ENSC 835: HIGH PERFORMANCE NETWORKS
CMPT 885: SPECIAL TOPICS: HIGH PERFORMANCE NETWORKS

FINAL PROJECT PRESENTATION

SPRING 2006

COMPARATIVE ANALYSIS OF WIRELESS ROUTING PROTOCOLS USING NS-2

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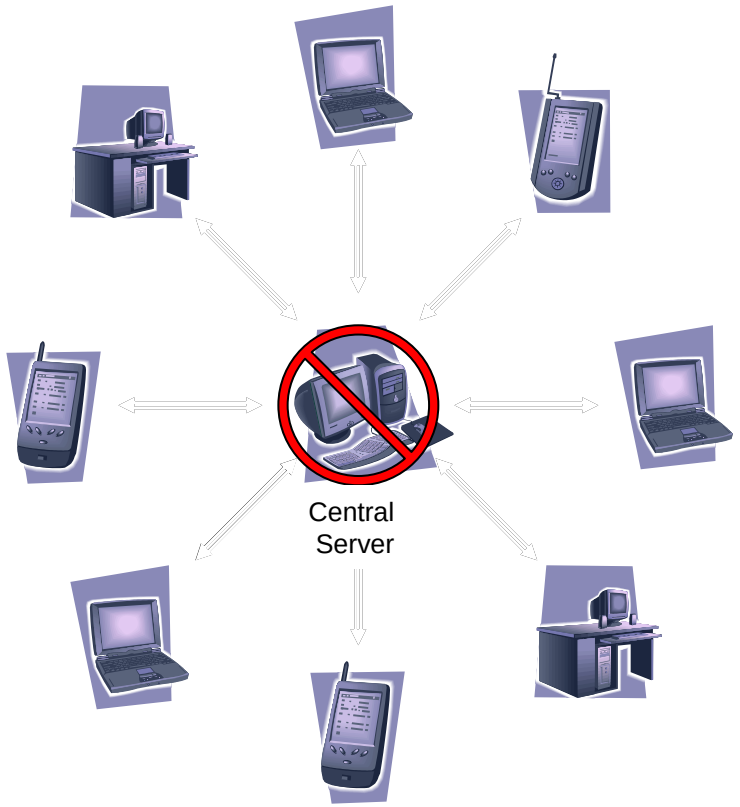
Presentation Overview

- Introduction
  - Motivation
  - Routing Protocol Overview
- Project Overview
  - Process Flow
- Project Simulation
  - Simulation parameters
  - Simulation metrics
- Analysis
  - Comparative Analysis
  - Individual Analysis
- Conclusion/Questions

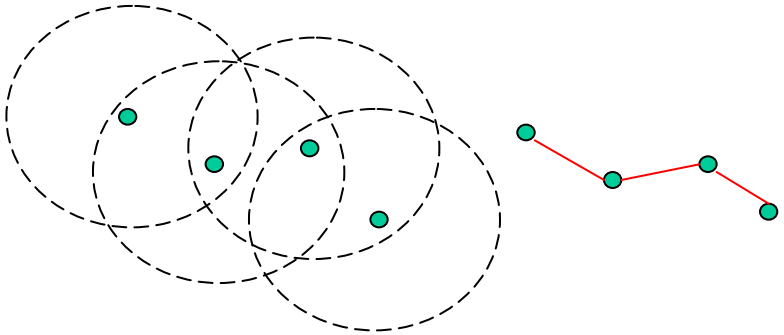
Introduction

- Traditional Centralized Topology
  - **Advantages:**
    - Simplistic
    - Secure
  - **Disadvantages:**
    - Scalability
    - Fault-tolerance



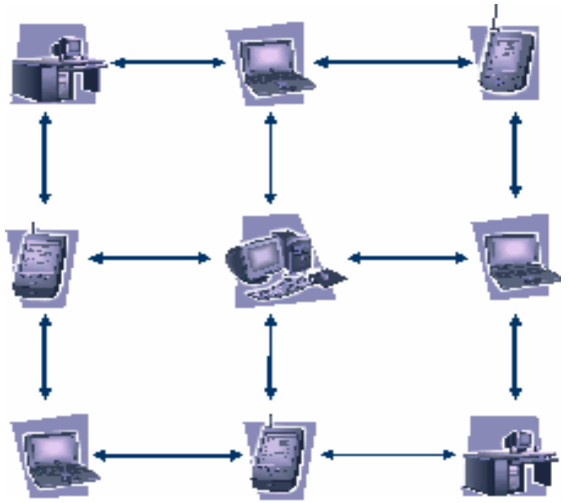
Introduction

- **Distributed Topology**
  - Lack of central server for storage/routing
  - Each node is both a *server* and a *client*
  - Messages routed by intermediary nodes



Introduction

- **Routing extremely important**
- **Many types depending on user criteria**
  - Simplicity, low overhead, minimize dropped packet … etc
- **AODV, DSDV and DSR**

