

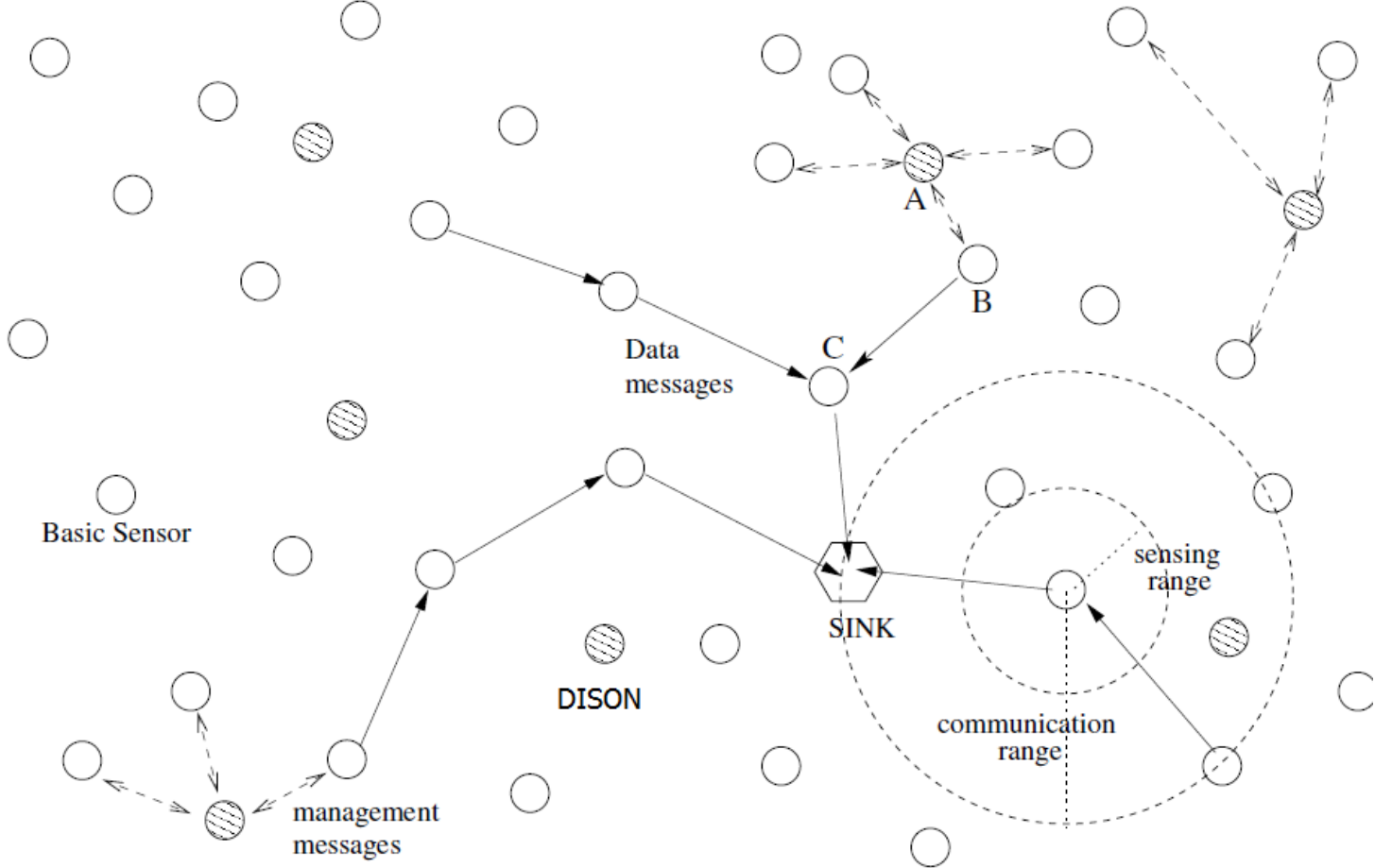
A self organizing network management framework for Wireless Sensor Networks

