Performance Analysis of AODV, RAODV and modified RAODV Routing Protocols

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1 Introduction

This report presents a comprehensive analysis of the performance metrics for AODV (Ad hoc On-demand Distance Vector), RAODV (Reliable AODV) and two other modifications of RAODV. The analysis includes comparisons of various performance parameters across different network conditions.

Input Parameters:

- Node Count
- Packets per second
- Node Speed

Output Parameters:

- Network Throughput
- End-to-end Delay
- Packet Drop Ratio (%)
- Packet Delivery Ratio (%)

Routing Protocols:

- **AODV:** In case of Ad-hoc On-demand Distance Vector routing protocol, we broadcast a RREQ packet from the sender end and upon receiving it as the destination or an intermediate which knows the path to destination, we unicast a RREP message.
- **RAODV:** The core point of change in case of RAODV is that, here we also broadcast the reverse request message rather than unicasting and we name it as REV_RREQ message.
- **RAODV-v1(Variant 1):** I propose this following modification of RAODV protocol where I also unicast the RREP message rather than just broadcasting the REV_RREQ message.

  Intuition: The unicast path we found by broadcasting is surely more promising in terms of link-breakage resistance since it was the shortest path found. Now, rather than entirely ignoring the unicast path, it seems better to keep both the unicast and broadcast approaches.
- **RAODV-v2(Variant 2):** The second modification of RAODV protocol I propose is sending RREP packets in multiple unicast paths rather than broadcasting. From an implementation perspective, this reduces to removing the idCache checking when the RREQ packet reaches the actual destination.

  Intuition: In this modification, I entirely remove the broadcast and replace it with multiple unicast messages. In this way, rather than replying on one shortest path found in the RREQ broadcasting approach of original AODV, we take into account all the different unicast paths through which RREQ packet reached the destination.

2 AODV Performance Analysis

2.1 Node Count Analysis

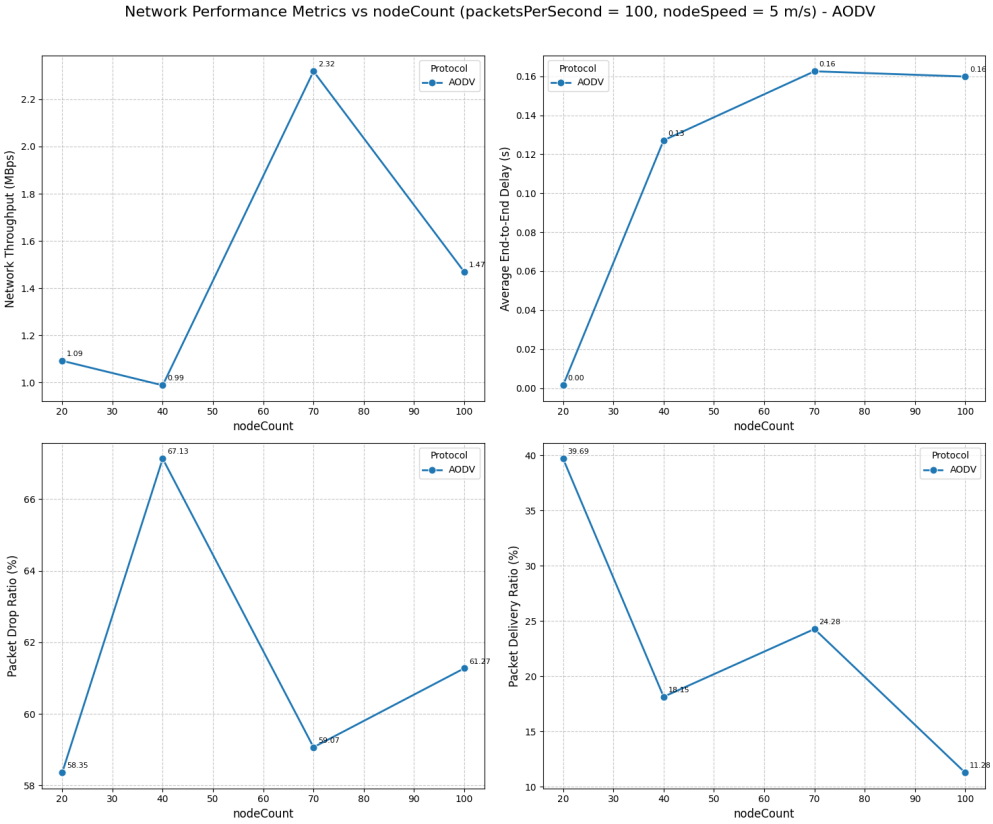

Figure 1: AODV Performance vs Node Count

This figure demonstrates how AODV performance varies with different node counts in the network.