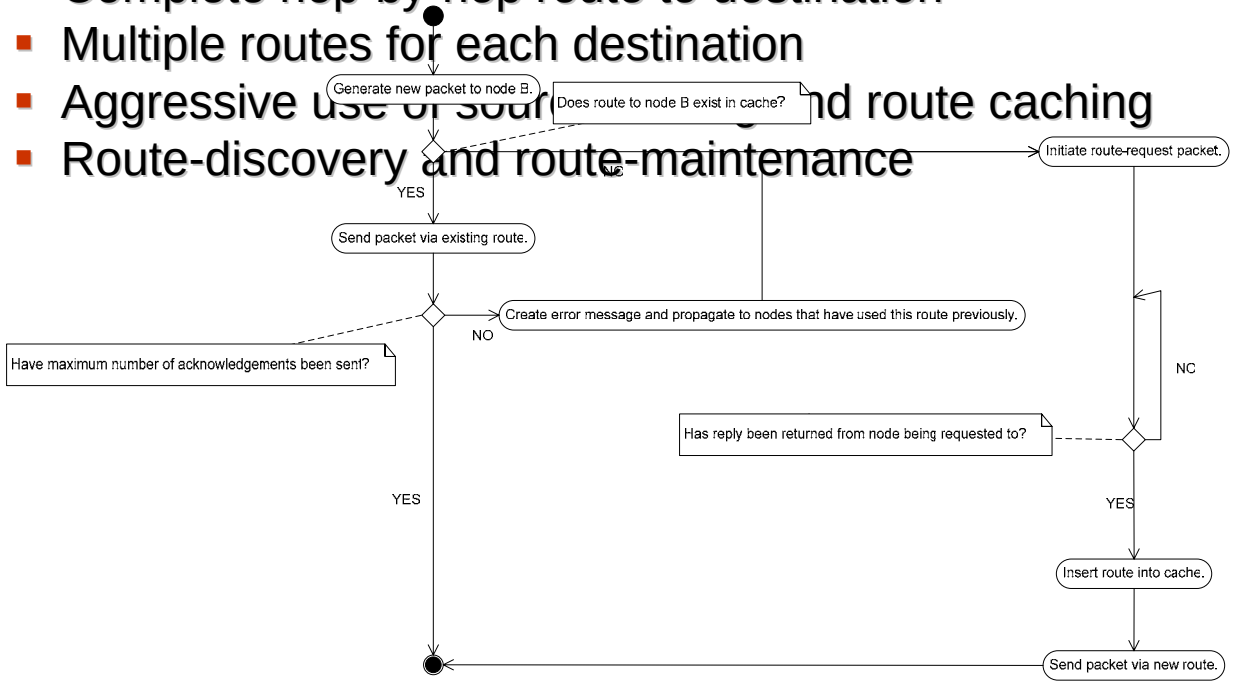


Protocols Overview - DSDV

- **Destination-Sequenced Distance Vector Routing**
  - Extension of Bellman-Ford (shortest path between two points)
  - Routing table list all available destinations, hops and sequence numbers
  - Seq. # avoids loops
  - Node periodically send out routing tables

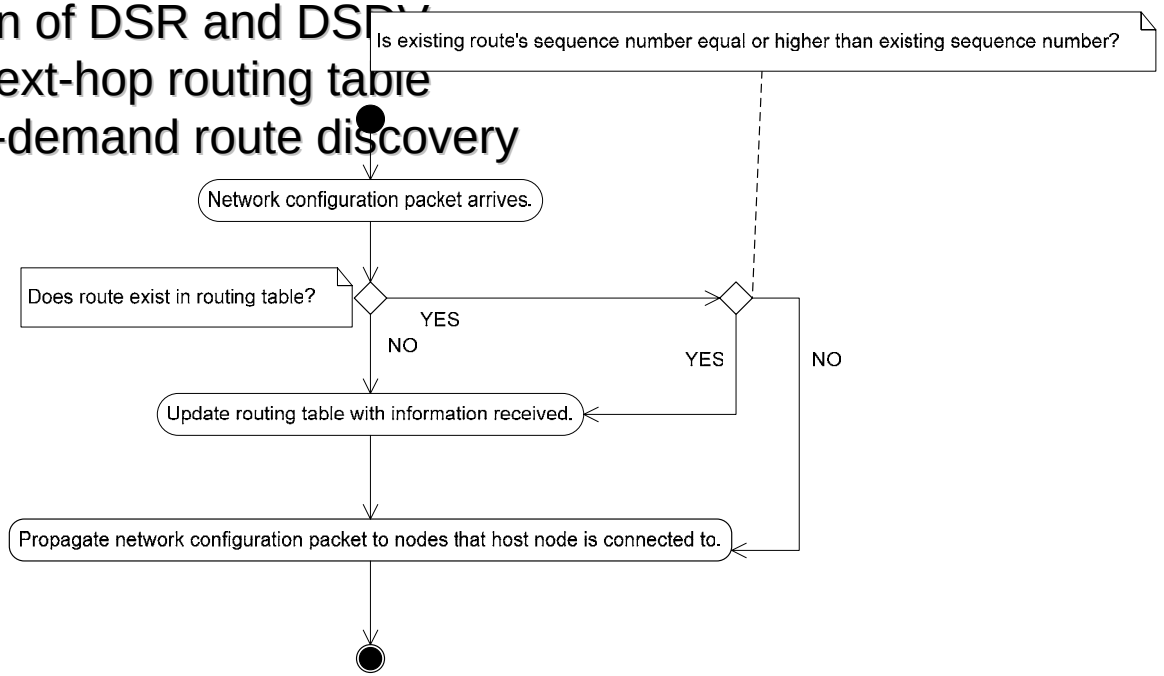
Protocols Overview - DSR

- **Dynamic Source Routing**
  - Complete hop-by-hop route to destination
  - Multiple routes for each destination
  - Aggressive use of sour[illegible]nd route caching
  - Route-discovery and route-maintenance



