Minimum Battery Draining Rate Aware Optimized Link State Routing in Wireless Mesh Network

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Agenda

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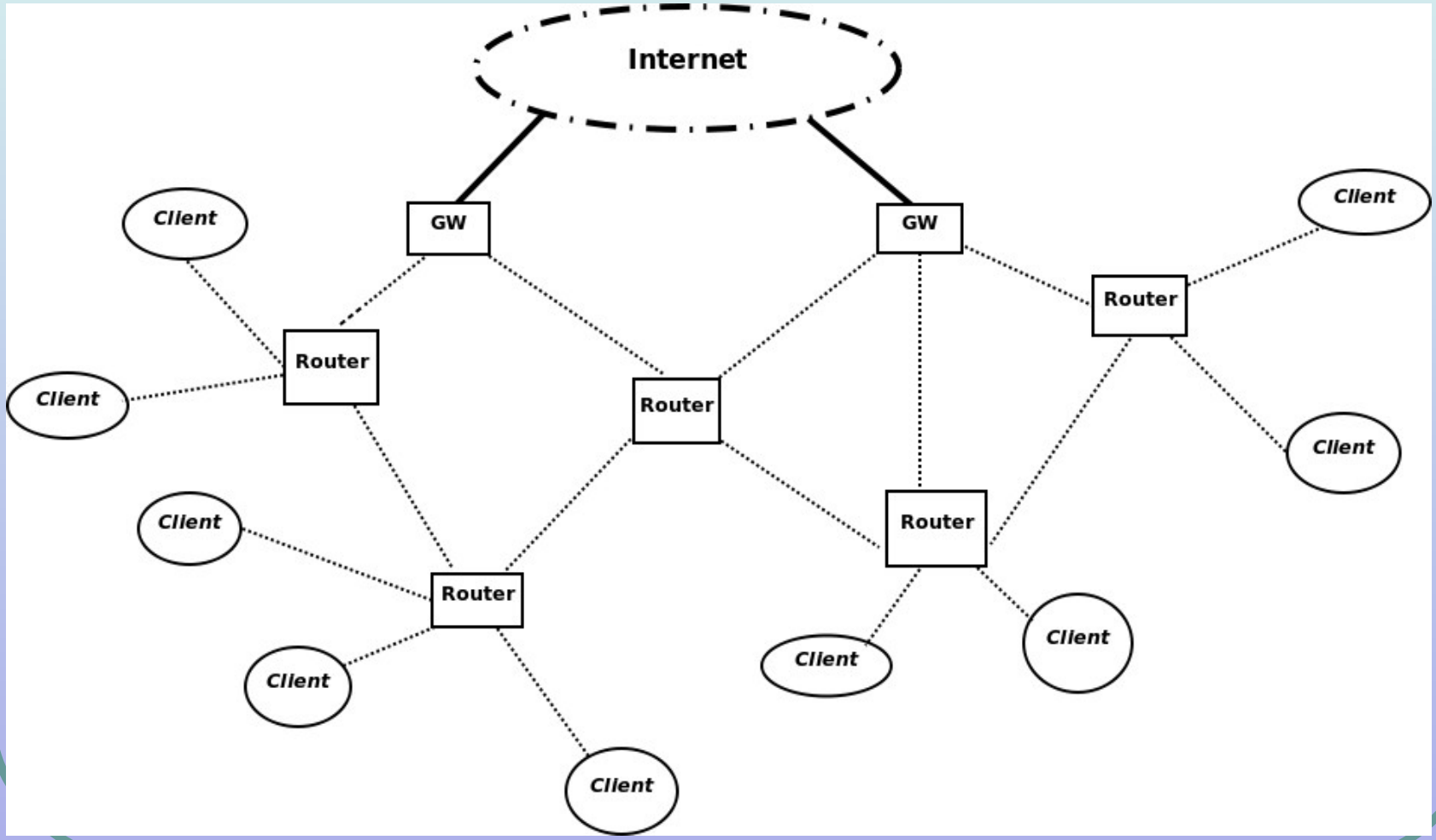
- Proposed Model
- Design
- Algorithms
- Experimental Result and Discussion
- Conclusion and Future Work

Introduction



Introduction

- Battery life of the node will play an important role
- Wireless mesh network nodes operate with finite battery capacity
- The lifetime can be increased by equally utilizing all nodes.
- Energy consumption is an important factor in wireless devices and wireless network
- Adding energy as a metric for making decision on routing.
- Routing process in wireless mesh network consumes energy at each node, there is a need to find the energy draining rate of the battery at every node and then select the path with minimum draining rate node to increase network life time.

