



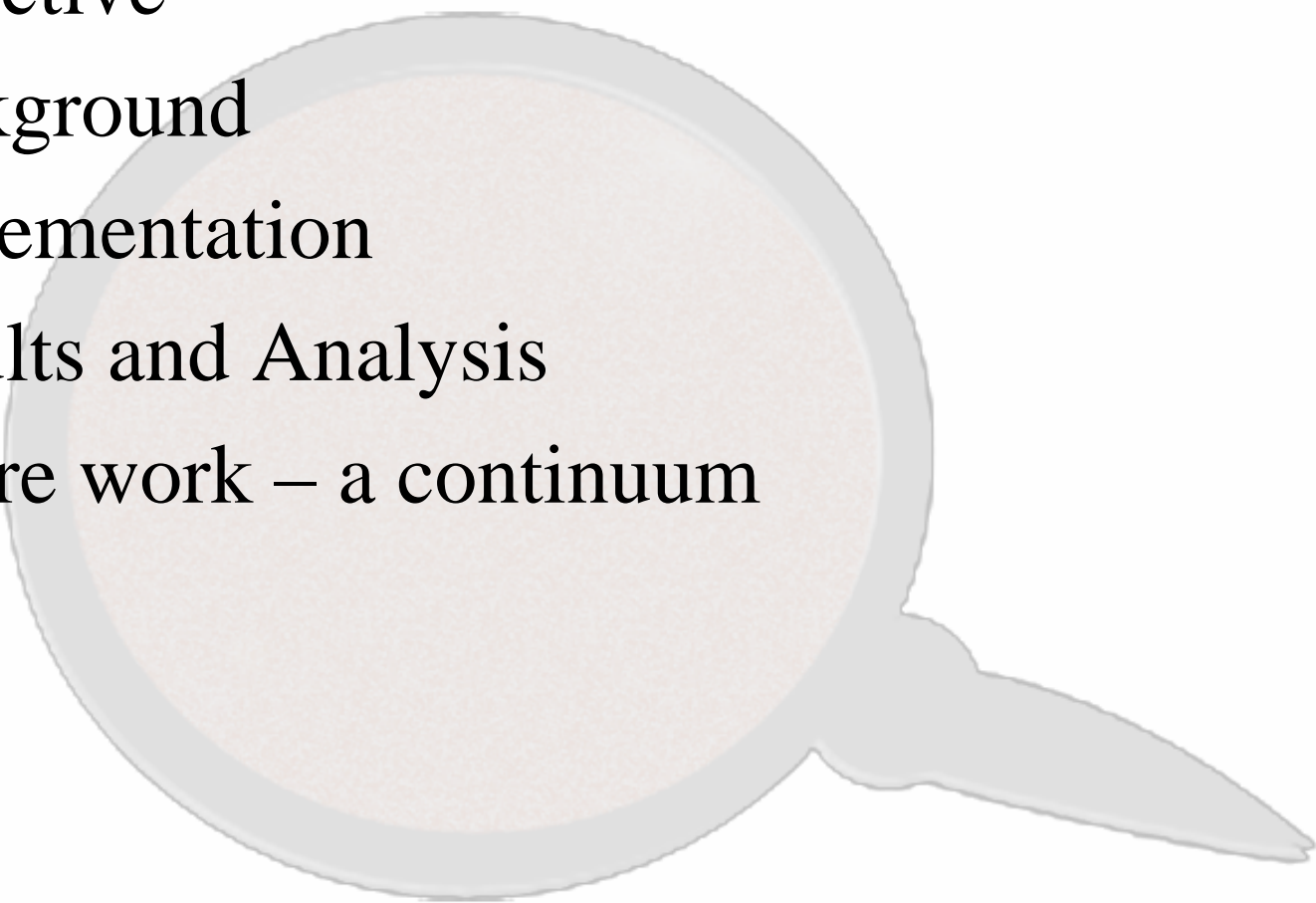
Research Consortium in Speckled Computing

# Analysis of MANET Algorithms on Wireless Sensor Networks

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# Outline of the Presentation

