

GEOGRAPHICAL AND ENERGY AWARE ROUTING PROTOCOL

COURSE : WIRELESS SENSOR NETWORKS

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PAPER BEING IMPLEMENTED

- Geographical and Energy Aware Routing: a recursive data dissemination protocol for wireless sensor networks
- Authors :Yan Yu, Ramesh Govindan, Deborah Estrin

ASSUMPTIONS USED

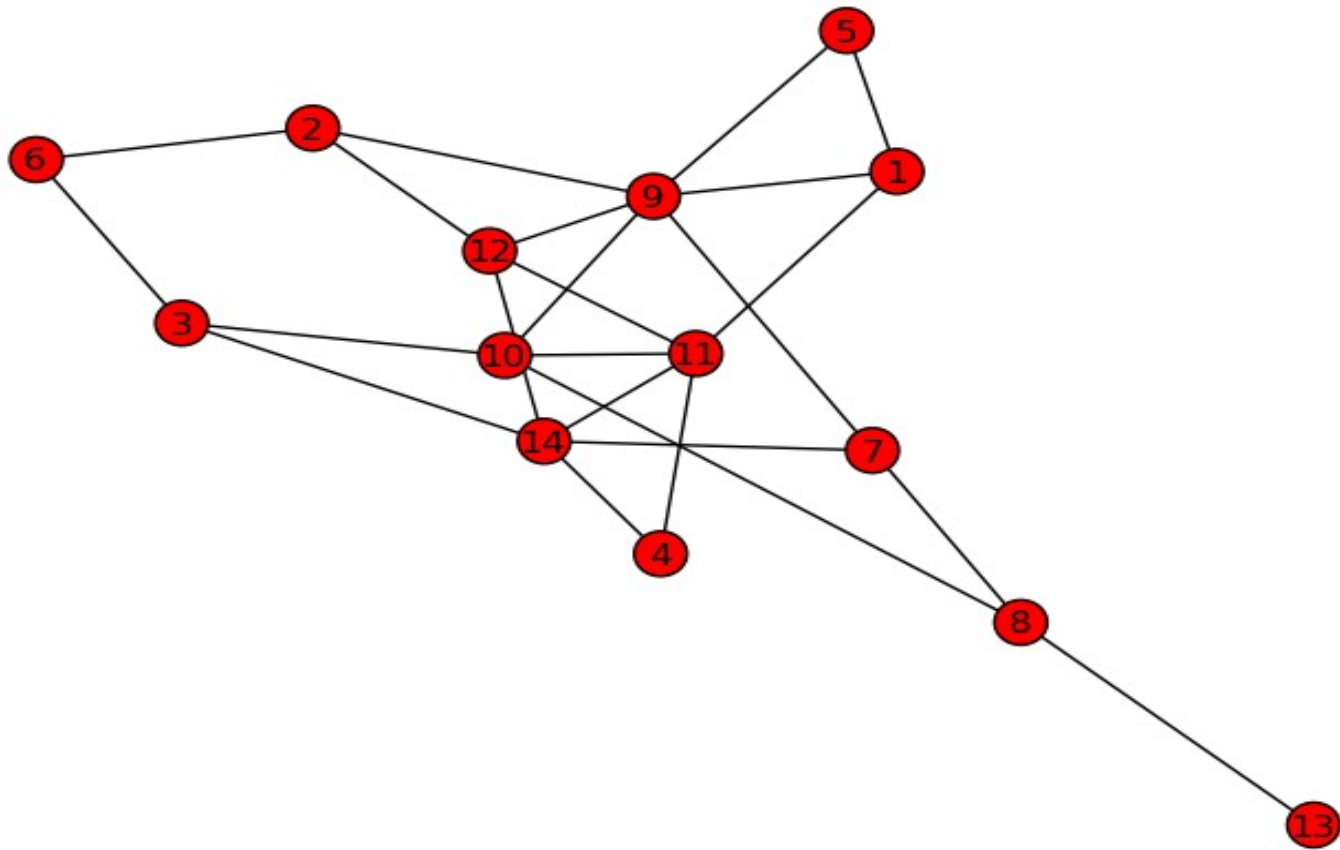
- each query packet has a target region specified in some way (for the description of the algorithm, we assume a specification through program)
- each node knows its own location and remaining energy level, and its neighbors' locations and remaining energy levels
- the link is bi-directional, i.e., if a node hears from a neighbor , then its transmission range can reach