Related works

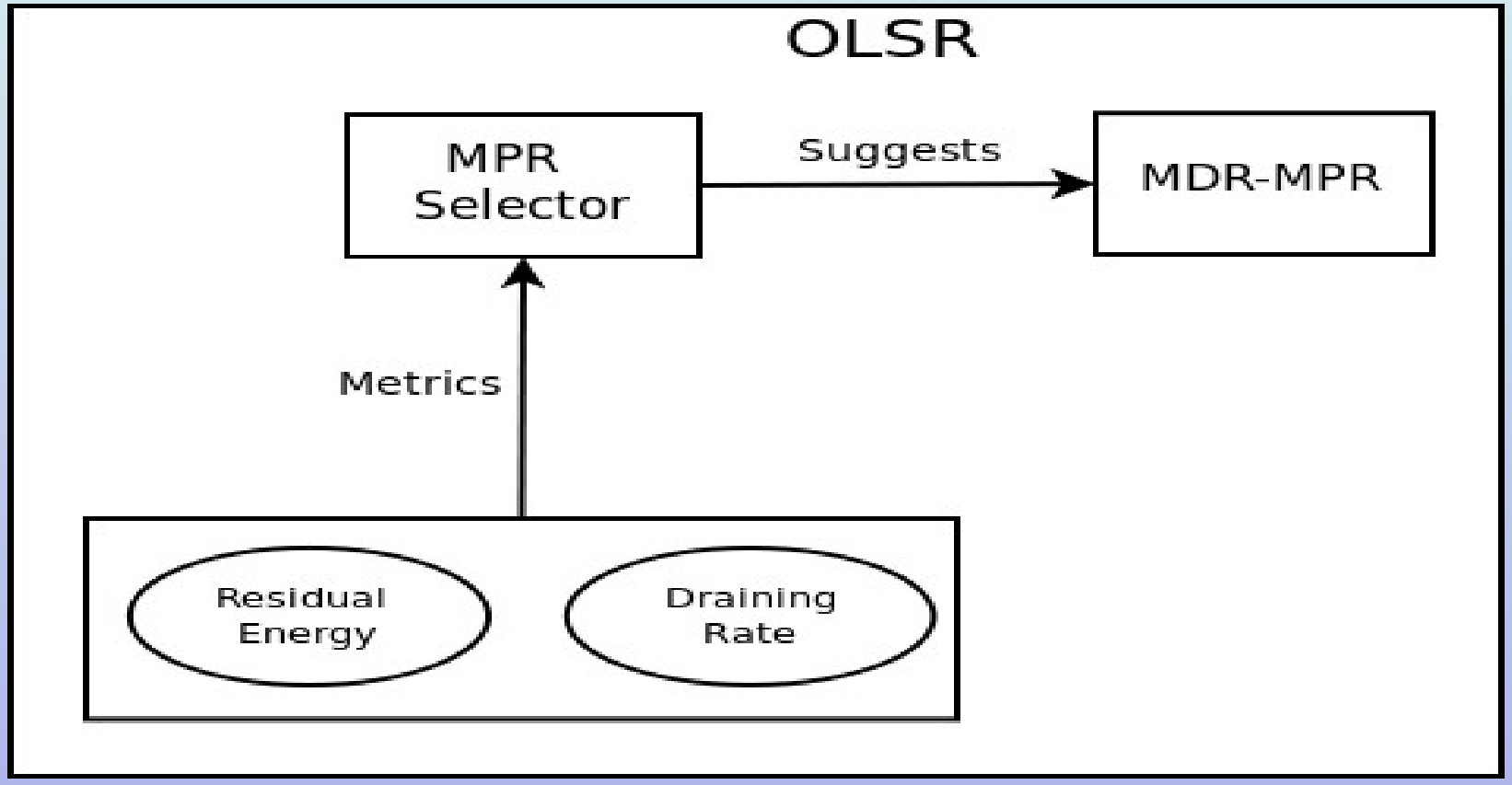
The Optimized Link State Routing protocol (OLSR) is a proactive routing protocol based on the shortest path algorithm