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Scenario



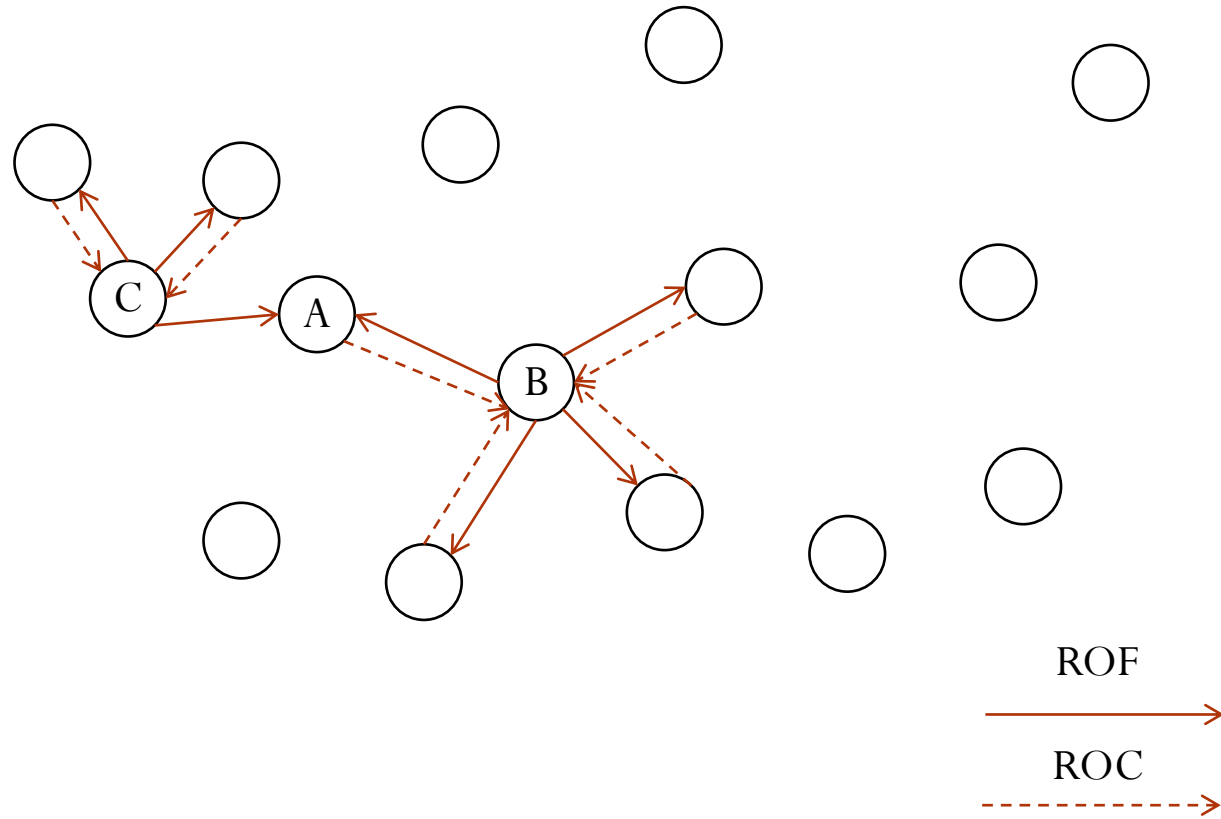
Management Protocols

- Role Election
- Collection
- Context-aware Reaction

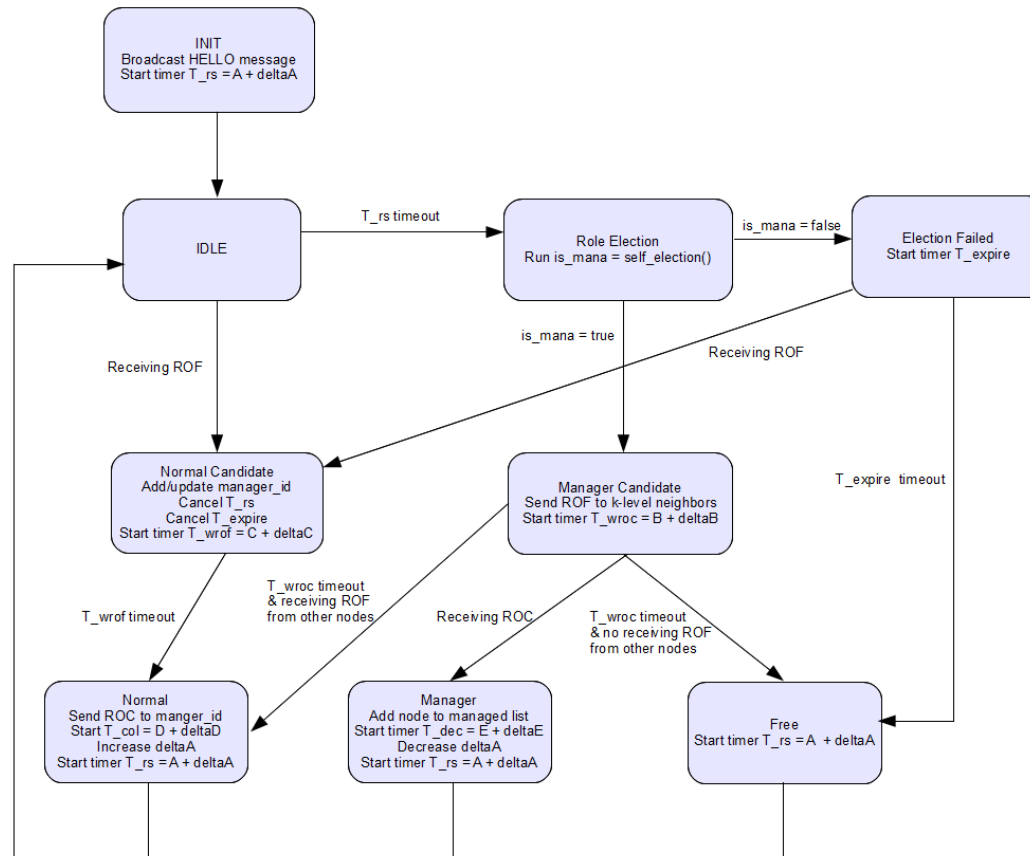
Role Election Protocol

- Self election function
 - $\text{threshold} = [w1 * Pwr + w2 * (1 - 1 / \text{NoNbr})] * w3$
 - $w1, w2, w3 < 1$
 - $w1 + w2 = 1, w1 > w2$
 - Pwr: Percent of remaining battery
 - NoNbr: number of neighbors
 - $w3$: used to adjust the number of managers in network
 - If $p < \text{threshold} \Rightarrow$ node is a candidate for manager
- Packet Types
 - Role Offer message (ROF): used to self elect as manager to other nodes
 - Role Confirm message (ROC): used to confirm that it agrees a node as its manager

Role Election Protocol



Main process of Role Election Protocol



Packet formats

- ROF
 - Message Type (4 bits)
 - Source Address (2 bytes)
 - Destination Address (2 bytes)
 - Hopcount (4 bits)
 - Threshold (4 bytes)
- ROC
 - Message Type (4 bits)
 - Source Address (2 bytes)
 - Destination Address (2 bytes)
 - Hopcount (4 bits)

Collection Protocol

- Each node i sends its information to its manager every T_i
- Collect Data (COD) message format
 - Message Type (4 bits)
 - Source Address (2 bytes)
 - Destination Address (2 bytes)
 - Location Info (8 bytes)
 - Battery Level (4 bytes)