- Objective
  - Background
  - Implementation
  - Results and Analysis
  - Future work – a continuum
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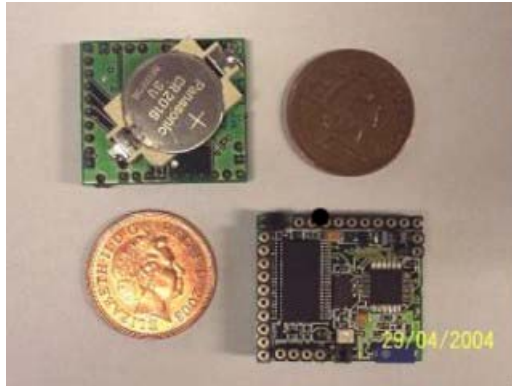
# Objective

- Requirements for Mobile Ad hoc Network (MANET) routing algorithms radically different.
  - Weaker power and size constraints.
- *Aims:*
  - Implement selected MANET algorithms on Wireless Sensor Networks (WSN).
  - Analyse suitability and performance.

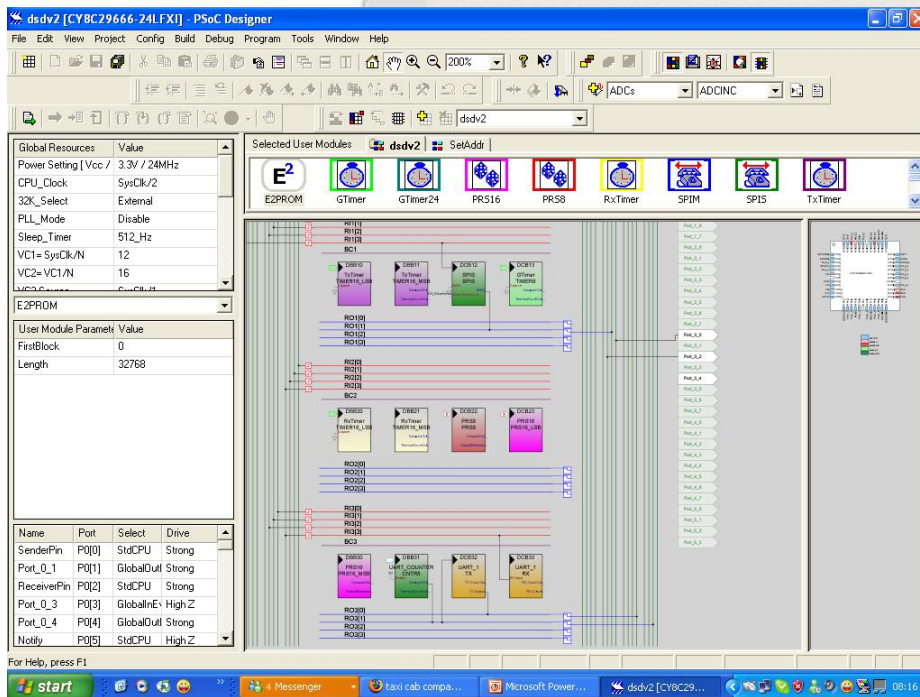
# Background

- Routing Algorithms:
  - To transmit packets across nodes in a network.
  - Can be *proactive* or *reactive*.
- Proactive algorithms require large network capacity for routing table maintenance. *Eg: Distance Vector Algorithms*
- Reactive algorithms have long route construction delays. *Eg: Ad hoc On-Demand Vector (AODV) routing*
- *Hybrid algorithms* combine features of proactive and reactive. *Eg: Zone Routing Protocol.*

# Background (contd.)



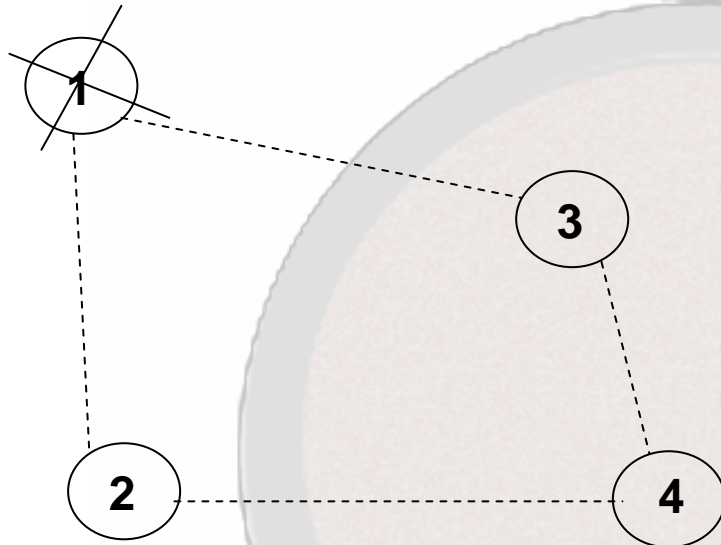
- Programmable Specks over Zigbee Radio (*ProSpeckz IIK*) used.
  - Programmable System on Chip (*PSoC*).
  - 2 Kbytes RAM.
  - 32 Kbytes ROM.
  - 802.15.4 compliant radio.
- PSoC Designer IDE used.