Protocols Overview - AODV

- **Ad-Hoc On-Demand Distance Vector Routing**
  - Combination of DSR and DSDV
  - DSDV → Next-hop routing table
  - DSR → On-demand route discovery



Protocols Overview - Summary

	DSDV	AODV	DSR
Node Overhead	Medium	Medium	High
Network Overhead	High	Medium	Low
Route Mechanism	Route Table with next hop	Route Table with next hop	Complete routes cached
Route Discovery	Periodic	On-Demand	On-Demand

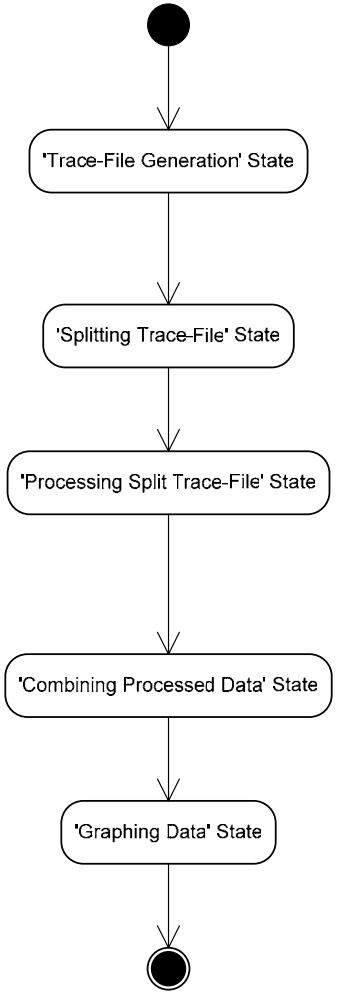
Project Overview

- **Implemented in ns-2**
- **Simulation of Wireless Distributed System (WDS)**
- **Wireless package developed by CMU**

- **Variables**
  - Routing Protocols x 3
  - Number of Nodes x 3
  - Pause time (mobility) x 3

- **Initially wanted to simulate larger network → > 1000 nodes**
- **27 trace files → > 1.5 Gb**
- **Processed with Pentium IV 2 GHz → > 72 hours**
- **Memory issue → aborted prematurely**

Project Overview



State	Purpose of State
Trace-file generation	To generate trace-file
Splitting trace-file	To divide the trace-file into smaller pieces
Processing split trace-file	To process each individual trace-file piece
Combining processed data	To combine the processed data of each trace-file piece
Graphing data	To graph processed data

Project Simulation

Variable Parameters

	Number of Nodes	Pause Time (sec)
AODV	20, 60, 100	1, 50, 100
DSDV	20, 60, 100	1, 50, 100
DSR	20, 60, 100	1, 50, 100

Fixed Parameters

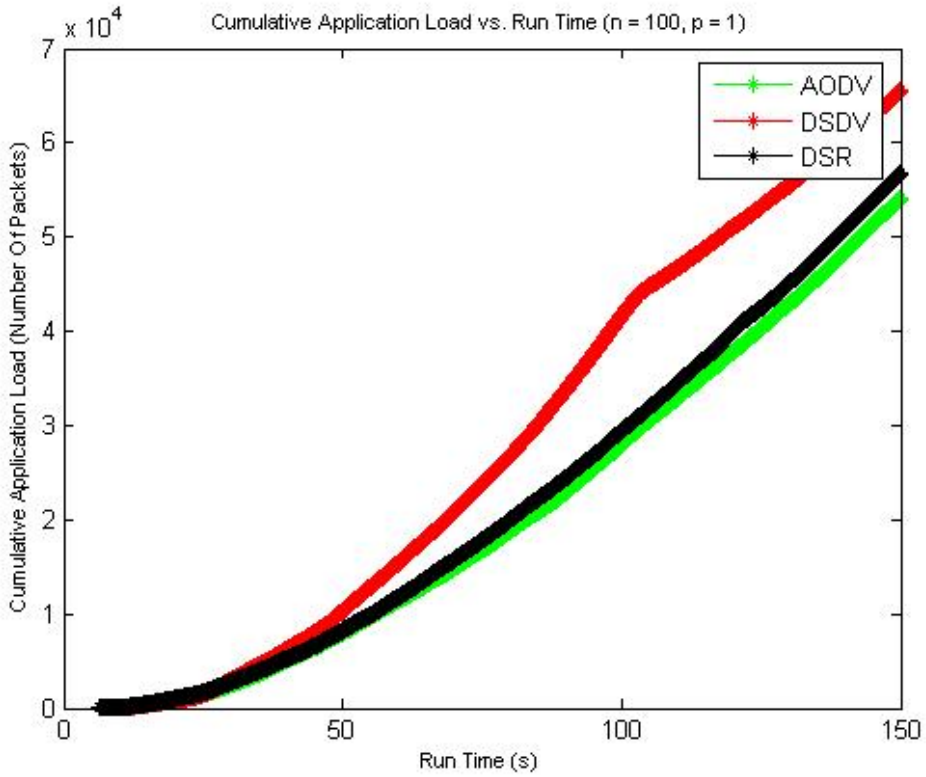
General Topology	
X-Boundary	1000 meters
Y-Boundary	1000 meters
Simulation Time	150 seconds
Node Movement	
Maximum Speed	5 m/s
Traffic Generation	
Traffic Type	Constant Bit Rate (CBR)
Maximum Connections	½ of number of nodes
Rate	5 kbps

