



ENSC 427: COMMUNICATION NETWORKS
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FINAL PROJECT PRESENTATIONS

Viability Analysis of GPS-Assisted Ant Routing Algorithm

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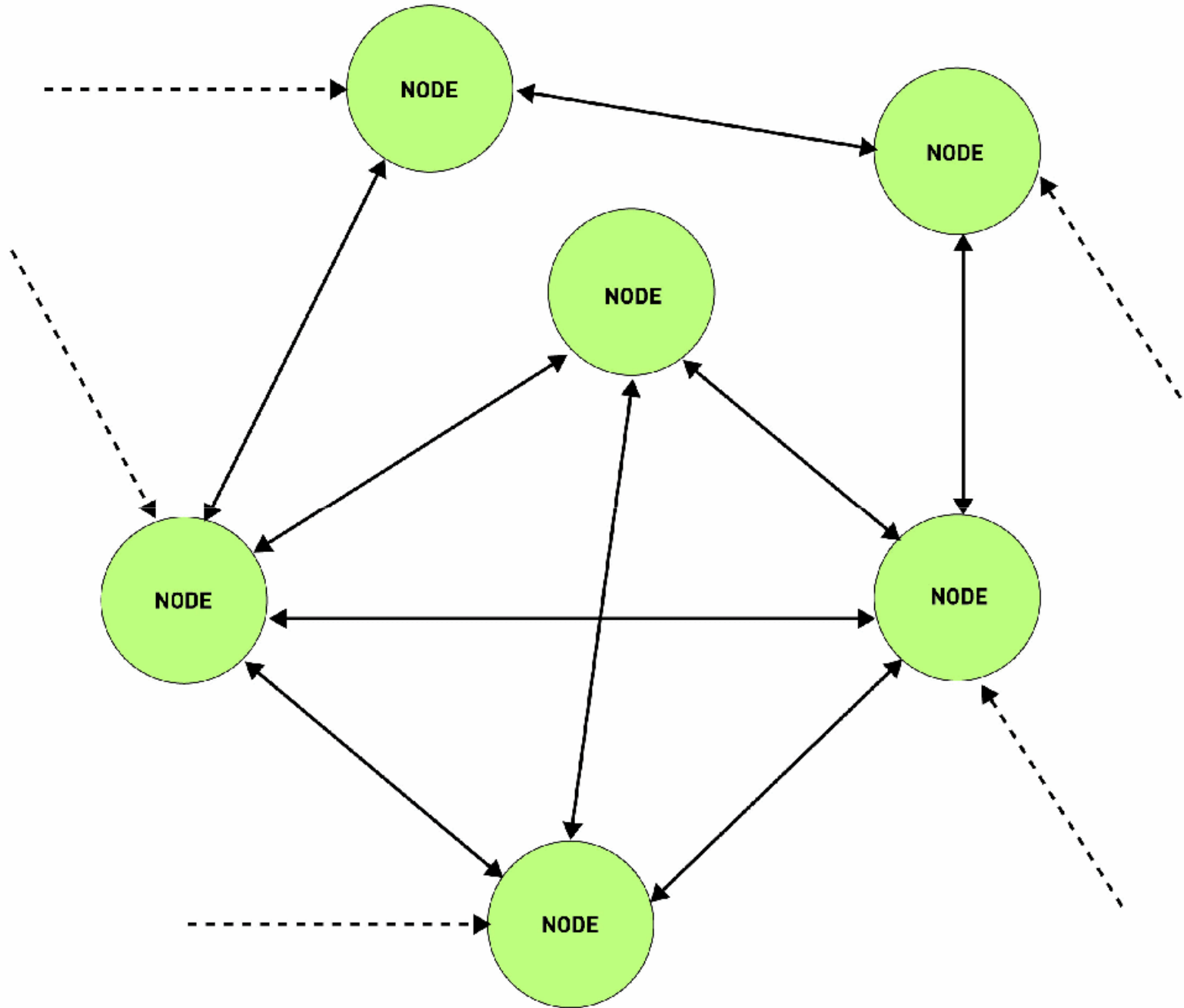
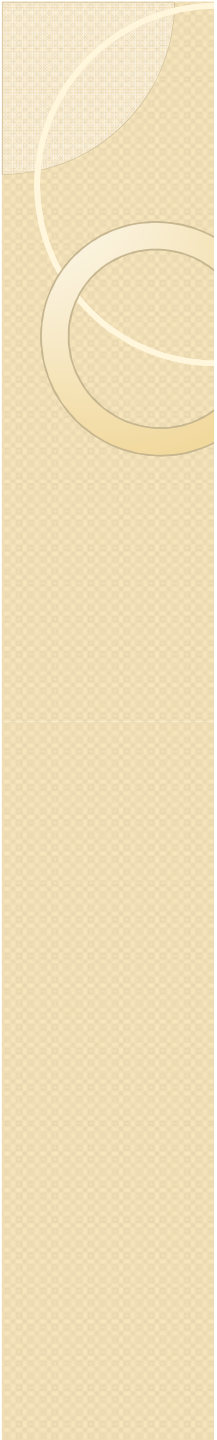
PRESENTATION OVERVIEW