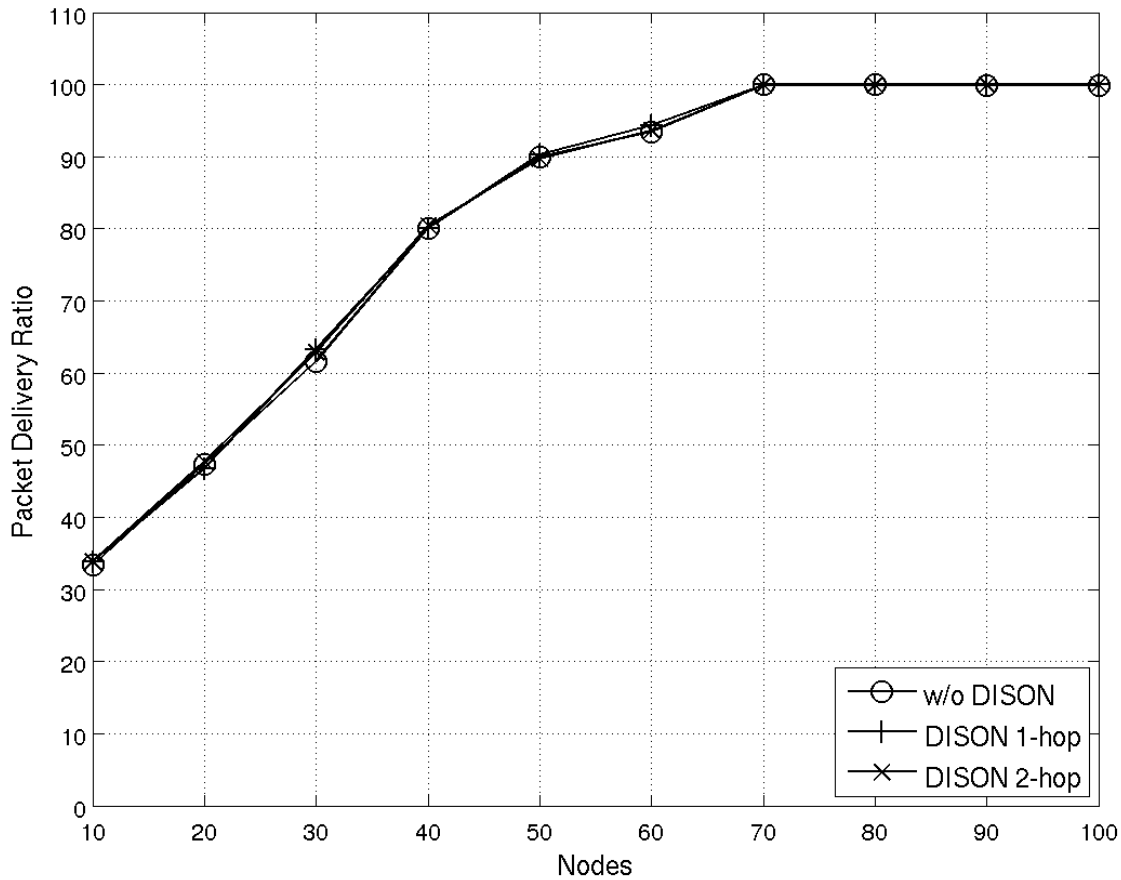
Context-aware Reaction

- Manager detects a context match event
 - Ex: redundant nodes without affecting to full sensing coverage
- Send Reaction Command (REC) message to nodes in its sub network
- Nodes receive REC, implement the command as requested
 - Ex: turn off sensing function
- REC format
 - Message Type: 4 bits
 - Command Type: 4 bits
 - Number of Reacting Nodes: 2 bytes
 - Reacting Nodes List: 2 * Number of Reacting Nodes