- OLSR always uses the shortest hop route which leads to congestion.
- Higher energies is considered to be the best path among the multiple paths between a given pair of source node and a destination node
- Being aware of the battery status and by prioritizing the

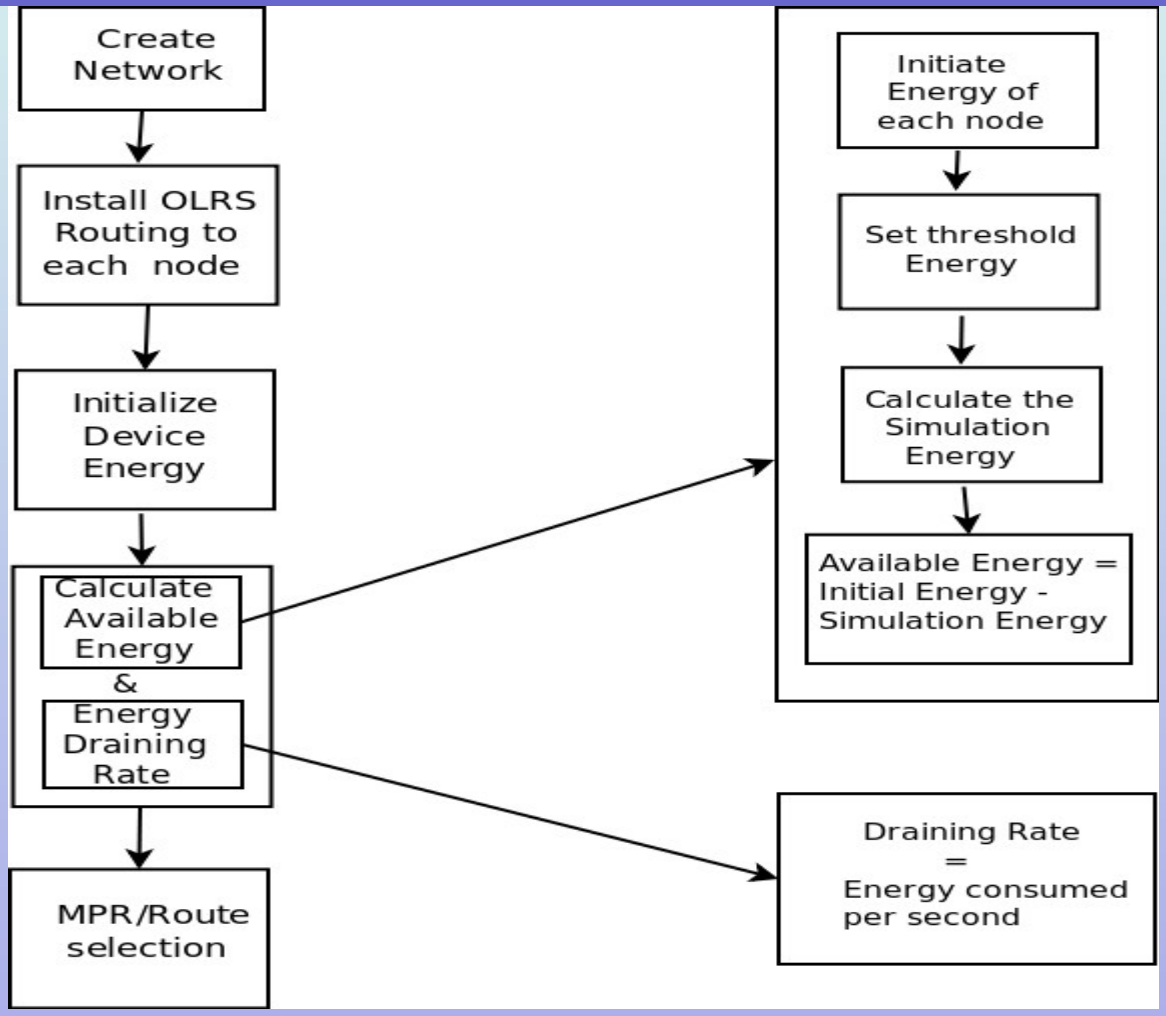
nodes, the network lifetime can be increased remarkably