- Introduction
- Project Scope
- Related work
- Ant Routing – Overview
- Antnet
- GPS-assisted Antnet
- Simulation Setup
- Simulation Scenarios
- Simulation Result (vs. Distance)



PROJECT SCOPE

- Mobile ad-hoc network
- All nodes acts as hosts and routers
- Dynamic topology changes
- Need algorithm for routing messages
- Must be adaptive, low computation requirement





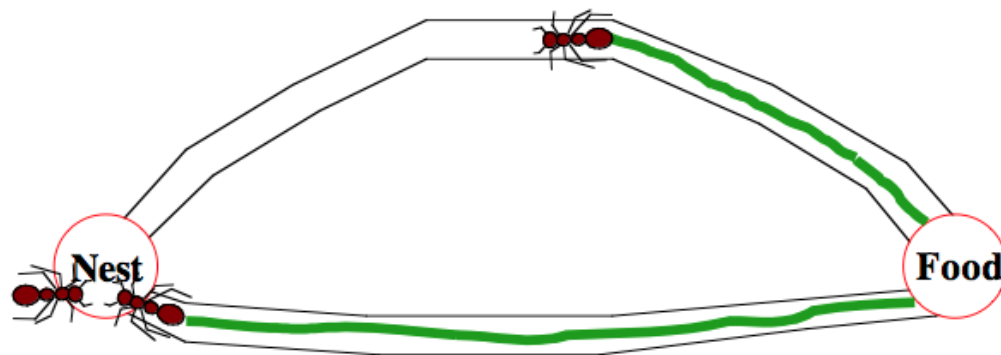
RELATED WORK

- **Dynamic Source Routing (DSR)**
 - Source sends small packet with destination info to all neighbors
 - When destination receives packet, reply to source with the shortest path
 - Repeat process if link lost

- **Ad-Hoc On-Demand Distance Vector Routing (AODV)**
 - Uses sequence numbers to find route
 - Source broadcasts request for connection
 - Once routes found, route through the least hop path
 - Recycle other routing tables from unneeded nodes

ANT ROUTING - OVERVIEW

- Based on food searching behavior of ants
- Ants randomly disperse until food found, leaving pheromone trail
- Ant with food return while leaving stronger trail
- Other ants use pheromone to search for food
- Unused path pheromone diffuses





ANTNET

- Antnet Ant Routing Algorithm
 - Originally by Lavina Jain
 - Implemented for ns-2.33
 - For routing packets in mobile ad-hoc network
 - Initialize routing table with uniform pheromone levels
 - Updates pheromone levels with time and passing packets
 - Does not use location awareness