# Routing Algorithms chosen

- Destination Sequenced Distance Vector (DSDV) routing.
- Ad hoc On demand Distance Vector (AODV) routing.
- Zone Routing Protocol (ZRP).
- DSDV implementation and analysis complete.

# DSDV



- Proactive DV based Routing algorithm.
- Sequence Numbers used.
- Priority for higher sequence numbers.
  - Avoids routing loops.
  - Avoids count to infinity problem

N	H	S
1	2	4
2	1	2
3	1	2

N	H	S
1	$\infty$	5
2	1	4
3	1	4

# Implementation

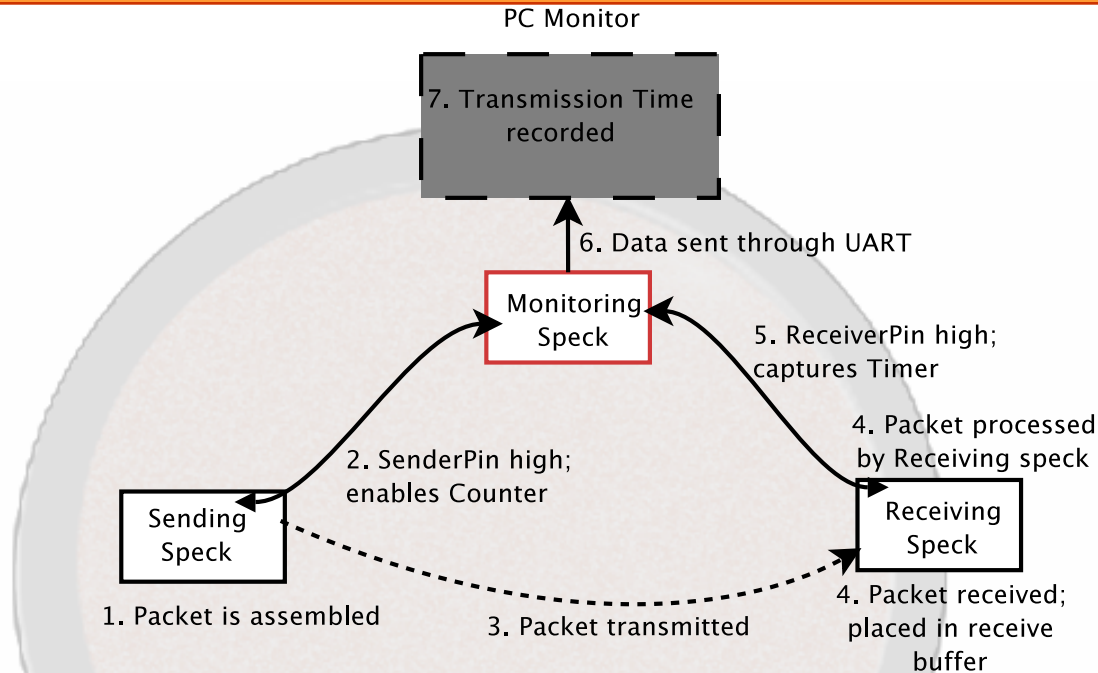
- SpeckMAC-D used in MAC sublayer.
- Packets
  - Hello Packets (transmitted every 1 second)
  - Incremental Routing Update (IRU) packet (every 20 seconds)
  - Data Packets (used for analysis)
  - Acknowledgement Packets (used for analysis)
- 77% of ROM and 22% of RAM used

Byte	0	1
7	<i>Data</i>	<i>Cmd</i>
6		<i>Wake-up</i>
5		<i>Ack</i>
4	<i>Hello</i>	<i>Routing</i>
3		
2		
1		
0		

