Department of Computer Science and Engineering

Report on

ARA – The Ant-Colony Based Routing Algorithm for MANETs

Mesut G¨unes, Udo Sorges, Imed Bouazizi

Report Writers:
Shantanu Sarkar
(0416052041)
Mahmud Ahmed
(0416052027)
Md. Mostafizur Rahman
(0416052032)

Supervisor:
Dr. Ashikur Rahman

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Abstract

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Introduction of the report goes here.

2 Context and Problem Statement

3 Idea

4 Evaluation Metrics

According to the Authors, the main feature of ARA is its low routing overhead and easy maintainability of routes between nodes in the topology. So, The evaluation metrics considered to measure the performance of ARA are:

- Delivery rate
- Routing overhead in terms of bits
- Routing overhead in terms of packets

5 Evaluation Process

The performance of ARA was evaluated using simulation in terms of evaluation metrics mentioned earlier. The simulation was implemented in ns-2. Some important parameters of the simulation environment are:

- Simulation area 1500m×300m
- Maximum velocity of nodes 10 m/s using Random waypoint model.
- Simulation time 900 seconds
- 10 Constant bit rate(CBR) connections
- 7 different pause times[1] 0,30, 60, 120, 300, 600 and 900 seconds

[1]pause time indicates the mobility of the nodes

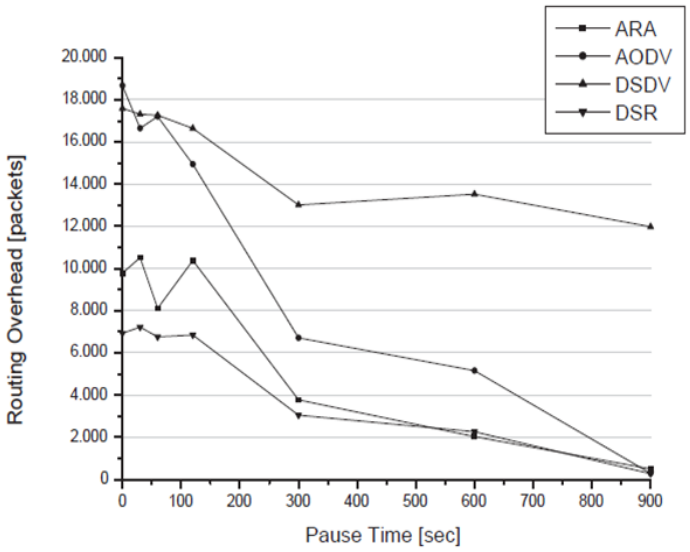

Figure 1: Successful delivered packets as a function of pause time.

6 Evaluation Results

Multiple simulations were run and the results were collected for evaluation.

6.1 Comparison with existing routing protocols in delivery rate

The best way to evaluate the performance of a new algorithm is to compare the performance with the existing algorithms. So, the performance of ARA was compared with AODV,DSR and DSDV in terms of delivery rate. The observed results are shown in Figure 1. With high mobility both DSR and ARA has more than 95% delivery rate. Throughout the simulations ARA performed better than DSDV and AODV in this criteria. Figure 2 shows the delivery rate of ARA within the confidence interval of 95%. As we can see All results are above 85% and most results are within the range 90% and 100% throughout the 10 simulation runs.

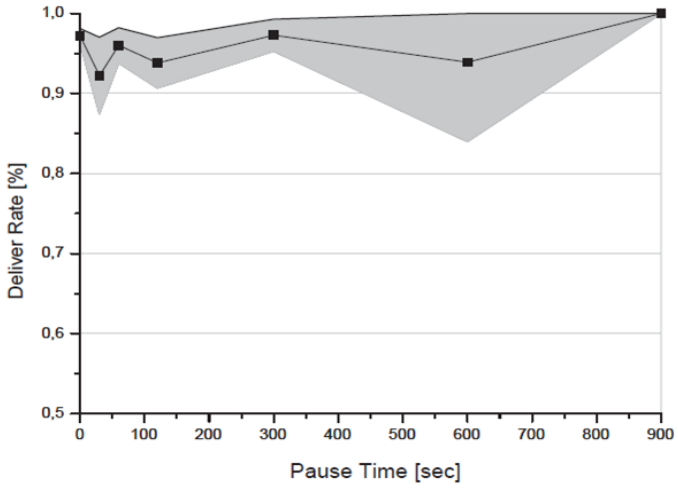

Figure 2: Delivery rate of ARA. Confidence interval of 95%

6.2 Routing Overhead Comparison

As different protocols generate the overhead in very different ways, the routing overhead of different algorithms were observed both in terms of fraction of routing packets needed to deliver a data packet and fraction of databits needed for routing.

6.2.1 Routing Overhead in terms of databits

Figure 3 shows the routing overhead of routing algorithms in term of routing bit as a fraction of total databits. In this case ARA give the best results throughout the simulations. Figure 4 show the overhead of ARA in 95% confidence interval.

6.2.2 Routing Overhead in terms of packets

Figure 5 shows the routing overhead of routing algorithms in term of packets. In this case ARA give second best results following DSR.This is due to the needed flooding of the approach in the route finding phase. With high node mobility route failure occur more often, thus requires the performing of the route failure handling part of the algorithm,which in worst case has to backtrack the path until the sender. Figure 6 show the overhead of ARA in 95% confidence interval.