Project Simulation - Metrics

- **Application Load**
  - The total number of sent messages and forwarded messages (application-related)
- **Dropped Load**
  - The total number of dropped messages (application-related)
- **Received Load**
  - The total number of received messages (application-related)
- **Routing Load**
  - The total number of sent messages and forwarded messages (routing-related)

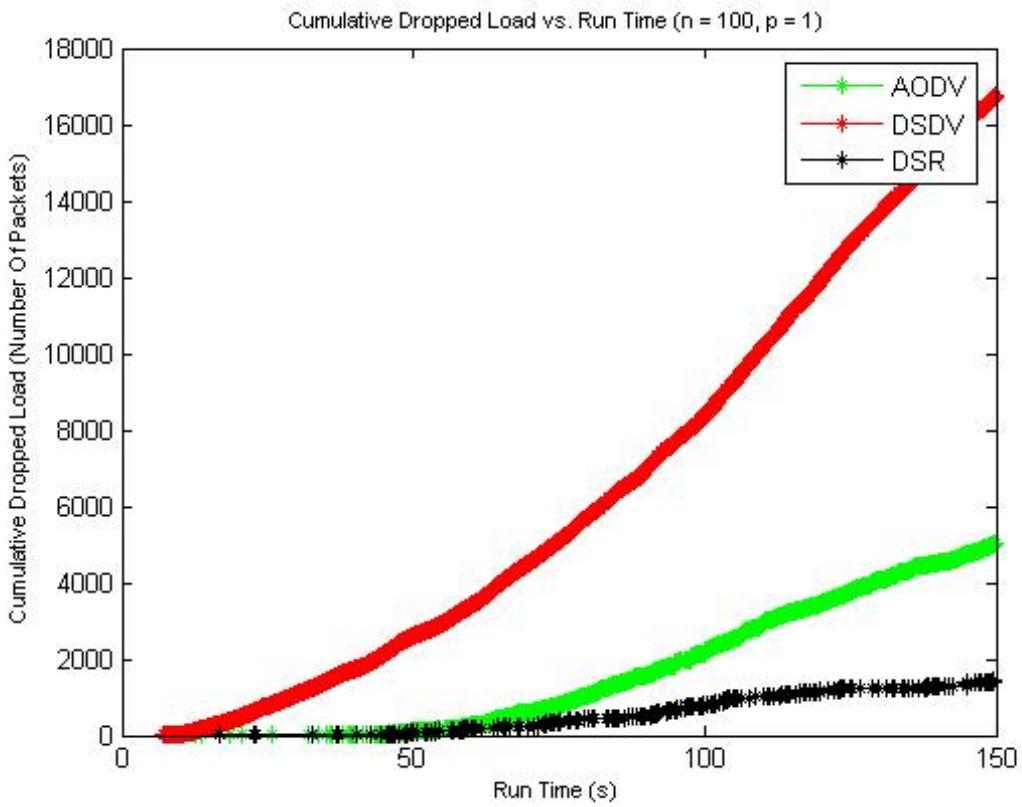