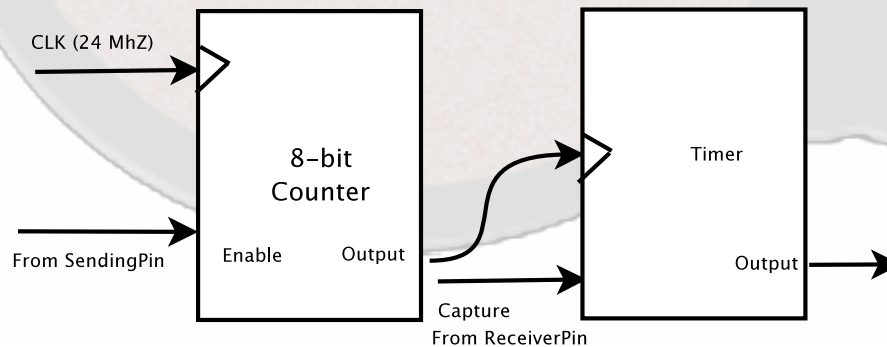
# Analysis

- Metrics used:
  - Transmission Time
  - Delivery Ratio
  - Tx/Rx On-time
- What results may indicate?
  - Performance of DSDV on WSNs.
  - Power efficiency.

# Transmission Time



(a) Steps involved in recording Transmission Time

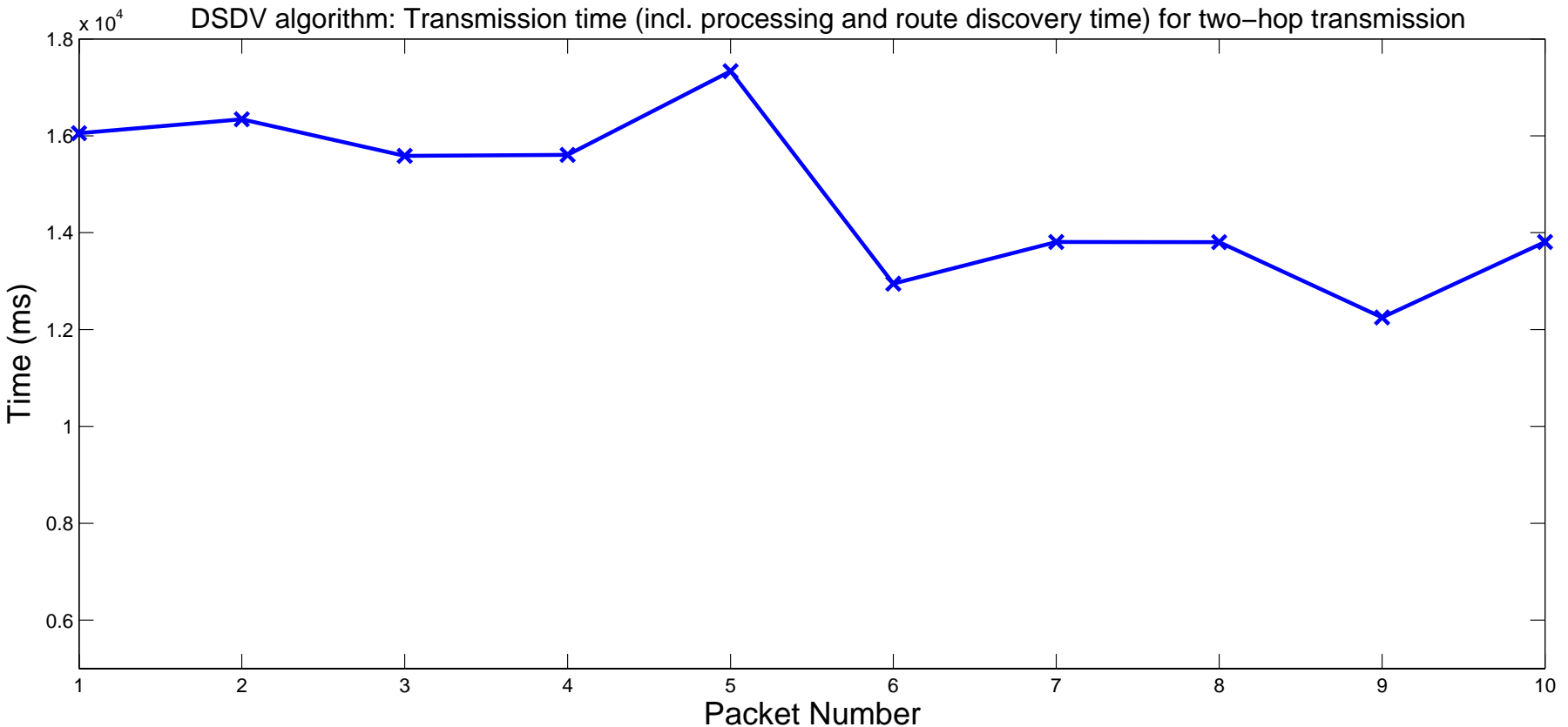


(b) Conceptual representation of the monitor speck