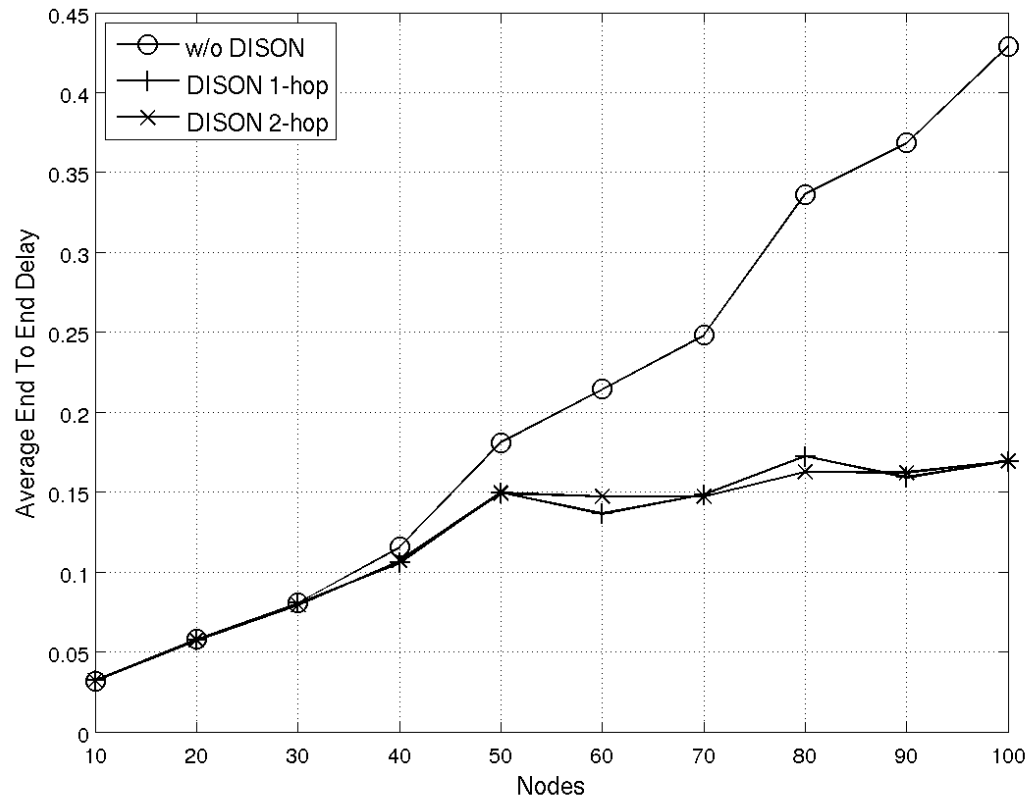
Simulation Parameters

- Area: 200 x 200 m
- Sensing radius: 25m
- Number of Nodes: 10-100
- IEEE 802.11
- Time: 3000s
- Sensing frequency 10s
- Hello frequency: 100s
- Collecting frequency: 500s
- App Packet Size: 20 bytes
- Decision frequency: 1000s
- Role Election frequency: 1500s

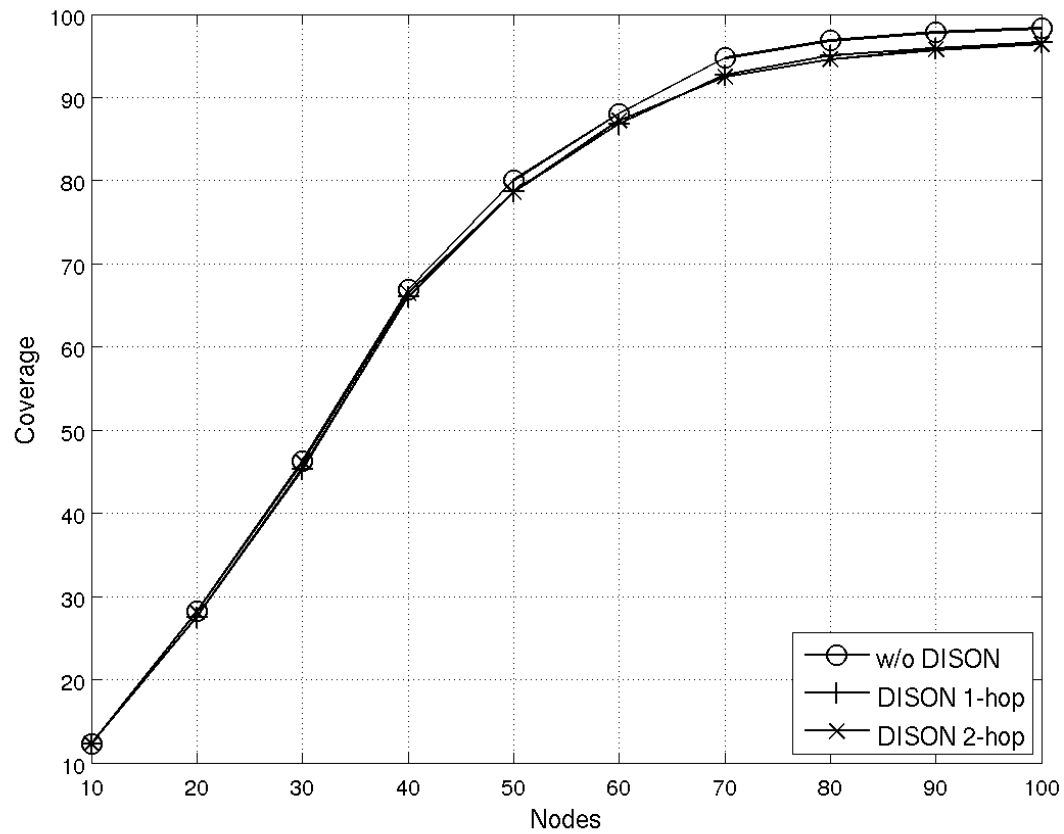
Simulation Results - Packet Deliver Rate