Analysis – Application Load

	High (N)	Low (N)
High (P)	AODV / DSR	DSDV
Low (P)	AODV / DSR	DSDV



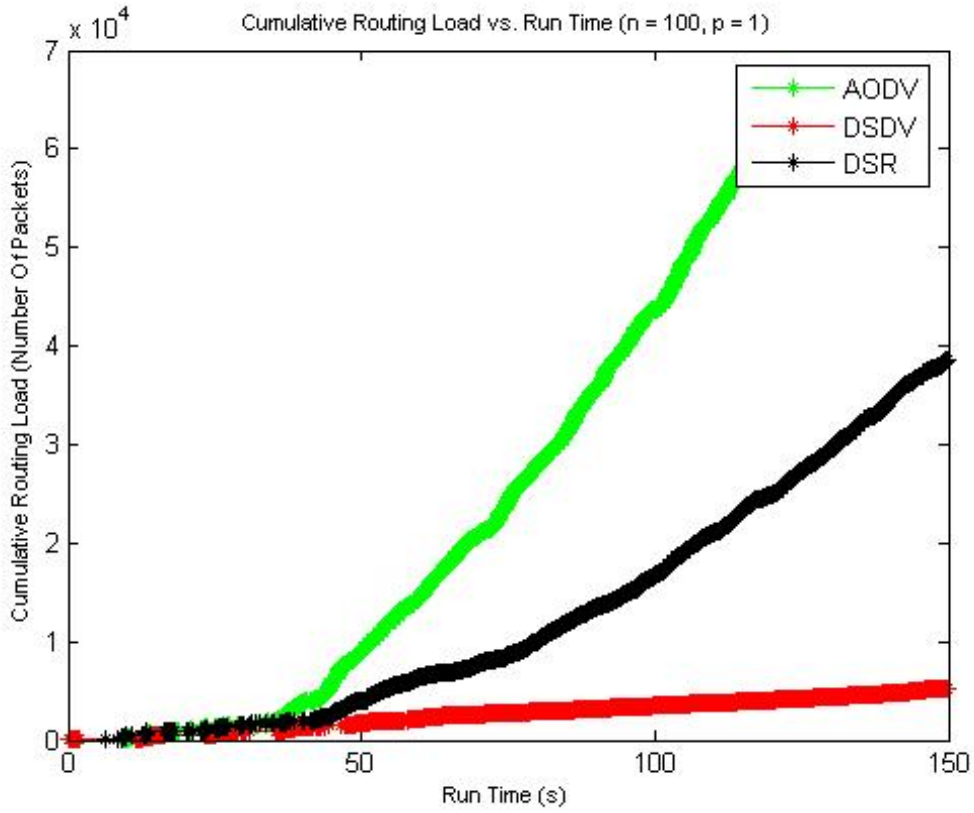
Analysis – Dropped Load

	High (N)	Low (N)
High (P)	AODV / DSR	AODV / DSR
Low (P)	AODV / DSR	AODV / DSR

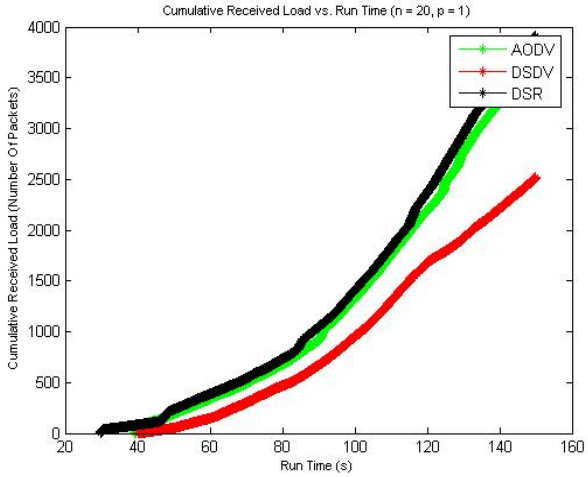


Analysis – Routing Load

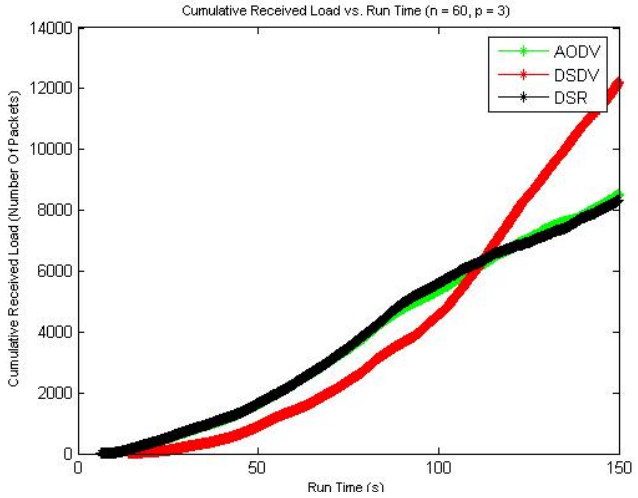
	High (N)	Low (N)
High (P)	DSDV	DSDV
Low (P)	DSDV	DSDV