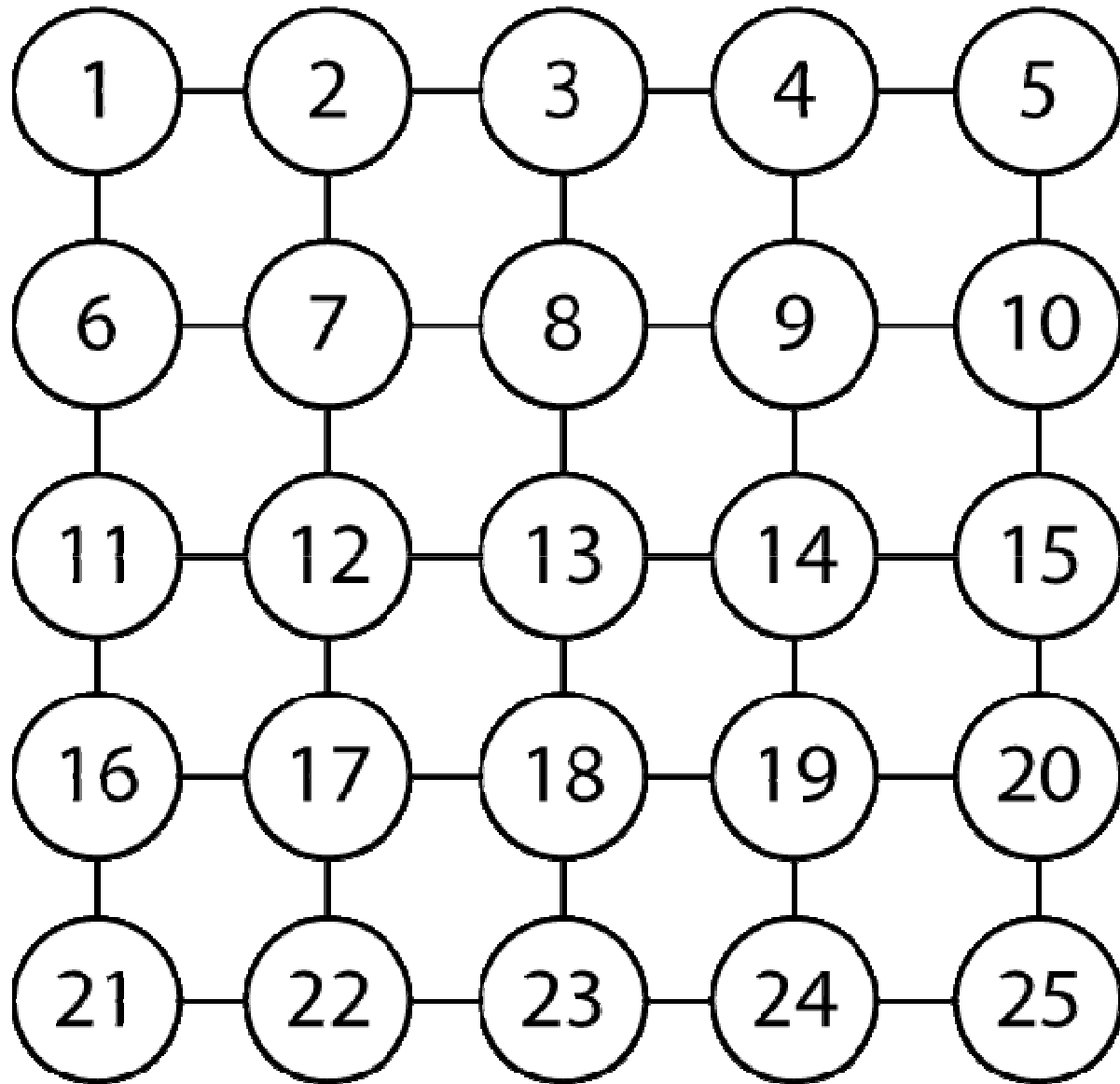
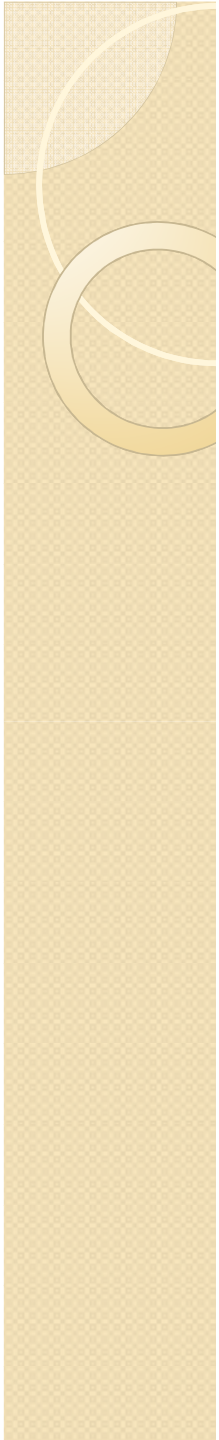
GPS-ASSISTED ANTNET

- Modified version of original Antnet
 - Location awareness of neighbor & destination nodes
 - Use GPS information when Antnet pheromone information is inconclusive
 - Assume GPS information is given
- Some expected advantages
 - Lower delay during initial routing stage
 - Faster convergence to the optimum route
 - Scalar relationship between distance & delay



SIMULATION SETUP

- Same For Both Scenarios
- Node Number = 25
- Network Size = 50m x 50m
- Link Types = 512Mbps 5ms Drop-Tail
- Grid Topology

