AODV vs RAODV Protocol

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1 Introduction

In this report, we compare the performance of the AODV (Ad hoc On-Demand Distance Vector) protocol with a modified version, RAODV. The goal of modifying the AODV protocol to RAODV was to achieve improved performance in terms of network throughput, average delay, packet delivery ratio, and packet drop ratio. Specifically, the modifications were intended to:

- Increase throughput.
- Decrease average delay.
- Increase packet delivery ratio.
- Decrease packet drop ratio.

The results from the twelve different graphs generated indicate that RAODV generally achieves better performance than AODV in all the considered metrics.

2 Performance Analysis

The performance comparison is conducted based on three different sets of conditions, with each condition analyzing the four performance metrics: throughput, average delay, packet delivery ratio, and packet drop ratio. Each set of conditions is described as follows:

2.1 Scenario 1: Varying Number of Nodes

In this scenario, we analyzed the performance of AODV and RAODV while varying the number of nodes, with the number of packets per second fixed at 100 and the speed of nodes fixed at 20.

2.1.1 Throughput

Observation: The RAODV protocol consistently achieved higher throughput compared to AODV, demonstrating its effectiveness in maximizing data transmission. The improvements in throughput were evident across most of the test cases, highlighting RAODV's superior capability in handling increased network sizes.

2.1.2 Average Delay

Observation: The average delay for RAODV was observed to be lower than that of AODV in most cases, indicating faster data delivery. This reduced delay highlights the efficiency of RAODV in minimizing the time taken for data to reach its destination, especially as the number of nodes increased.

2.1.3 Packet Delivery Ratio

Observation: RAODV showed a consistently higher packet delivery ratio compared to AODV. This indicates that RAODV is more reliable in ensuring that packets reach their intended destination, thereby enhancing the overall network reliability.

2.1.4 Packet Drop Ratio

Observation: The packet drop ratio for RAODV was consistently lower compared to AODV. This result highlights the improved robustness of RAODV, which effectively minimizes packet loss, ensuring that more data is successfully transmitted.

2.2 Scenario 2: Varying Number of Packets per Second

In this scenario, we analyzed the performance while varying the number of packets per second, with the number of nodes fixed at 70 and the speed of nodes fixed at 20.

2.2.1 Throughput

Observation: RAODV demonstrated higher throughput compared to AODV across different packet rates. This improvement underscores RAODV's capability to efficiently manage higher traffic loads, ensuring optimal data transmission even as the packet rate increased.

2.2.2 Average Delay

Observation: The average delay for RAODV was lower compared to AODV, especially under higher packet rates. This reduction in delay shows RAODV's efficiency in handling increased traffic without compromising on speed, making it suitable for scenarios requiring timely data delivery.

2.2.3 Packet Delivery Ratio

Observation: RAODV consistently outperformed AODV in terms of packet delivery ratio. The higher delivery ratio indicates that RAODV is more effective in maintaining data integrity and ensuring successful packet transmissions under varying traffic conditions.

2.2.4 Packet Drop Ratio

Observation: The packet drop ratio for RAODV was lower than that for AODV, even as the packet rate increased. This demonstrates RAODV's improved ability to manage congestion and reduce packet loss, contributing to better network performance.

2.3 Scenario 3: Varying Speed of Nodes

In this scenario, we analyzed the performance while varying the speed of nodes, with the number of nodes fixed at 40 and the number of packets per second fixed at 100.

2.3.1 Throughput

Observation: The throughput for RAODV was consistently higher than that for AODV, even as the speed of nodes varied. This demonstrates RAODV's robustness in maintaining high data transmission rates regardless of node mobility.

2.3.2 Average Delay

Observation: RAODV achieved lower average delay compared to AODV across different node speeds, highlighting its efficiency in rapidly delivering data in dynamic network environments. This makes RAODV particularly suitable for mobile ad hoc networks where node mobility is a key factor.

2.3.3 Packet Delivery Ratio

Observation: The packet delivery ratio for RAODV remained higher than that of AODV, demonstrating its reliability in ensuring successful packet delivery even with varying node speeds. This consistent performance indicates RAODV's adaptability to changing network dynamics.

2.3.4 Packet Drop Ratio

Observation: RAODV consistently achieved a lower packet drop ratio compared to AODV, which highlights its effectiveness in minimizing data loss. This is especially important in scenarios involving high node mobility, where packet drops are more likely to occur.

3 Conclusion

The RAODV protocol was designed to improve upon the AODV protocol by increasing throughput, reducing average delay, increasing packet delivery ratio, and reducing packet drop ratio. The analysis of the graphs shows that RAODV consistently performs better than AODV across different scenarios. RAODV effectively enhances network throughput, reduces delay, improves packet delivery reliability, and minimizes packet loss, making it a superior choice for dynamic and high-traffic network environments.

Overall, the modifications made to create RAODV have successfully enhanced the performance metrics, providing a more reliable and efficient protocol for ad hoc networks.