2.2 Node Speed Analysis

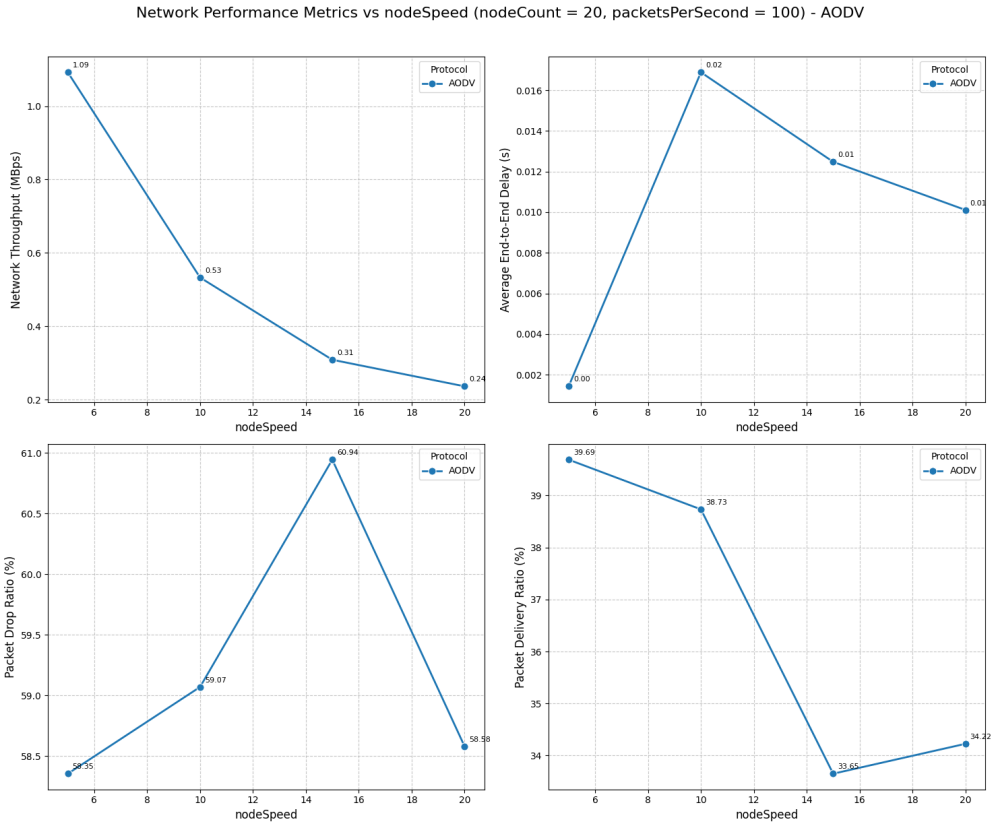

Figure 2: AODV Performance vs Node Speed

This analysis shows the impact of node mobility speed on AODV protocol performance.