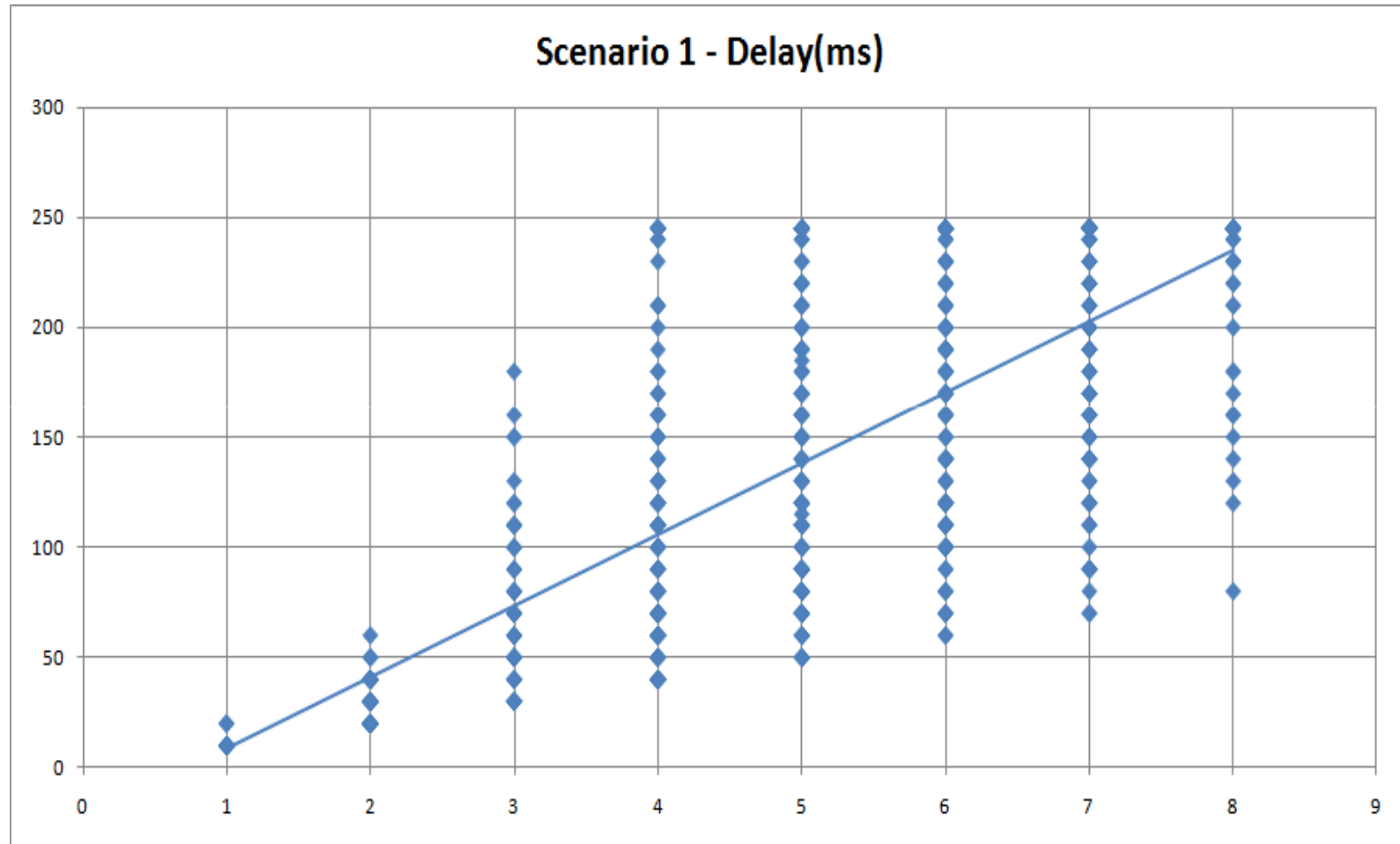




SIMULATION SCENARIO

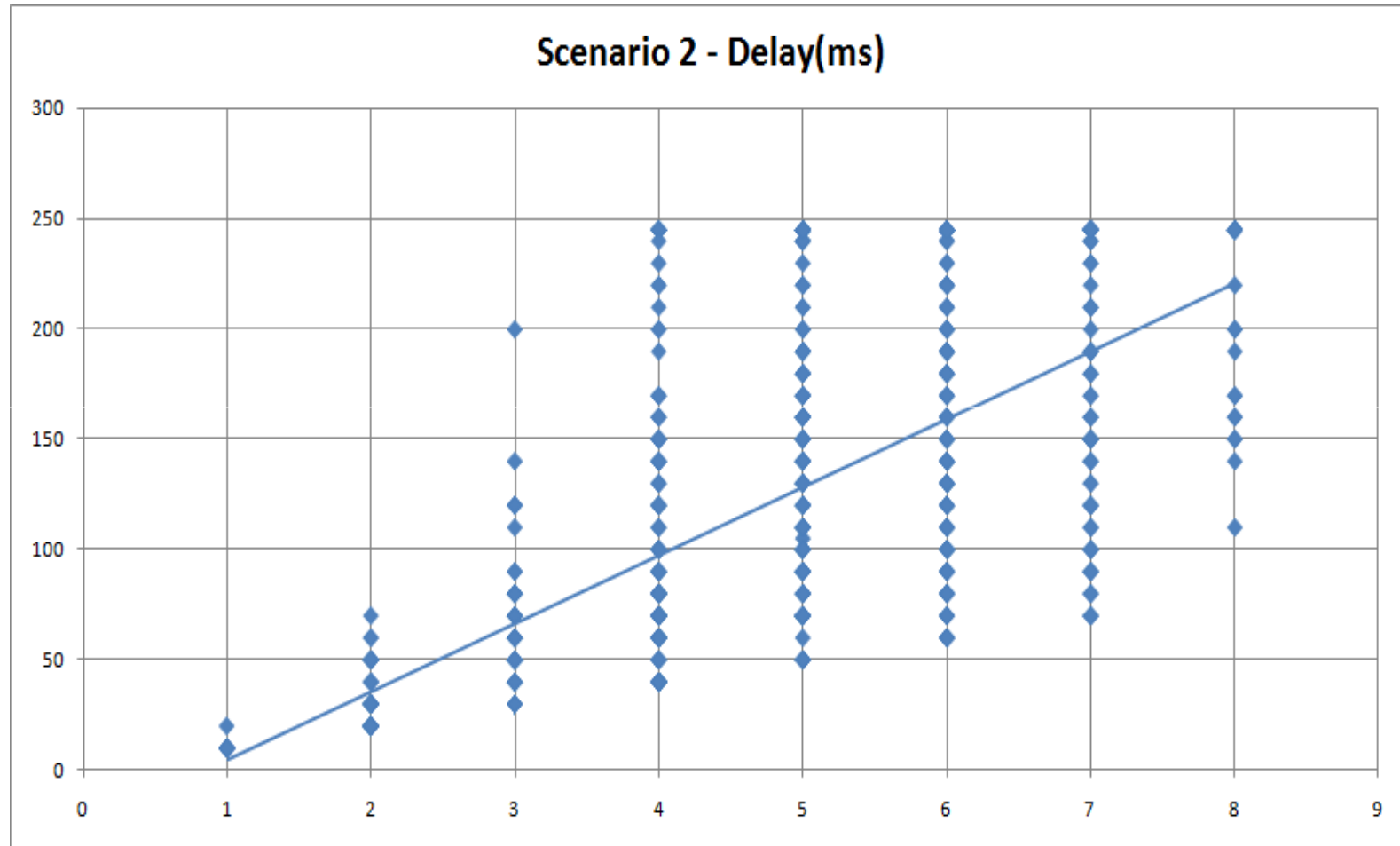
- Interested in **Delay vs. Time** and **Delay vs. Distance**
 - 1. Original Antnet
 - Baseline
 - 2. GPS-Assisted Antnet
 - 2.5. GPS-Assisted Antnet, $V=0.01$
 - Modified routing decision algorithm
 - Rely more on GPS information compared to previous
 - 3. Full GPS Routing
 - Use **ONLY**GPS information and route toward destination
 - Best-case scenario