- we consider two more metric called energy draining rate and available energy to select MPR in existing OLSR routing

Proposed MDRA-OLSR Model



Design


Create Network
Install OLRS Routing to each node
Initialize Device Energy
Calculate Available Energy
&
Energy Draining Rate
MPR/Route selection
Initiate Energy of each node
Set threshold Energy
Calculate the Simulation Energy
Available Energy = Initial Energy - Simulation Energy
Draining Rate = Energy consumed per second

Design

MDRA-OLSR the willingness of the node defined as

$$W_{mn} = \begin{cases} f(k) & 1 < k < 4 \\ m & 1 < m < 25 \\ n & 1 < n < 25 \end{cases}$$

Where,

Where k value suggests the willingness of node equal to 1, 2, 3 and 4 as low, mid, default
and high respectively, m and n are the number of nodes and

Design

Criteria to select MPR

$$f(k) = \begin{matrix} Min(D_R) \\ Max(A_E) \end{matrix} \left\{ \quad R(k) \quad \right\} \in R^*$$

where R∗ is the set of all possible routes from node.

Algorithm-MDRA-OLSR

Algorithm 1 Select MPR

Require: $A_E = 10 \vee D_R = 0$

Ensure: $A_E \geq= 3 \vee D_R \leq 3$

if $(A_E >= 7 \&\& D_R <= 3)$ **then**

willingness == high

else if $((A_E > 5 \&\& A_E < 7) \&\& (D_R < 5 \&\& D_R > 3))$ **then**

willingness == mid

else if $((A_E > 3 \&\& A_E < 5) \&\& (D_R < 7 \&\& D_R > 5))$ **then**

willingness == default

else

willingness == low

end if

Algorithm-MDRA-OLSR contd…

Algorithm 2 Calculate Available Energy

Require: $I_E = 10 \vee C_E = 0$

Ensure: $A_E \geq 3$

$$E_{i+1} = E_i + V * (t_{i+1} t_i) * I_i$$

$$A_E = I_E - C_E$$

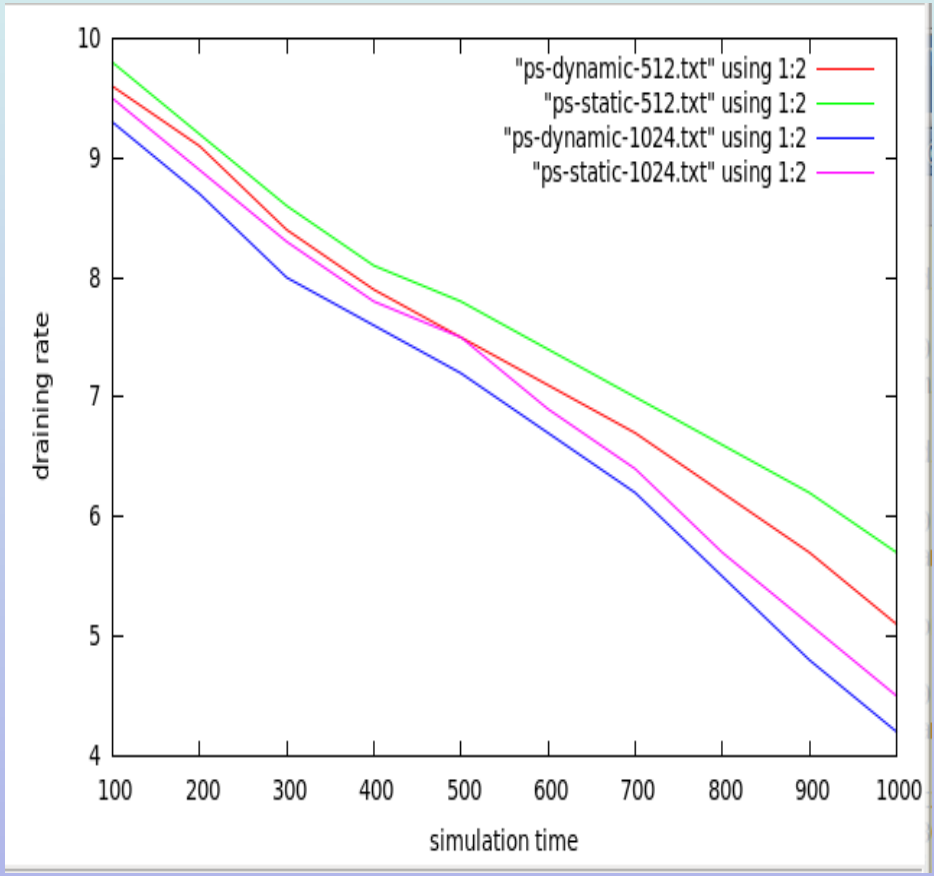
Experimental Result and Discussion

- **A. Simulation Setup**
- Created 5X5 mesh

Parameters	Values
Area	300X500
Nodes	25
Nodes speed	40 m/ss
Simulation Time	400s
Traffic Sources	12
Traffic Type	CBR
Packet Size	512 bytes
Start of Traffic	30 s
End of Traffic	380
Transmission Power	1.4 W
Reception Power	1.0 W
Idle Power	0.0 W
Initial Energy	10 J
Energy threshold	3 J