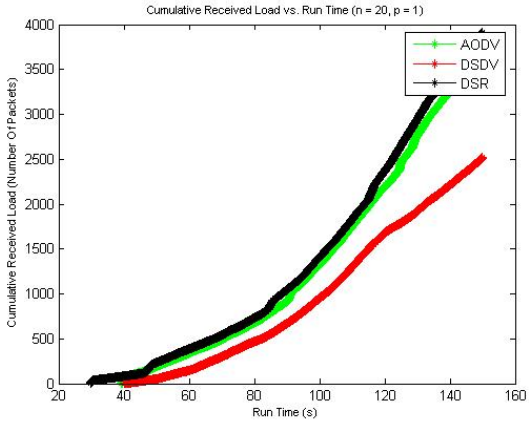


Analysis – Received Load

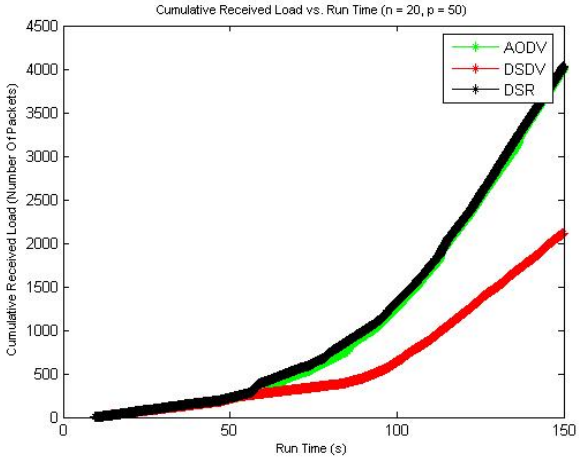


Node Variance



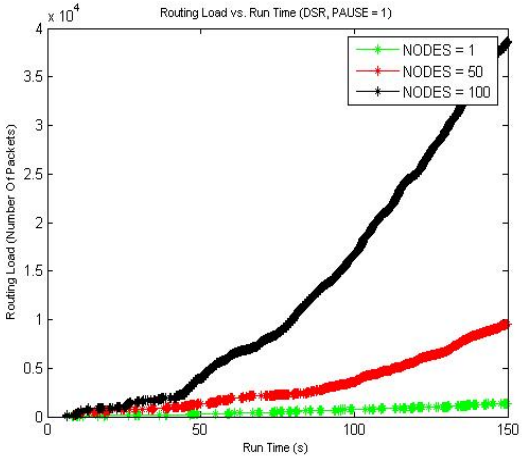


Pause Variance

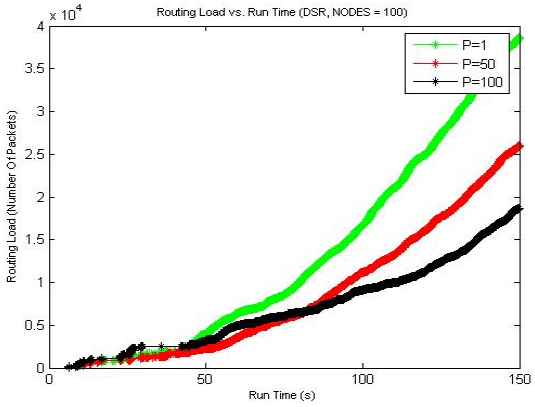


Analysis - DSR

- **Routing Load**

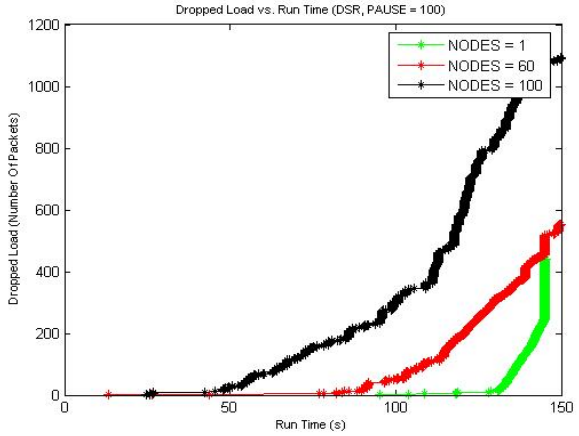


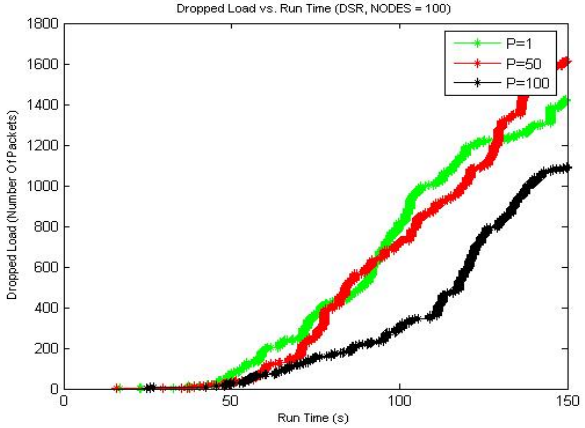
Node Variance



Pause Variance

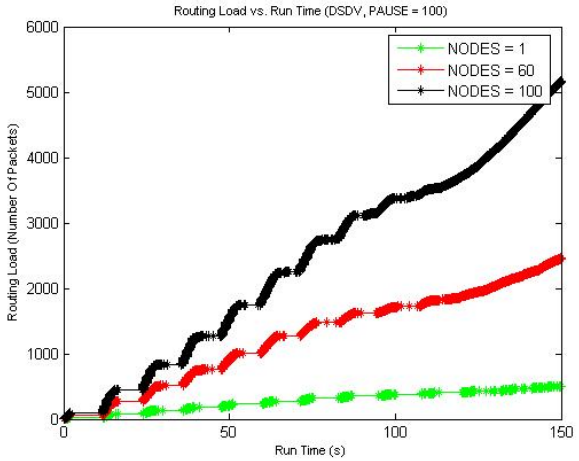
- **Dropped Load**



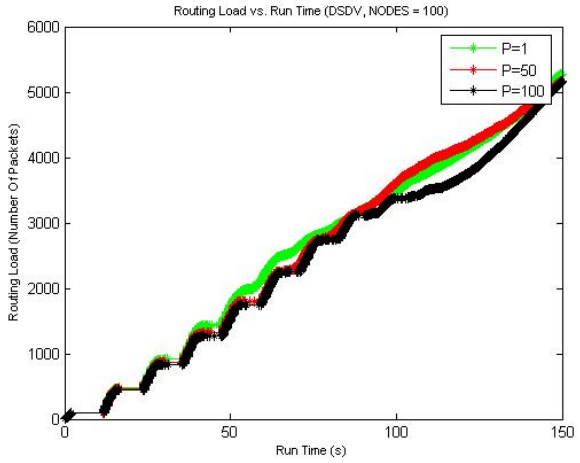


Analysis - DSDV

- **Routing Load**

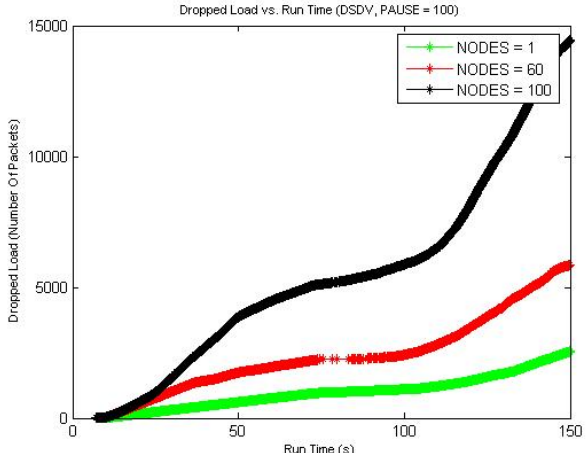