# Delivery Ratio and Tx/Rx On-time

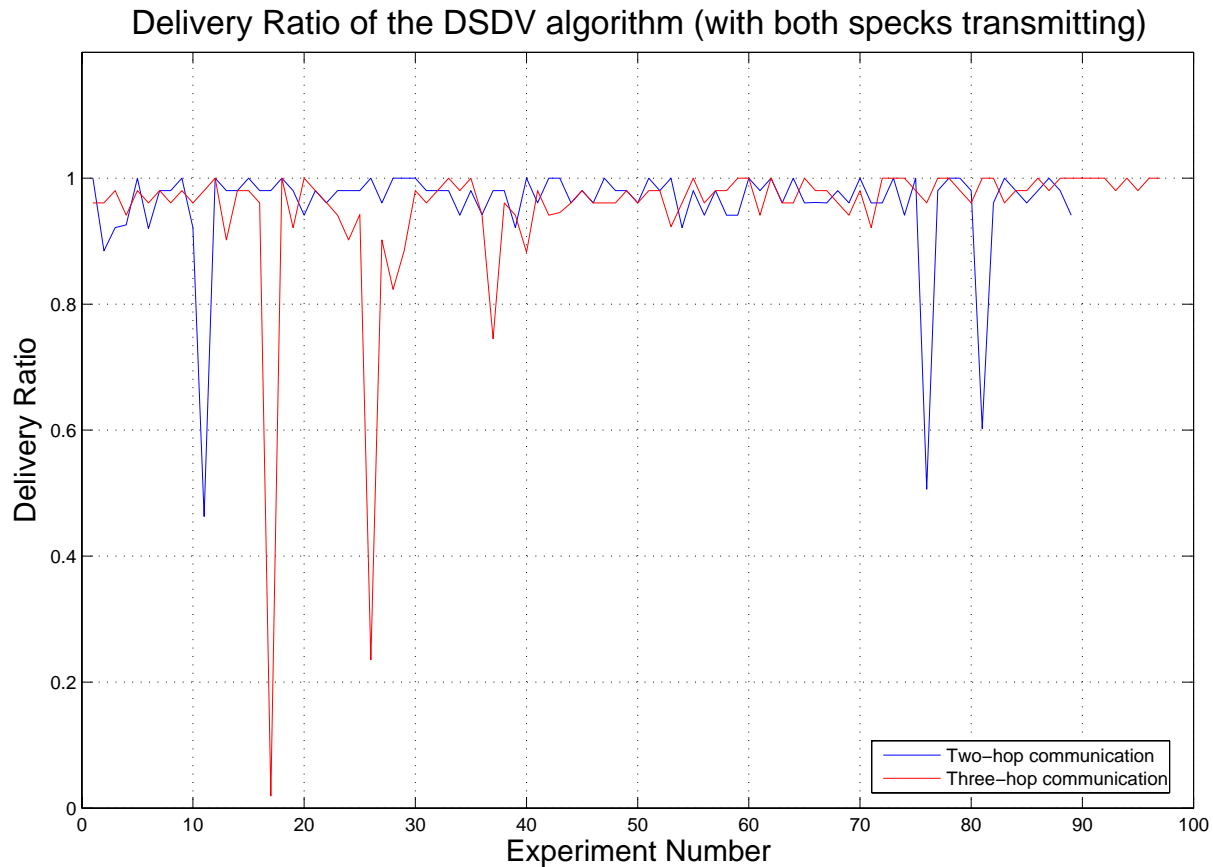
- Delivery Ratio:
  - Data Packets transmitted every second.
  - When packet with sequence number  $\geq 100$  received:
    - Receiver sends Ack packet with number received.
    - Sender calculates Delivery Ratio.
    - Sender resets sequence numbers.
- Tx/Rx On-time
  - Time transmitter/receiver on for every 60 seconds.