2.3 Packets Per Second Analysis

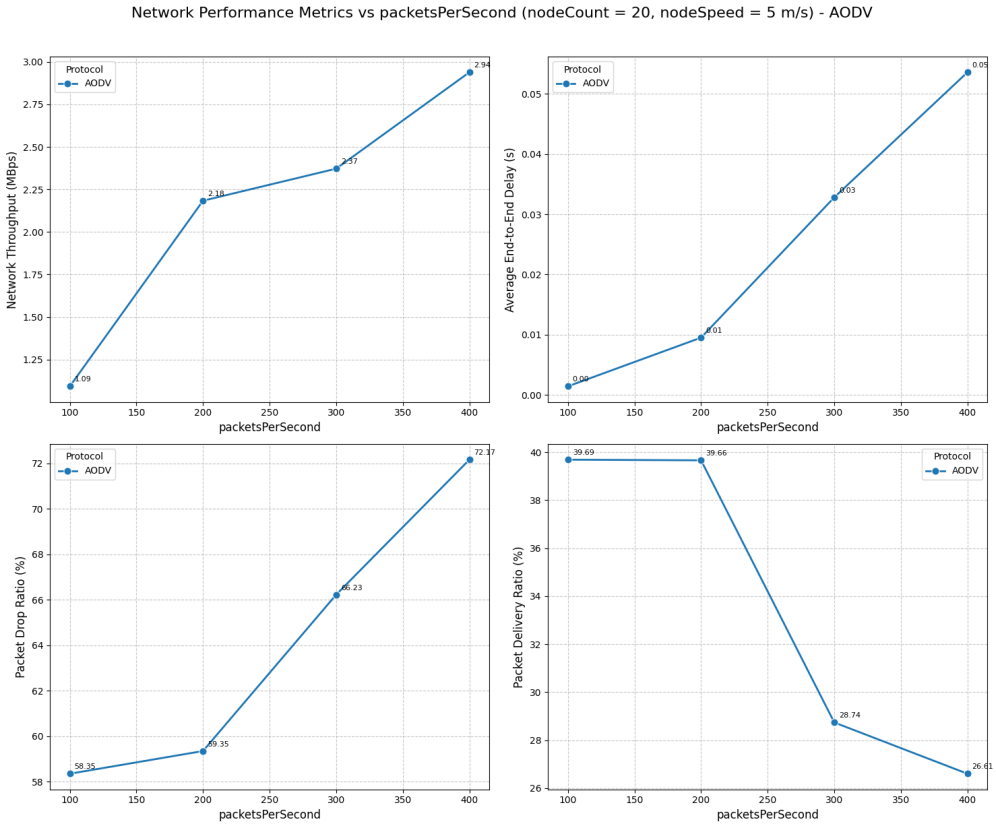

Figure 3: AODV Performance vs Packets Per Second

This figure shows how packet transmission rate affects AODV performance.

3 RAODV Performance Analysis

3.1 Node Count Analysis

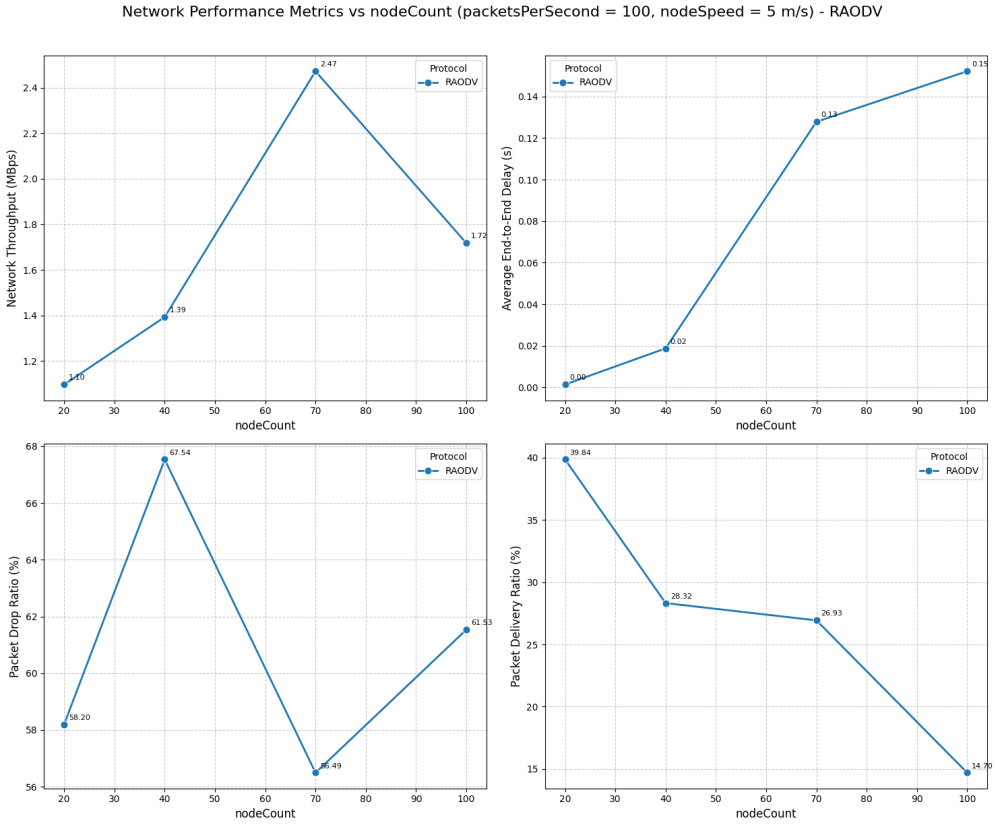

Figure 4: RAODV Performance vs Node Count

This figure demonstrates how RAODV performance varies with different node counts.

