**(2):305-326, 2005). The *LR* algorithms are studied in terms of *work* (number of node reversals) and *time* needed until the algorithm stabilizes to a state in which all the routes are reestablished. The *full reversal* algorithm and the *partial reversal* algorithm are considered.

- The *full reversal* algorithm requires $O(n^2)$ work and time, where n is the number of nodes that have lost routes to the destination. This bound is tight in the worst case.
- The *partial reversal* algorithm requires $O(na^* + n^2)$ work and time, where a^* is a non-negative integral function of the initial state of the network. Further, the *partial reversal* algorithm requires $\Omega(na^* + n^2)$ work and time.
- There is an inherent lower bound on the worst-case performance of *LR* algorithms: $\Omega(n^2)$. Therefore, surprisingly, the full reversal algorithm is *asymptotically optimal* in the worst-case, while the partial reversal algorithm is *not*; since a^* can be arbitrarily larger than n .

Short Biography of Christian Lavault

Christian Lavault received the Ph.D degree in Mathematics from University Paris 11, Orsay, France, in 1975. He received the Doctor of Philosophy degree (*Thèse d'État*) in Computer Science from the Computing Department at the University Paris 11 in 1987. Currently, he is a full professor at the *Institut Galilée*, University Paris 13, and is director of the OCAD team of the Research Laboratory LIPN (CNRS, UMR 7030).

His research interests include applications of discrete Maths to Computer Science: complexity analysis of algorithms and data structures, analytic combinatorics, distributed computing, wireless communications, sensor networks.