# Results – Transmission Time



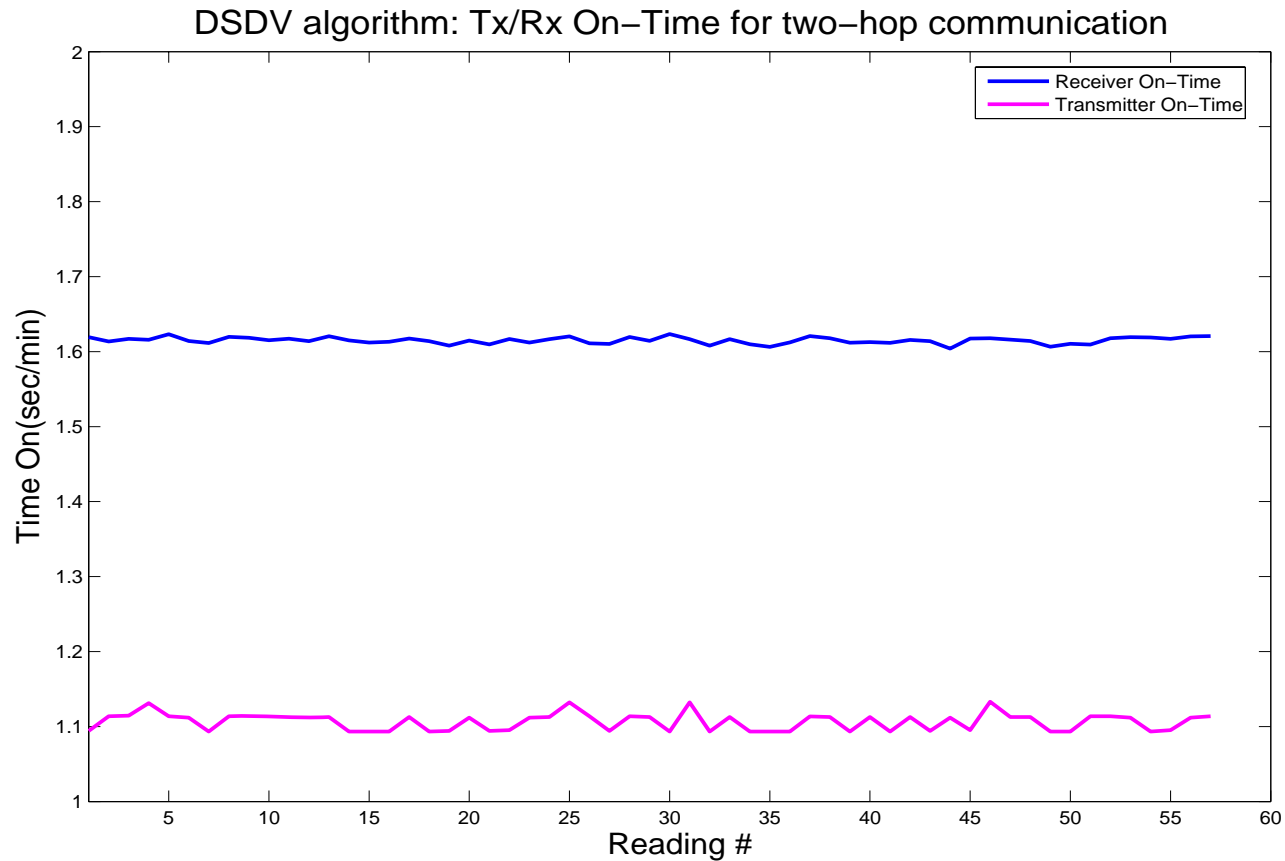
- Transmission time: 14367 milliseconds.