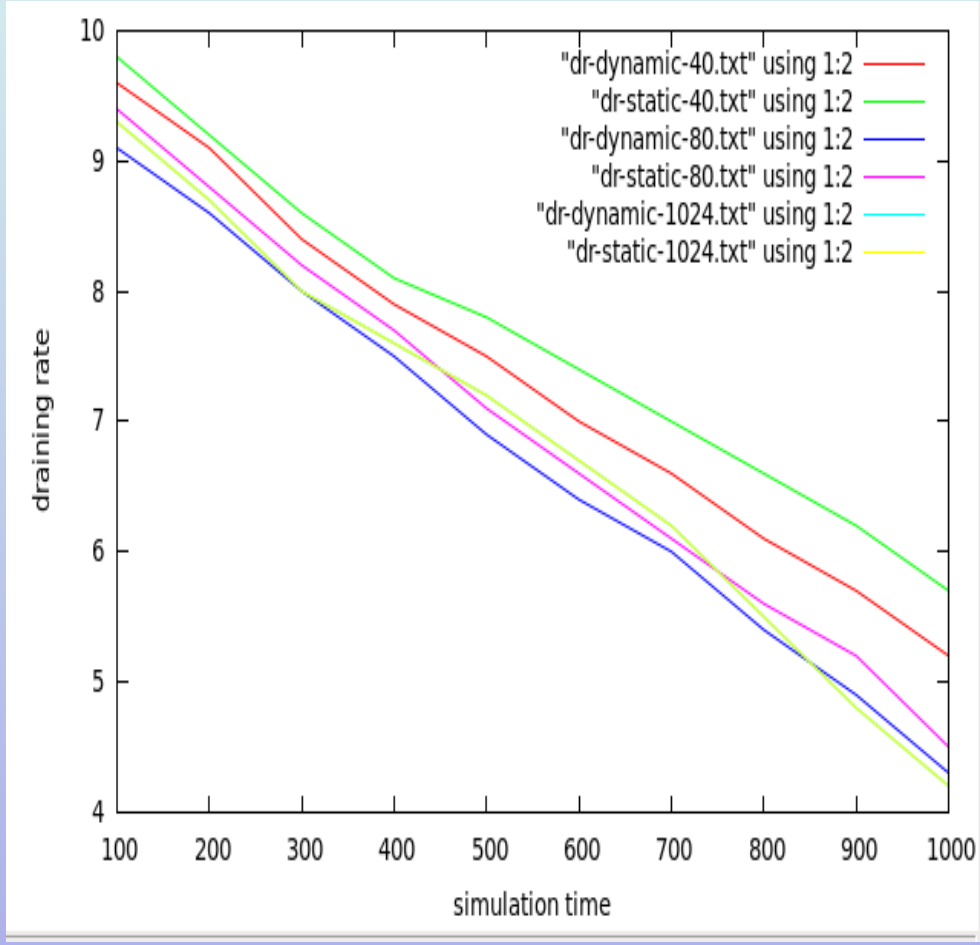
Results

i. Draining rate changing packet size in static and dynamic