3.2 Node Speed Analysis

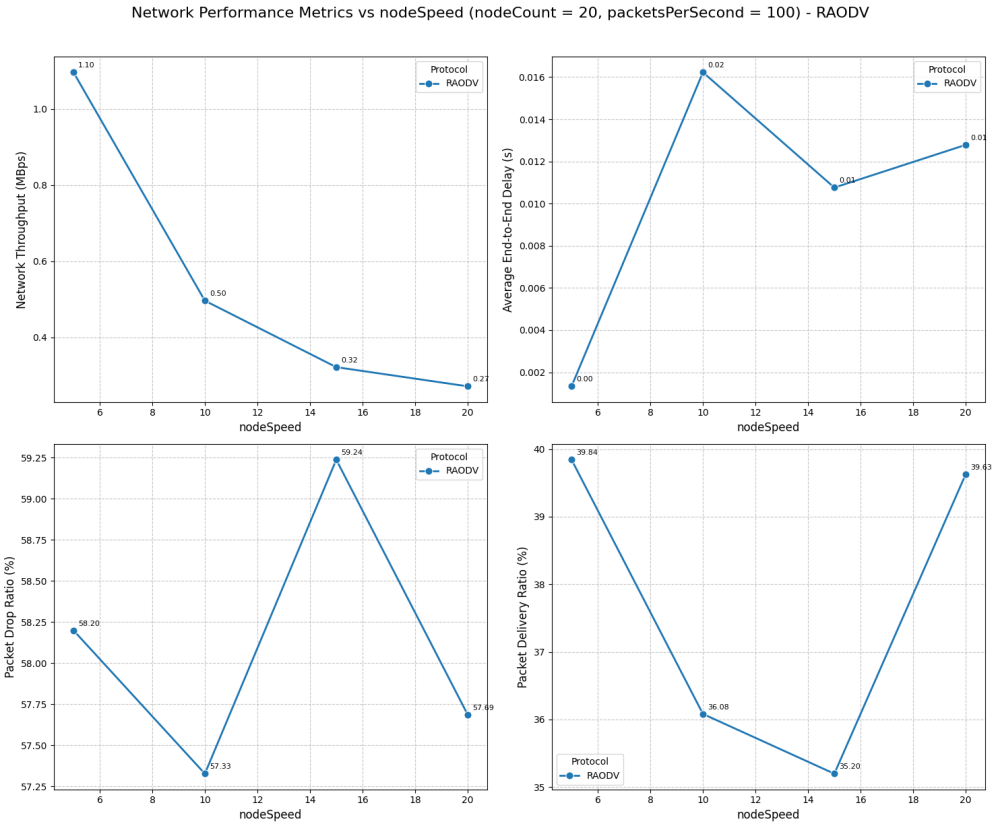

Figure 5: RAODV Performance vs Node Speed

This analysis shows the impact of node mobility speed on RAODV protocol performance.