# Results – Delivery Ratio



- 1 hop: 99.44% (not shown)
- 2 hops: 95.87%
- 3 hops: 95.37%

# Results – Tx/Rx On-time

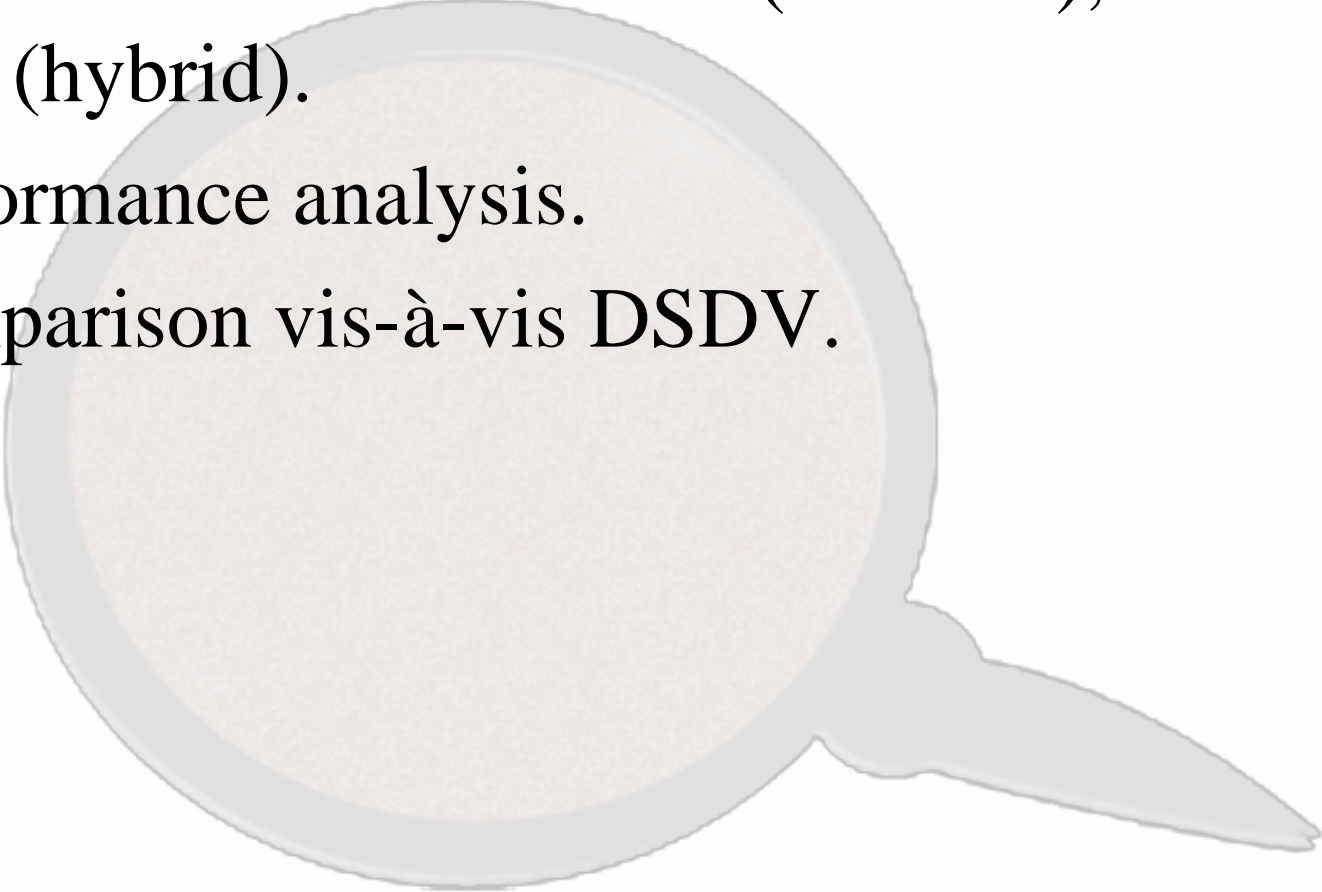


- $\leq 2\%$  for 2-hop transmission, i.e., good power conservation characteristics.

# Implications

- Routing algorithm fit into memory.
- Number of packets dropped did not dip significantly in comparison with SpeckMAC-D.
- Very low Tx/Rx On-time; i.e., good power conservation characteristics.
- DSDV is therefore suitable for use in WSNs like Specknets.

# Future Work

- Implementation of AODV (reactive), and ZRP (hybrid).
  - Performance analysis.
  - Comparison vis-à-vis DSDV.
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# Thank You!