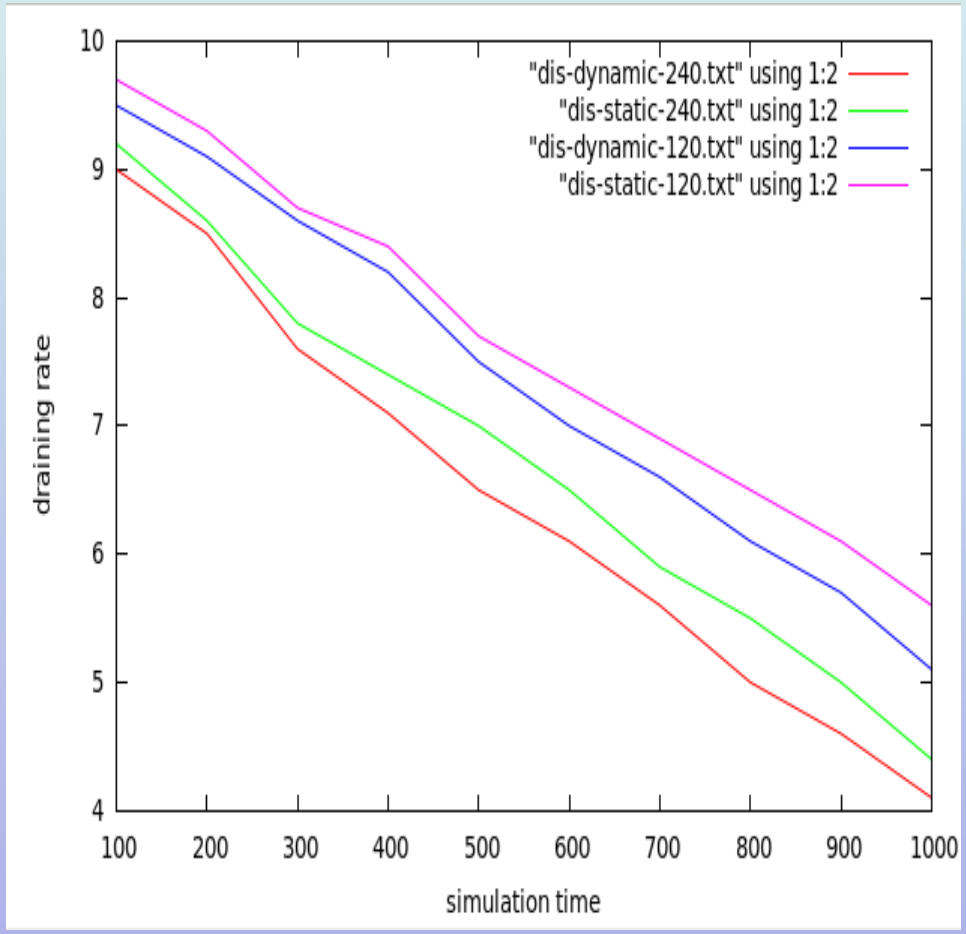
Results and Discussion of energy consumption behavior of the node