3.3 Packets Per Second Analysis

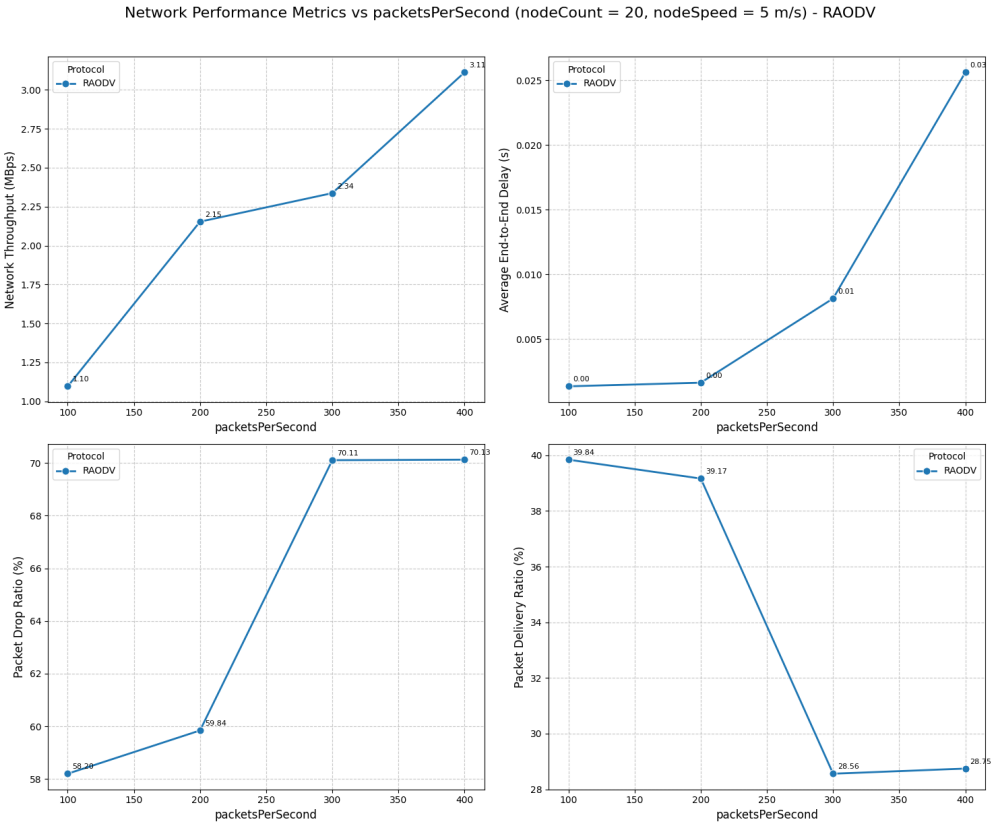

Figure 6: RAODV Performance vs Packets Per Second

This figure shows how packet transmission rate affects RAODV performance.

4 AODV vs RAODV Comparison

4.1 Node Count Comparison

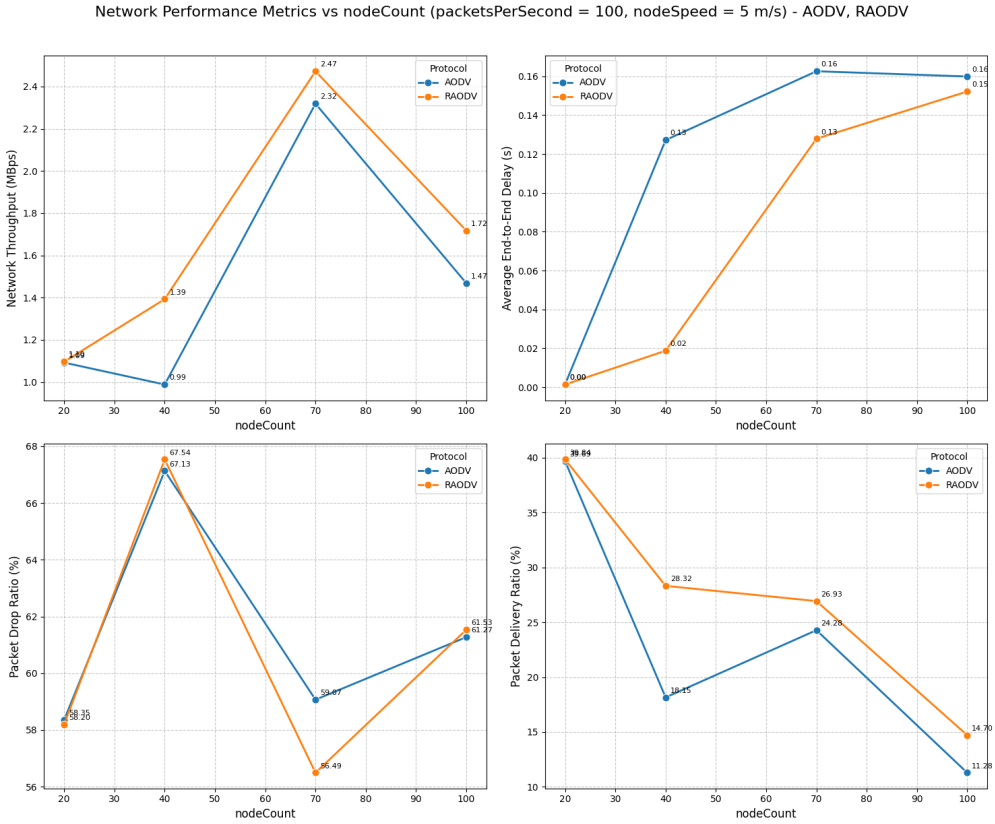

Figure 7: Node Count Performance Comparison

This comparison demonstrates the relative performance of AODV and RAODV across different node counts.