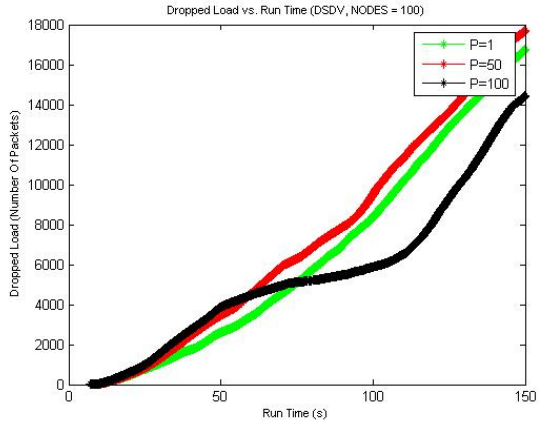
Node Variance



Pause Variance

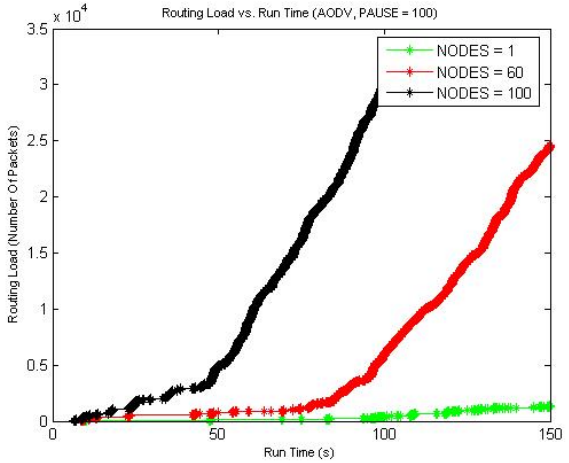
- **Dropped Load**



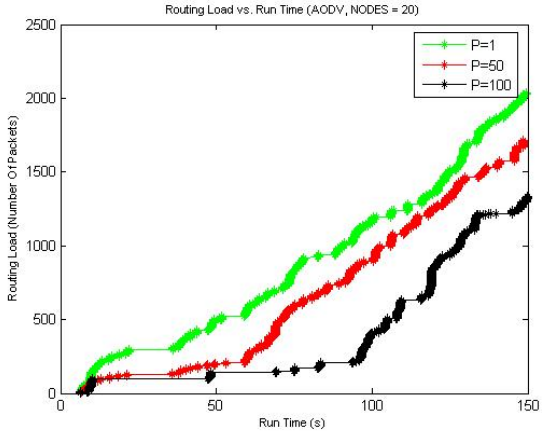


Analysis - AODV

- **Routing Load**

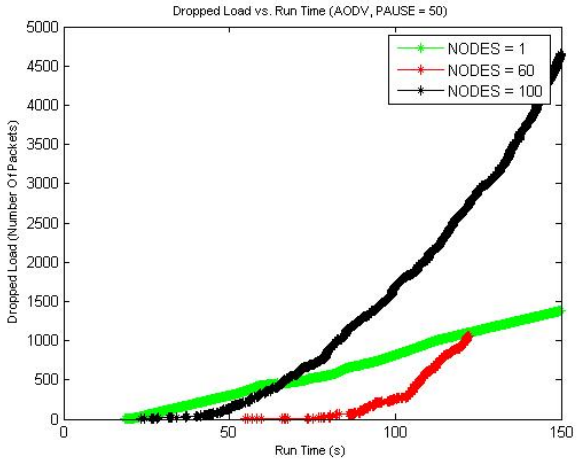


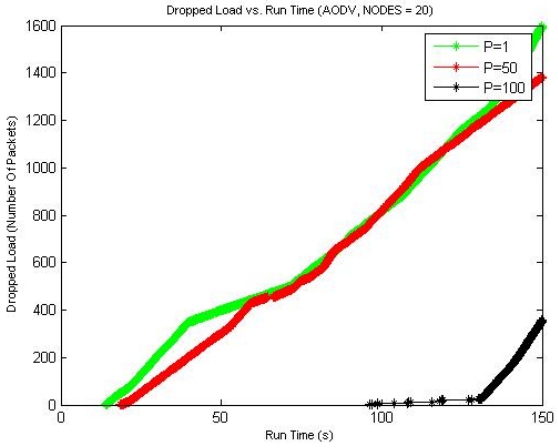
Node Variance



Pause Variance

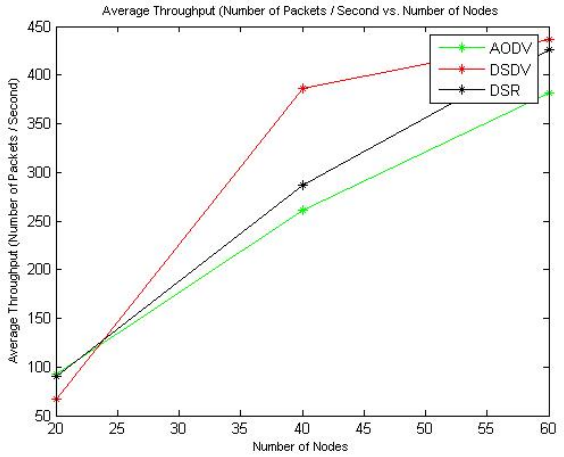
- **Dropped Load**



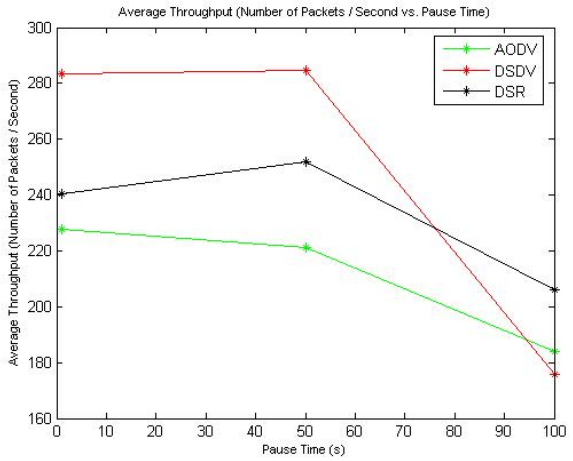


Analysis – Throughput

Node Variance

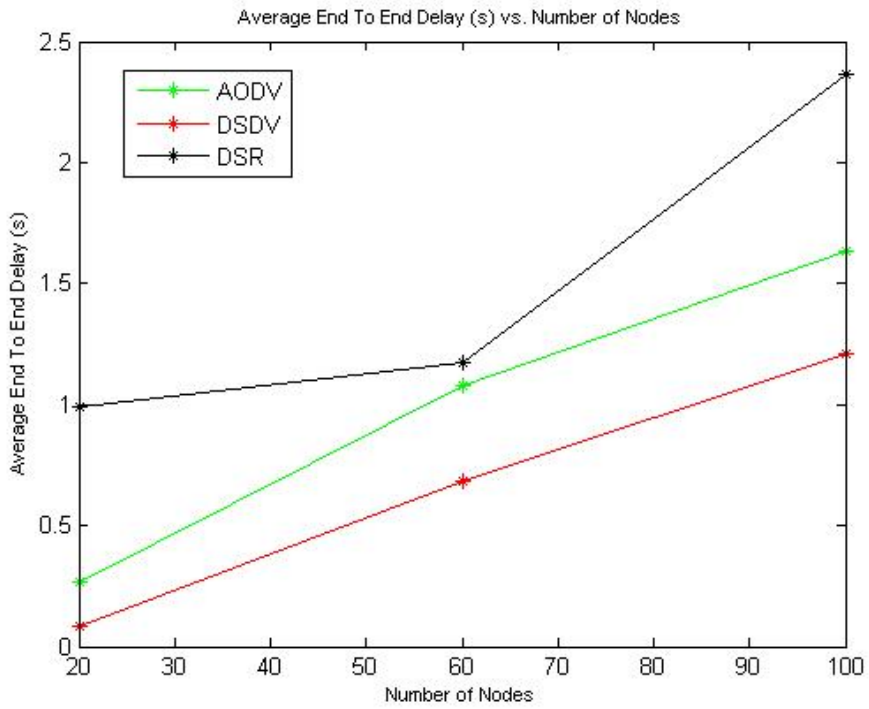


Pause Variance



Analysis – End-To-End Delay

Node Variance



Summary

- **Motivation**
  - Decentralized framework is better than a centralized framework
  - Efficient routing is required
  - Compared AODV, DSDV, DSR in ns-2
- **Simulation parameters**
  - Varying nodes, pause time, and routing protocols
- **Performance metrics**
  - Application load, dropped load, received load, routing load

Summary

- **Best Case / Worst Case:**
  - Application load
  - Dropped load
  - Routing load

	High (N)	Low (N)
High (P)	AODV / DSDV / DSR	AODV / DSDV / DSR
Low (P)	AODV / DSDV / DSR	AODV / DSDV / DSR

References

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Q & A?