SIMULATION RESULTS – Antnet Only



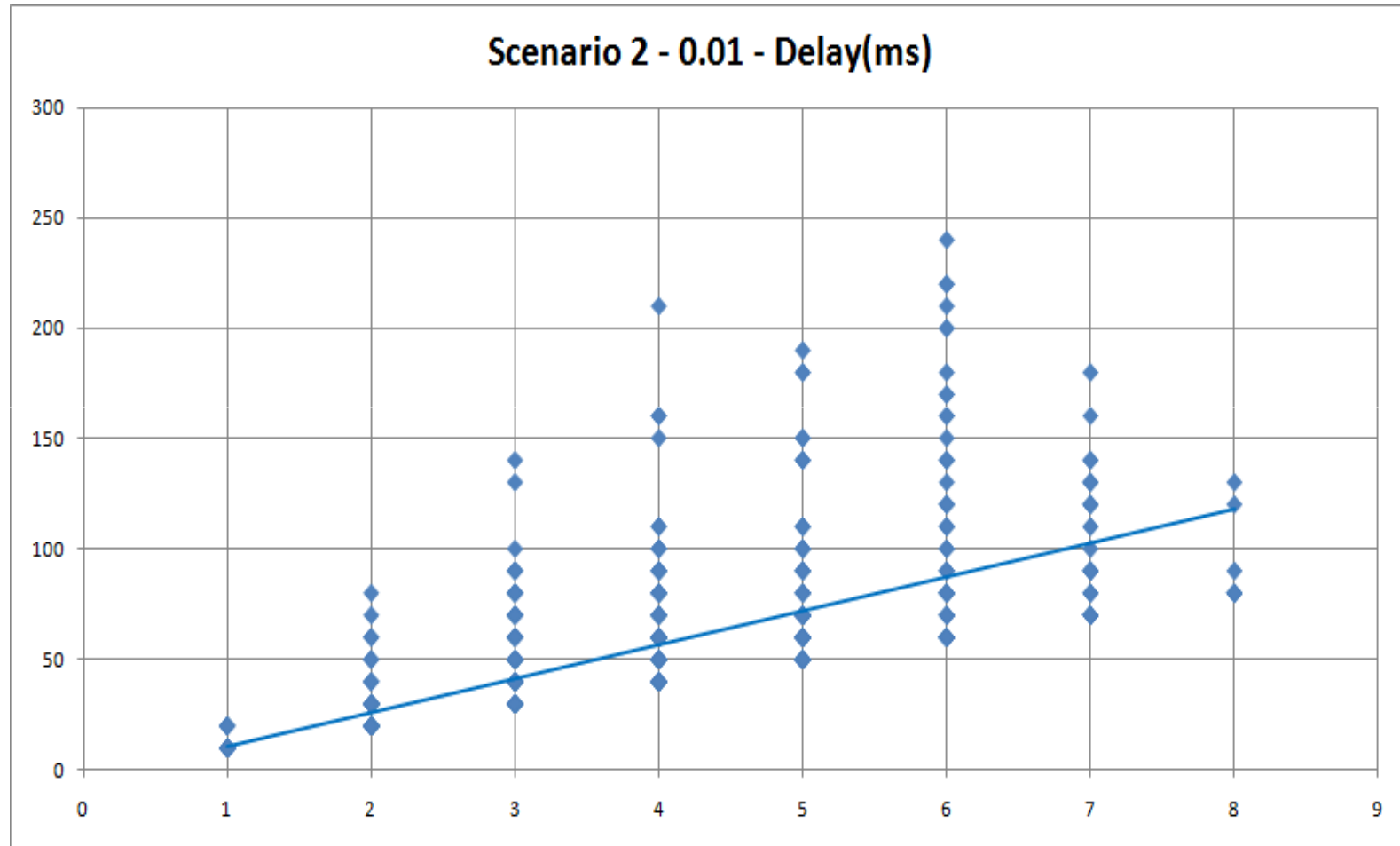
Average Delay – 131.15ms

SIMULATION RESULTS – Antnet with GPS



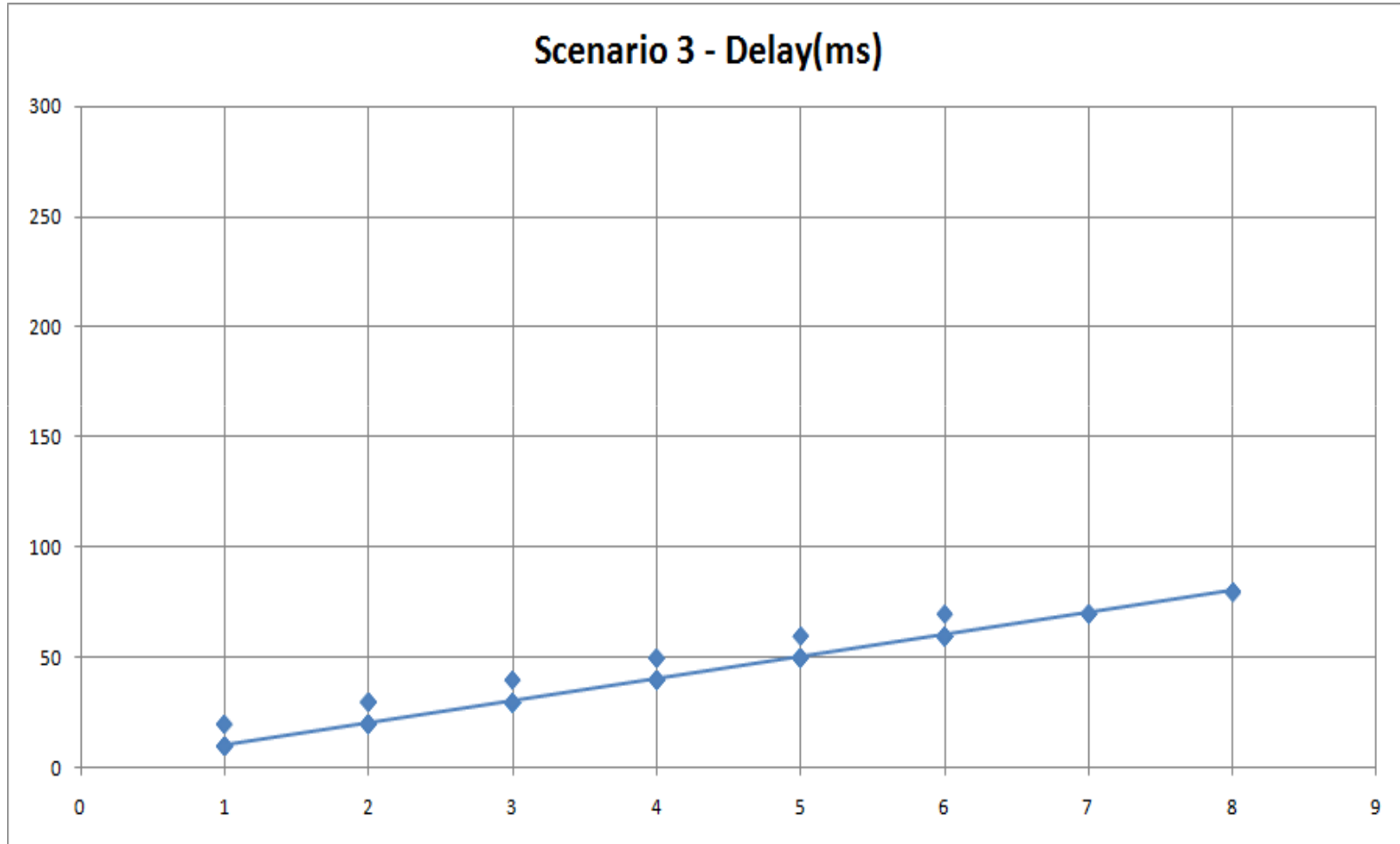
Average Delay – 117.80ms

SIMULATION RESULTS – Antnet with GPS, $V = 0.01$



Average Delay – **53.06ms**

SIMULATION RESULTS – GPS only



Average Delay – **34.06ms**



DISCUSSION OF RESULTS

- Results were as expected
- As V approaches I , the routing solution converges to the ideal
- It is possible to use Antnet with GPS, reducing end-to-end delay by about 10%.



FUTURE WORK

- Different Topology
 - More nodes
 - A bottle-necked link
- Wireless links instead of Wired
 - Enable mobile nodes
- Mobile Nodes
 - Varying GPS coordinates
- Add GPS communication on packet
 - Current nodes know all GPS coordinates

REFERENCES

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QUESTIONS?