4.2 Node Speed Comparison

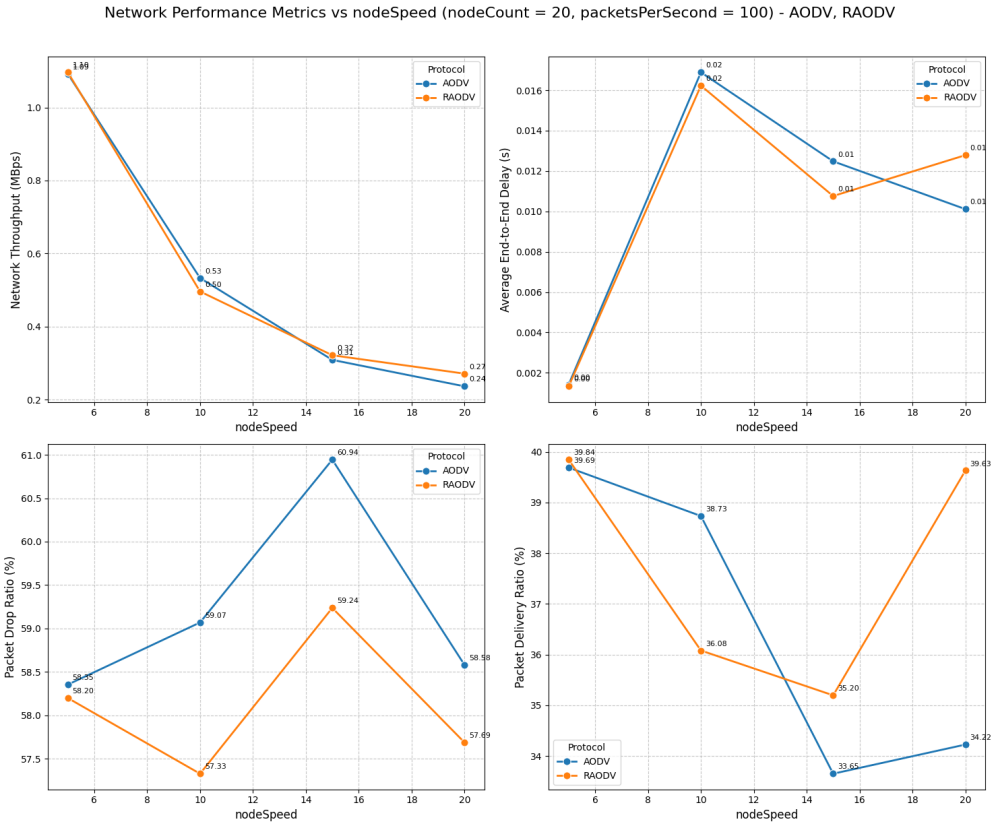

Figure 8: Node Speed Performance Comparison

This analysis compares how node mobility speed affects both protocols.

4.3 Packets Per Second Comparison

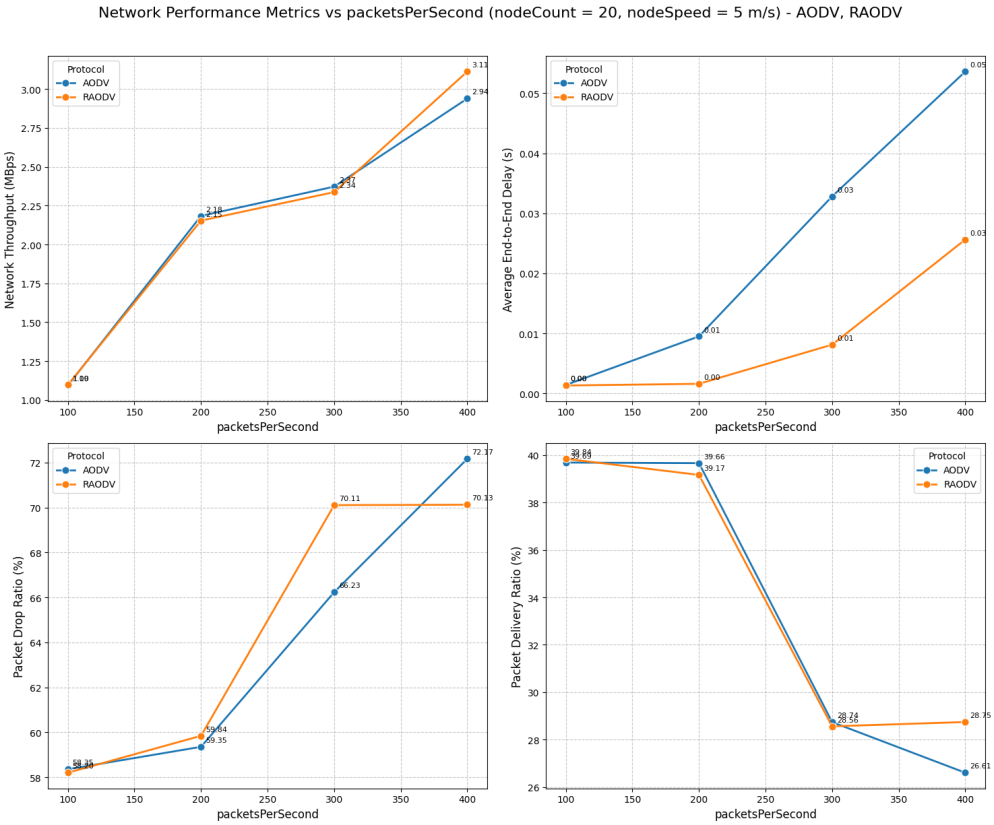

Figure 9: Packets Per Second Performance Comparison

This figure compares how packet transmission rate affects both protocols.