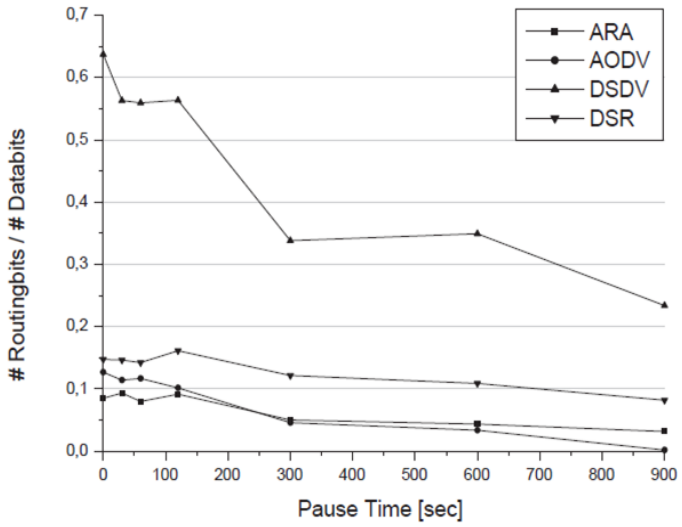

Figure 3: Pause time vs Fraction of successfully send bits and the needed bits

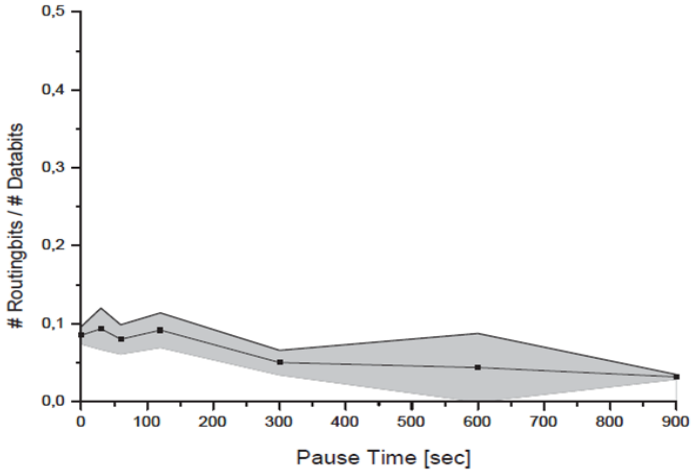

Figure 4: Overhead of ARA in bits. Confidence interval of 95%

Remarks: ARA is a good choice for mobile networks in terms of data delivery,routing overhead. But a better conclusion can be derived if individual performances of DSR,DSDV,AODV were presented in 95% confidence interval like Figure 2, Figure 4, Figure 6. In that case we would be able to observe the fluctuations of performance over different mobility. Nevertheless,

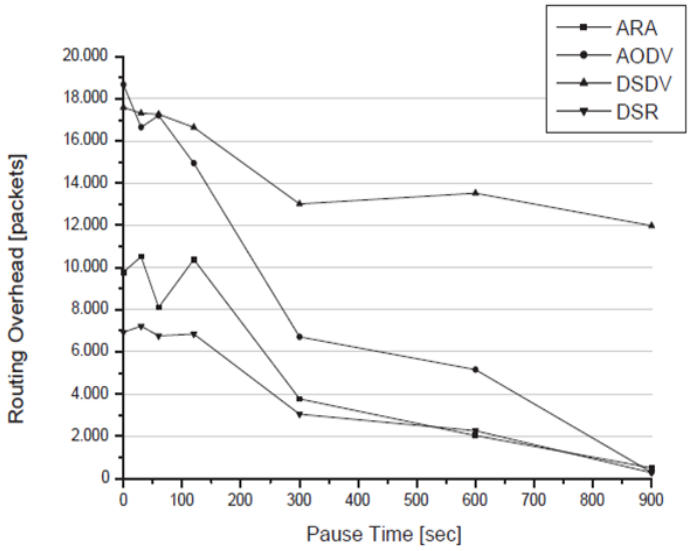

Figure 5: Pause time vs Fraction of successfully send bits and the needed bits

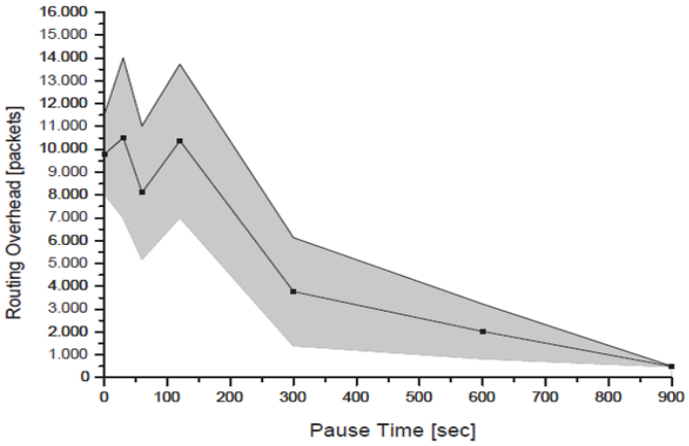

Figure 6: Overhead of ARA in packets. Confidence interval of 95%

we consider ARA as a robust and highly maintainable routing protocols in mobile adhoc networks.