ENERGY AWARE COMPUTATION

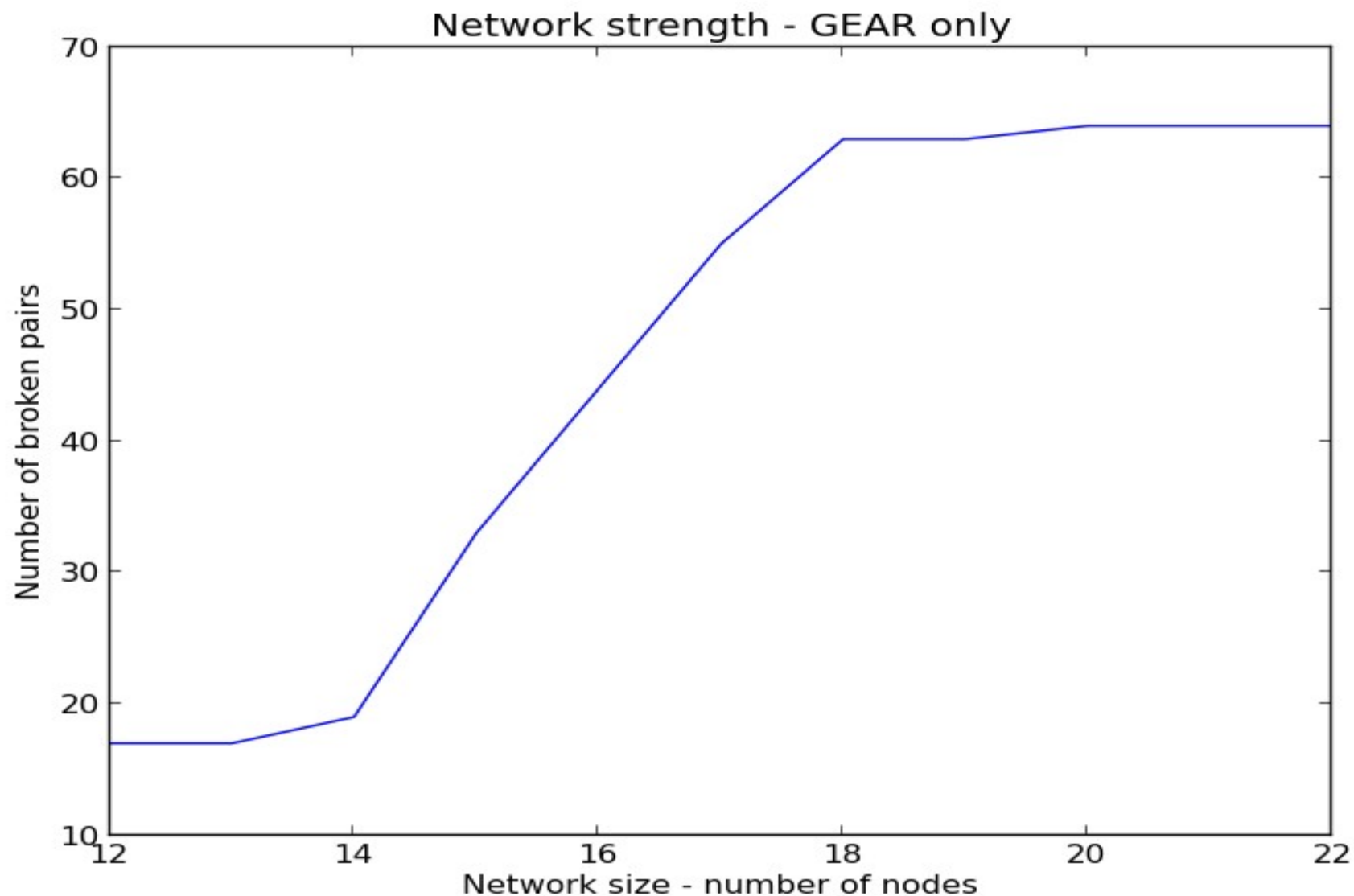
$$C(Ni, R) = \alpha d(Ni, R) + (1-\alpha)\epsilon(Ni)$$