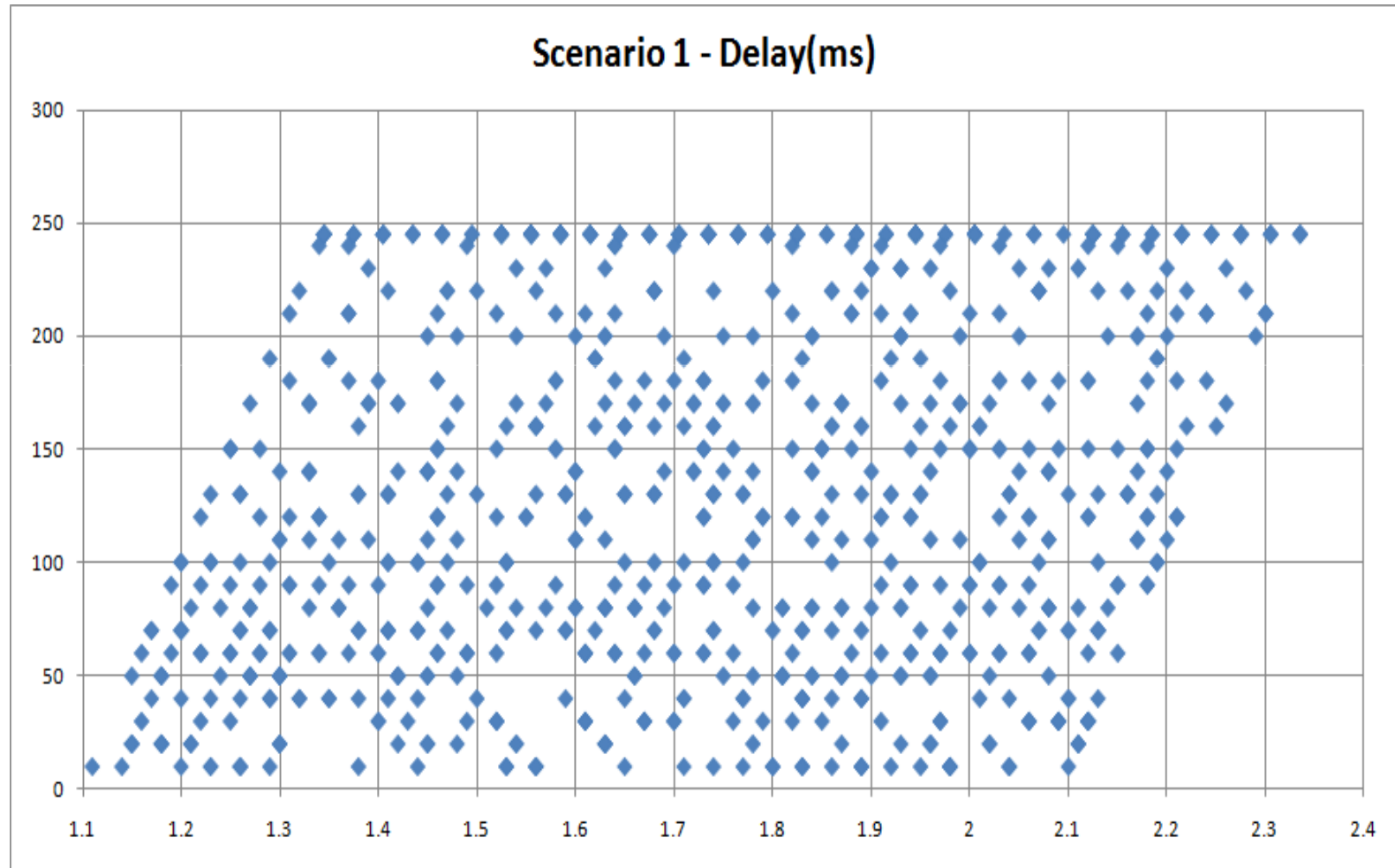




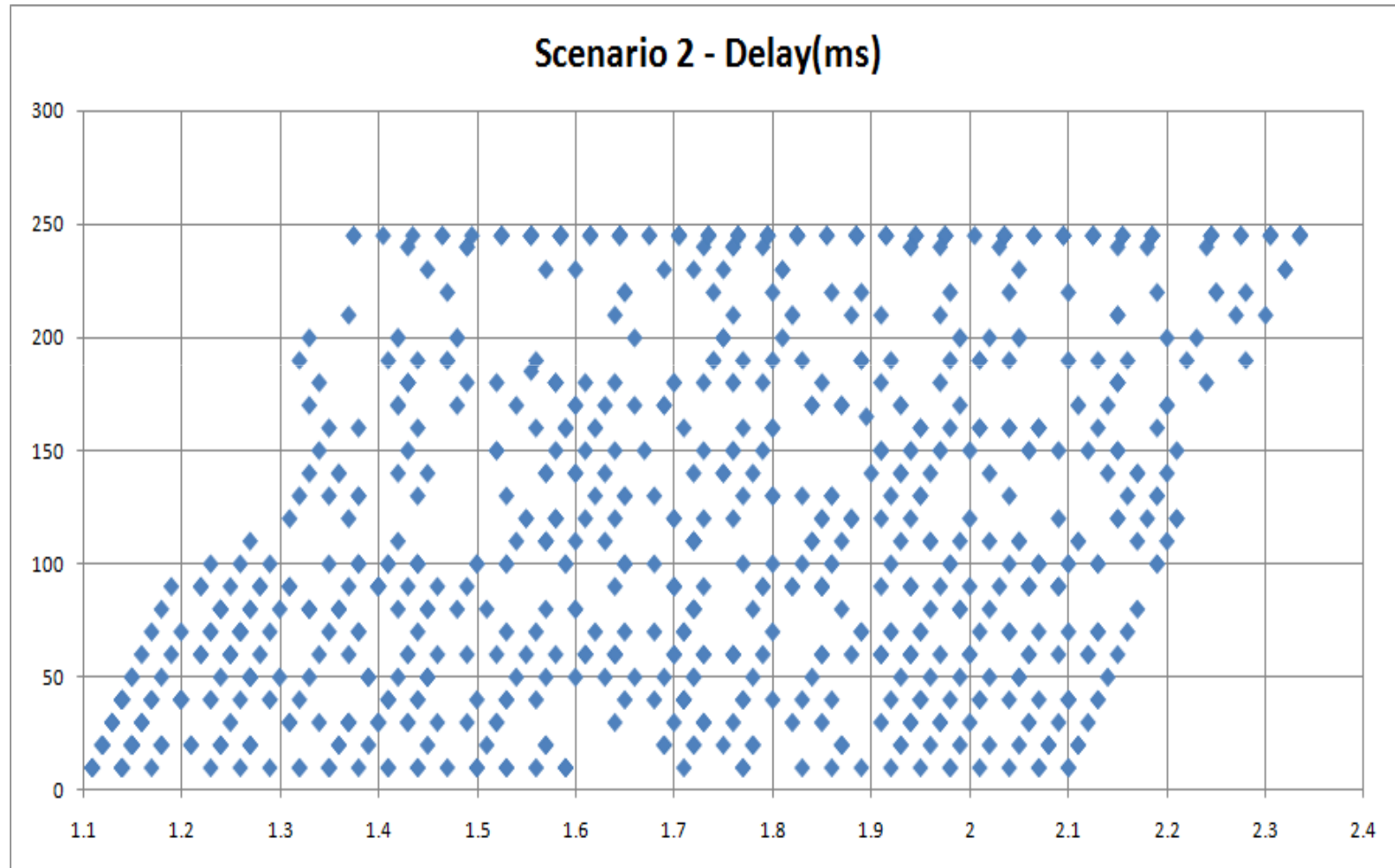
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- **Simulation Results (vs. Time)**
 - [Scenario 1](#)
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SIMULATION RESULTS – Scenario I Delay



SIMULATION RESULTS – Scenario 2 Delay



SIMULATION RESULTS – Scenario 3 Delay