ii. Draining rate varying data rate



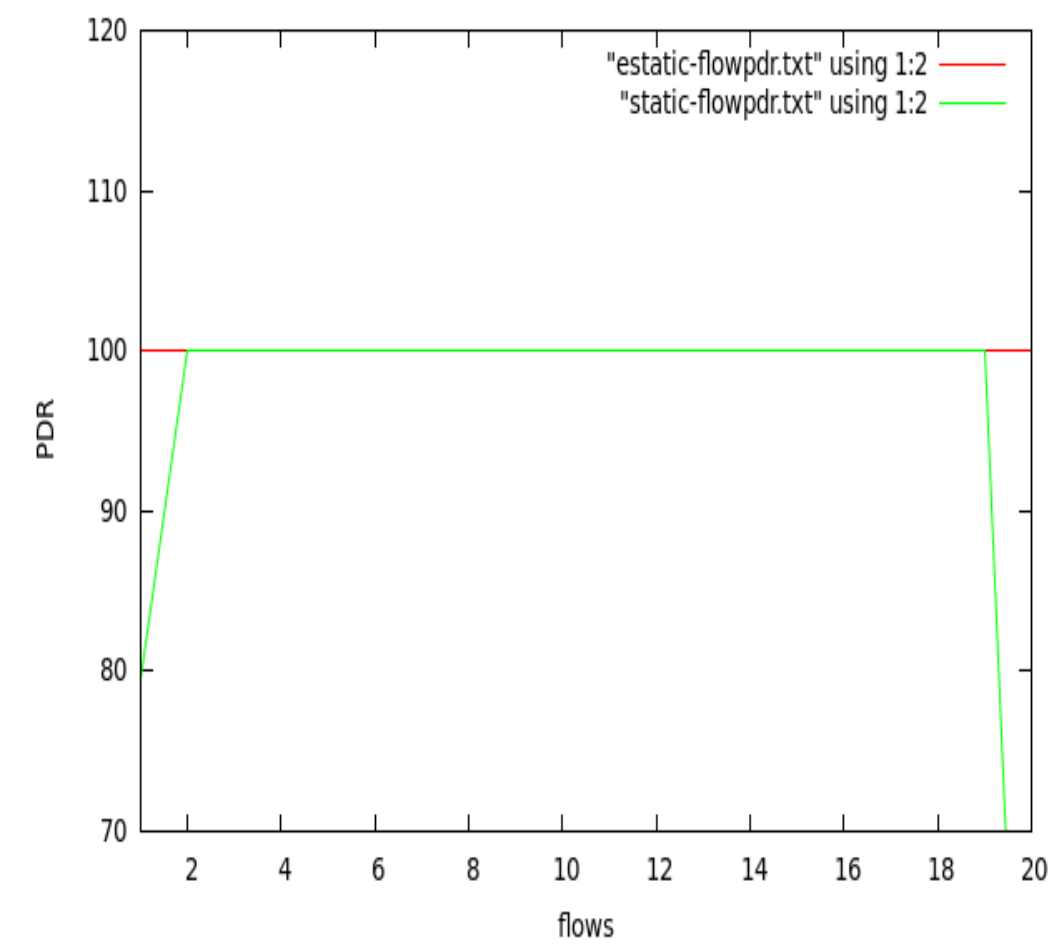
Results and Discussion of energy consumption behavior of the node