- Our method uses first order radio model for energy computation statistics
- **Energy Model followed** : First order Radio Model

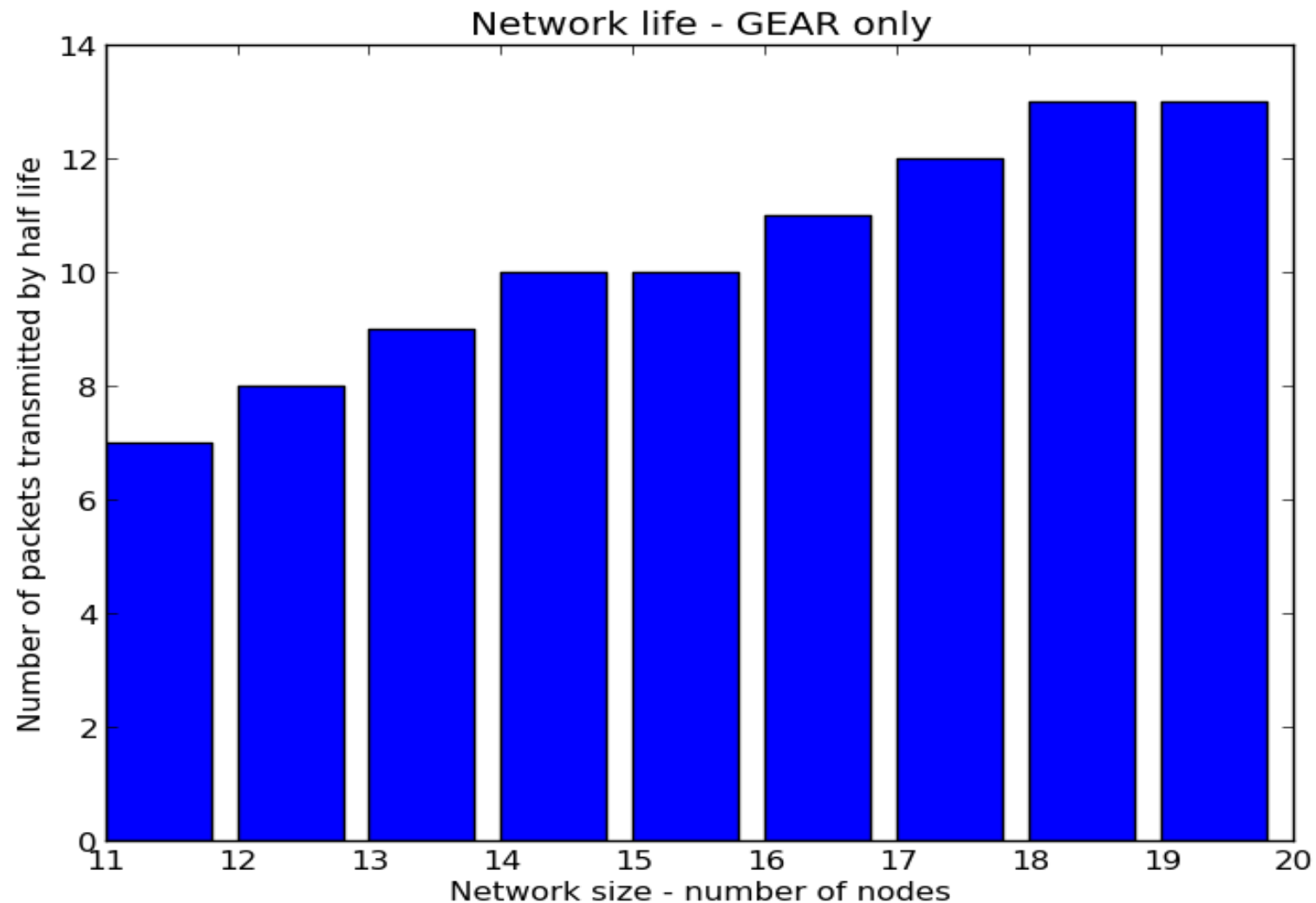
RANDOM NETWORKS OF VARIOUS SIZES



NUMBER OF BROKEN PAIRS VERSUS NUMBER OF NODES TRANSMISSION



NETWORK HALF LIFE WITH SIZE VARIATION



UNIQUENESS OF APPROACH

- Unlike unicast communication in previous systems, we study the problem of forwarding a packet to all the nodes inside a target region, which is a common primitive in data-centric sensor net applications
- Furthermore, our work does not assume the need for a location database that maps node identifier to node location. We expect sensor networks to be data-centric, where communication primitives are expressed not in terms of node identifiers but in terms of named data

UNIQUENESS OF APPROACH

- Works for static (i.e., immobile) sensors
- Motivated by the stringent energy constraint in sensor networks, we use energy aware metrics, together with geographical information, to make energy efficient routing decisions. In previous work, balancing energy usage has not been an explicit design goal.

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COMPARISON OF LEACH AND GEAR PROTOCOLS

LEACH PROTOCOL

LEACH stands for Low-Energy Adaptive Clustering Hierarchy