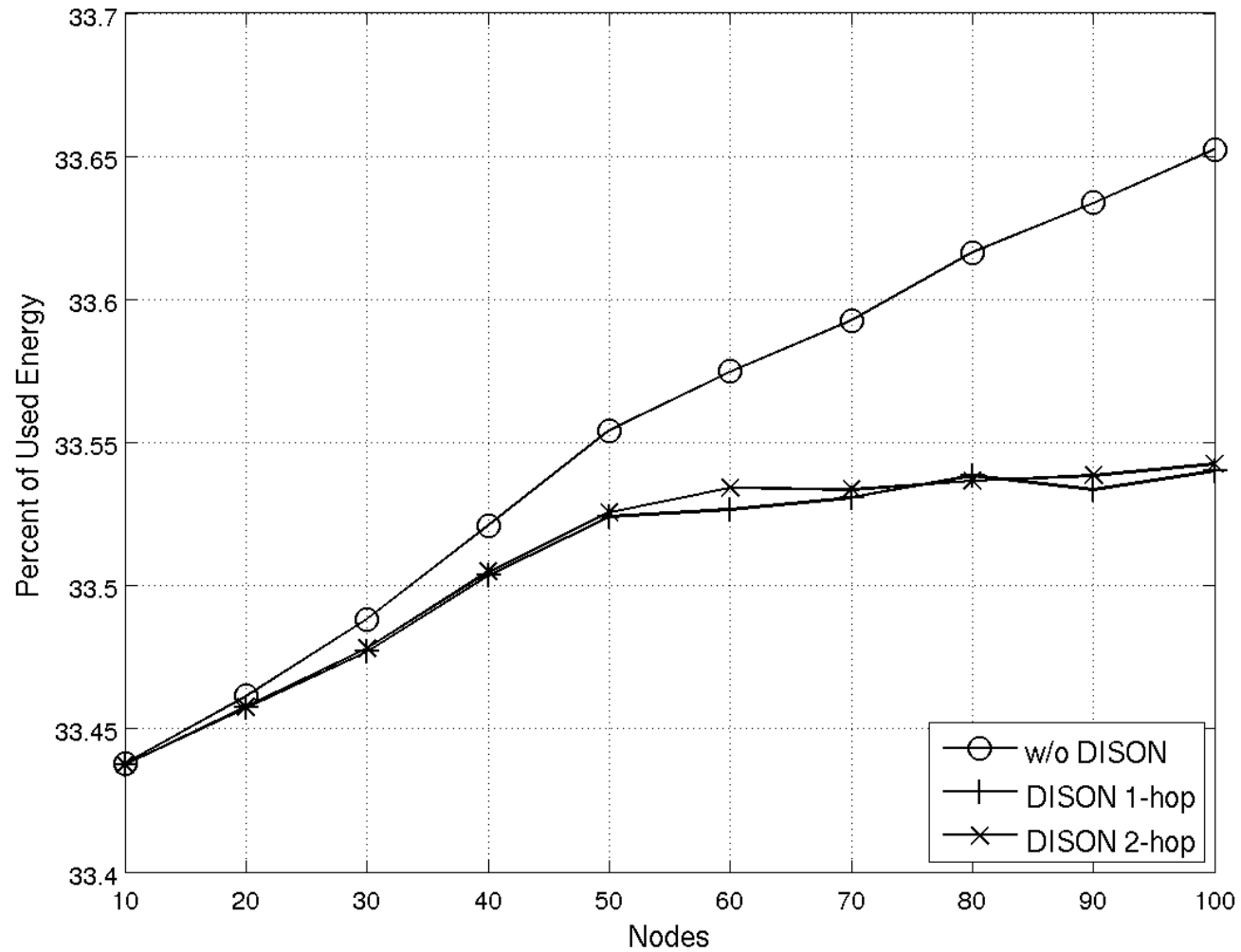
Average End to End Delay



Percent of Coverage



Percent of Used Energy



Thank you & Question