5 Multi-variant RAODV Comparison

5.1 Node Count Multi-comparison

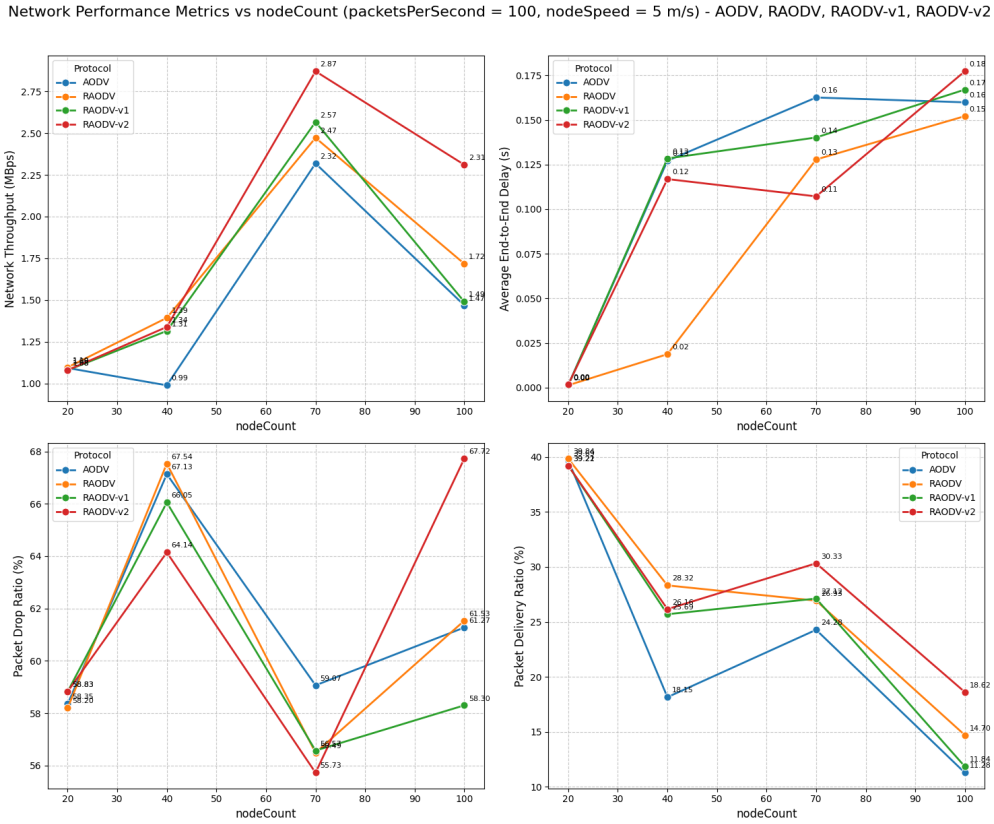

Figure 10: Node Count Performance Multi-comparison

This comparison shows performance across different node counts for all protocol variants.

