Northeastern University

Wireless Sensor Networks

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HW2

Report

For instructions about running the code please see attached Readme.txt

We use ns-2 to study the average delay and average dissipated energy using directed diffusion routing in the IEEE 802:11 network. The main purpose of this experiment is to evaluate the delay and energy consumption of two-phase pull routing protocol.

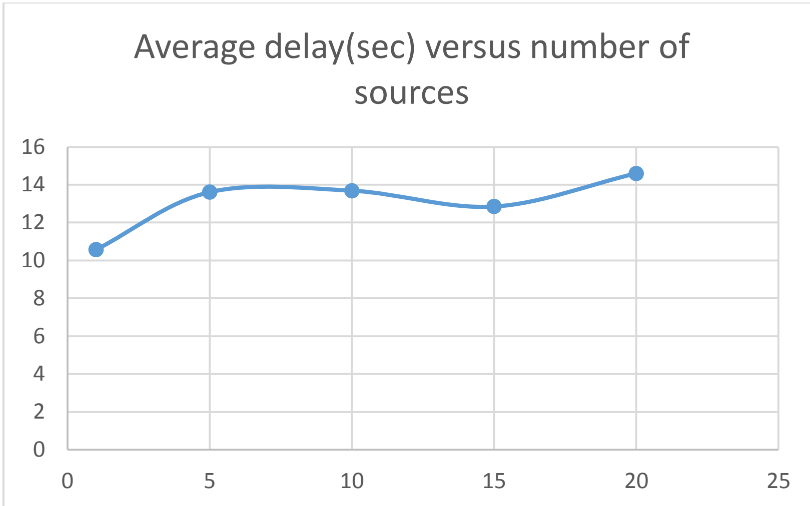
We construct a simulation scenario with 49 nodes, out of which one is a sink and all the others are senders. The number of senders ranges between 1, 5, 10, 15, 20. For each number of senders I run the experiment 10 times and vary the seed as #nodes*#iteration_no (see script file).

Question A

- Plot average delay versus number of sources and comment on your result.

The average delay vs number of sources is shown below:

#Sources	Avg Delay (sec)
1	10.5703
5	13.6043
10	13.6844
15	12.8467
20	14.5956



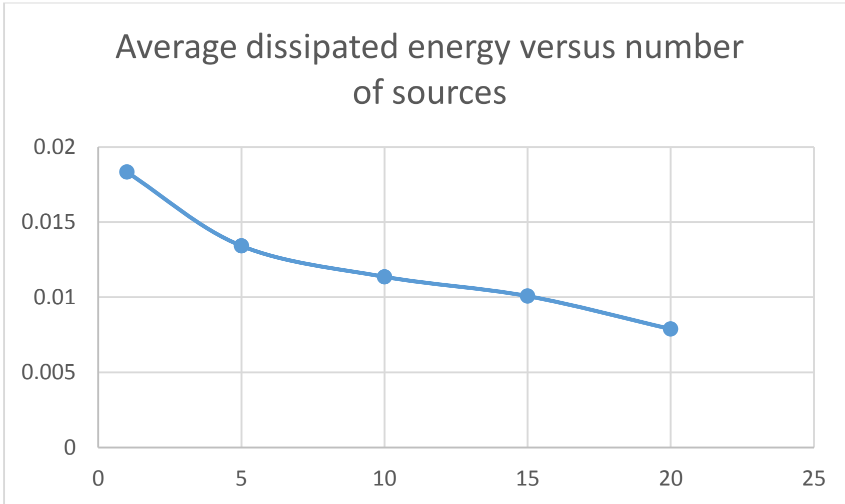
We observe that generally, the more sources we have, the higher the delay. This is natural, since as the number of sources increases, the total load is higher and there is more congestion which leads to higher delays. However, we observe that for 15 sources, we have a value for delay which is smaller than the delay for 10 sources. There might be an optimal behavior of the algorithm for that amount of load, because of the “interest” functionality that it uses to discover the sources.

Question B

- Plot average dissipated energy versus number of sources and comment on your result.

Below we show the data we got from our simulations and the relevant graph.

#Sources	Avg Dis. Energy
1	0.018325
5	0.0134175
10	0.0113588
15	0.0100725
20	0.0078805



We observe that the higher the number of sources, the lower the average dissipated energy. We wouldn't expect that the average dissipated energy would increase with such a great slope related to the number of sources.

The average dissipated energy is computed as the ratio of the total dissipated energy per source in the network to the number of distinct events seen by sinks. Therefore, we take the total dissipated energy in the whole network, we divide it by the number of sources and then we divide it by the number of packets that manage to arrive at the sink. We observe that the more load we have the "easier" and less energy consuming it is to arrive to the destination. Maybe this is because of the functionality of the diffusion protocol, where interest packets are used to discover sources. If more sources are there, it's easier to find them and therefore the more the sources, the easier the communication is and less energy is used per event.

<u>Printscreen from simulation</u>

Below you can see a printscreen from the simulation:

The numbers below mean that there are for this simulation 5 sources, which are the nodes 38 13 16 37 27.