iii. Draining rate changing nodes distance in static and dynamic



Results

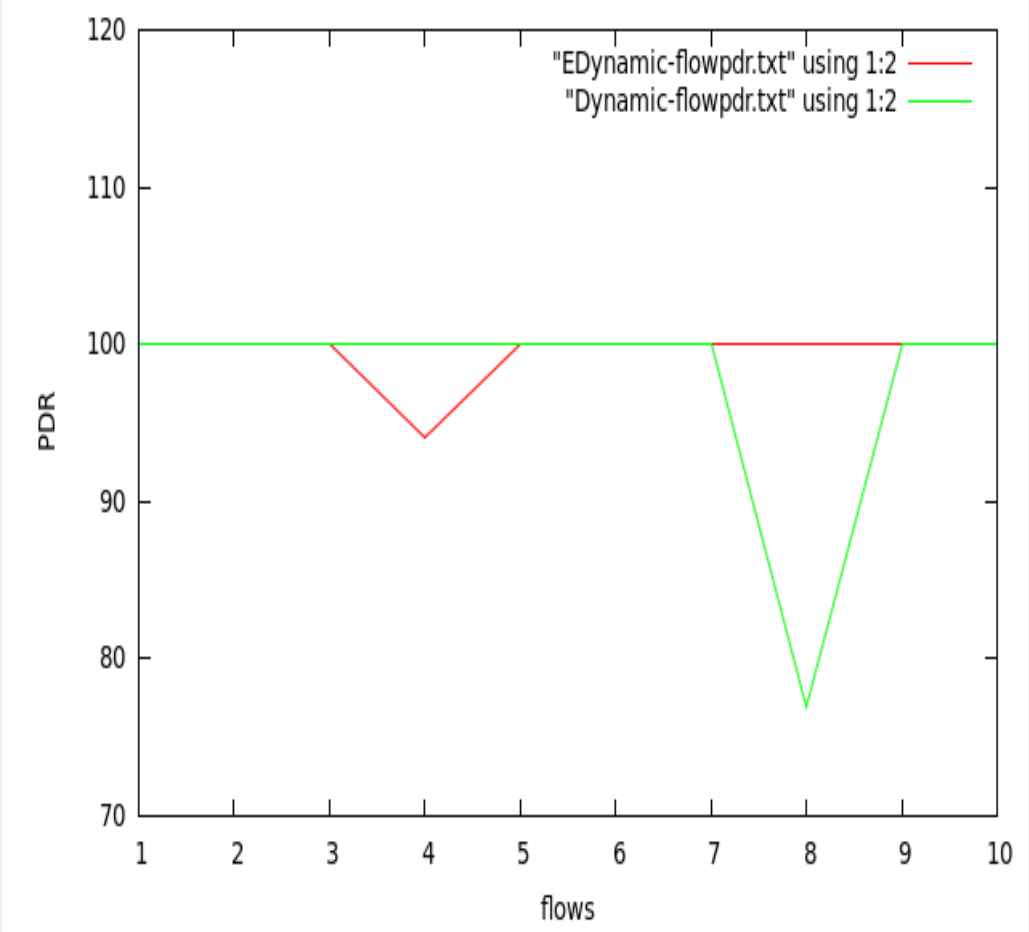
iv. PDR keeping nodes static



Results

v. PDR keeping nodes

dynamic



Algorithms comparison

Techniques	MPR selection	Description
OLSR	MPR selection based on link state	Finds the optimal link state to reach destination, Packet delivery Ratio is lower
MDRA-OLSR	MPR selection based on both Available En-ergy and Nodes draining Rate	Maintain same energy level in all nodes over networks , Packet delivery Ratio is higher

CONCLUSION AND FUTURE WORK

- Existing considered only link statefor routing.
- In our proposed model, we consider both the available energy and the draining rate of a node as a metric to identify

  the MPR in OLSR.
- Results shows that these two metrics will help in the increase of network life time and also increases the packet delivery ratio, throughput in both static and dynamic environment

CONCLUSION AND FUTURE WORK

- Present work considers only the battery draining rate and available energy to select MPR in OLSR.
- We can notice that there is a change in PDR and throughput when the nodes are moving dynamically.
- Also the speed of the node result in changing of battery status/energy consumption.
- Hence there is a need to consider the nodes mobility and its speed to assure high PDR rate.
- Wireless mesh network has a power safe mode which changes nodes status from awake to sleep or deep sleep modes. So our future work concentrate on implementing power safe modes of wireless mesh network in OLSR routing.

Thank you