5.2 Node Speed Multi-comparison

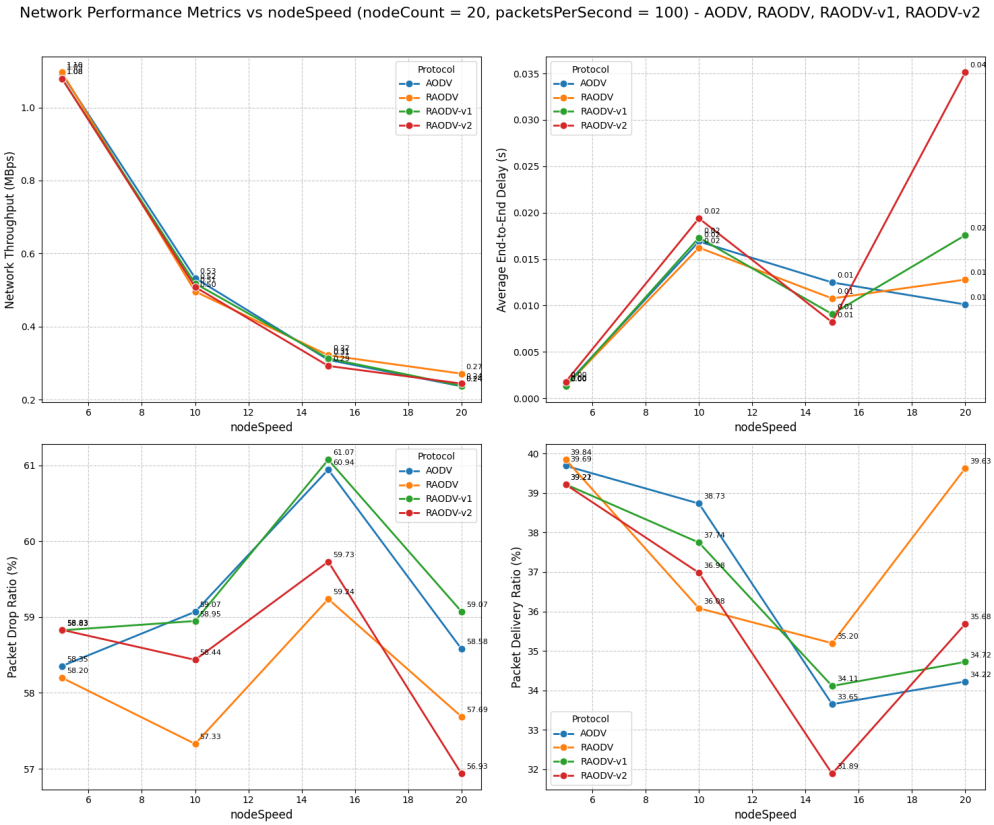

Figure 11: Node Speed Performance Multi-comparison

This analysis compares how node mobility speed affects all protocol variants.

5.3 Packets Per Second Multi-comparison

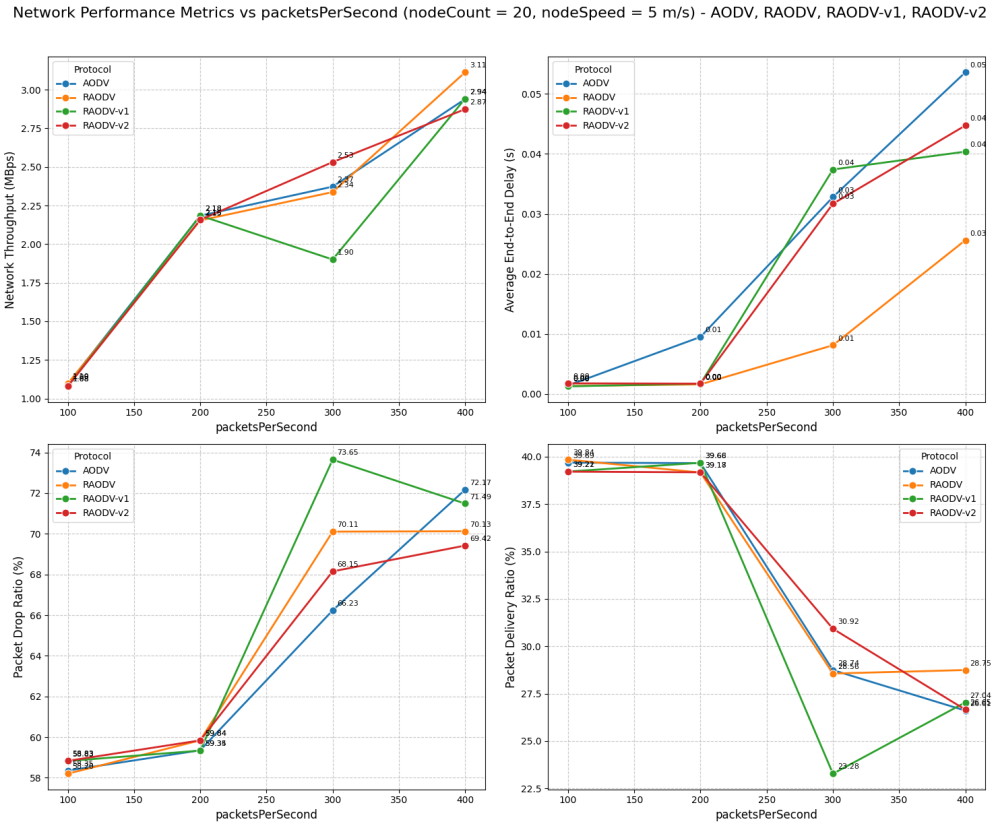

Figure 12: Packets Per Second Performance Multi-comparison

This figure compares how packet transmission rate affects all protocol variants.