This WSN is considered to be a dynamic clustering method

NECESSITY FOR LEACH

The reason we need network protocol such as LEACH is due to the fact that a node in the network is no longer useful when its battery dies

This protocol allows us to space out the lifespan of the nodes, allowing it to do only the minimum work it needs to transmit data

LEACH – A CLUSTERING PROTOCOL

The LEACH Network is made up of nodes, some of which are called *cluster-heads*

The job of the cluster-head is to collect data from their surrounding nodes and pass it on to the base station

LEACH is *dynamic* because the job of cluster-head rotates

PHASES OF LEACH

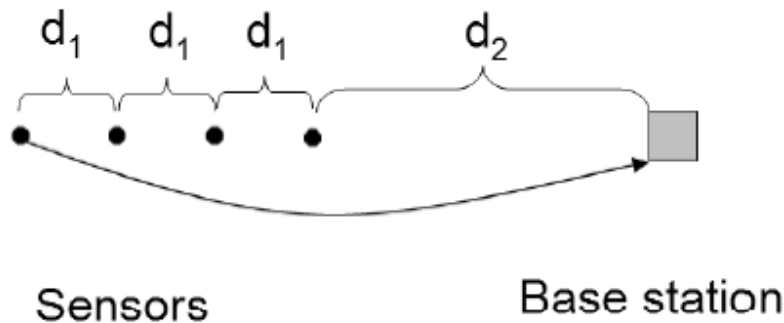
The LEACH network has two phases: the set-up phase and the steady-state

The Set-Up Phase :

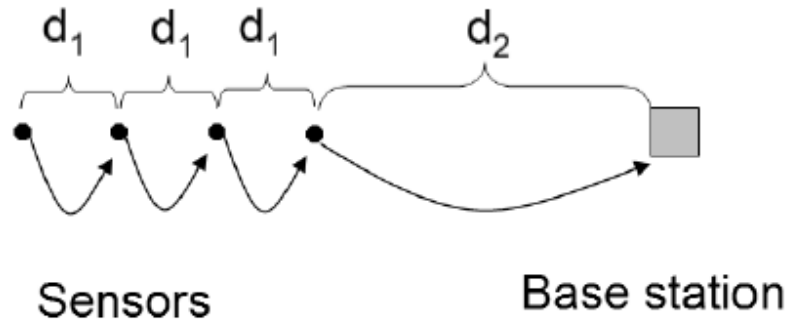
Where cluster-heads are chosen

The Steady-State:

The cluster-head is maintained When data is transmitted between nodes



(a) Direct transmission



(b) Minimum transmission energy

- The amount of energy used in figure (a) can be modeled by this formula:

$$- \epsilon_{\text{amp}} k (3d_1 + d_2)^2$$

- Whereas the amount of energy used in figure (b) uses this formula:

$$- \epsilon_{\text{amp}} k (3d_1^2 + d_2^2)$$

Figure 1

GEAR Protocol

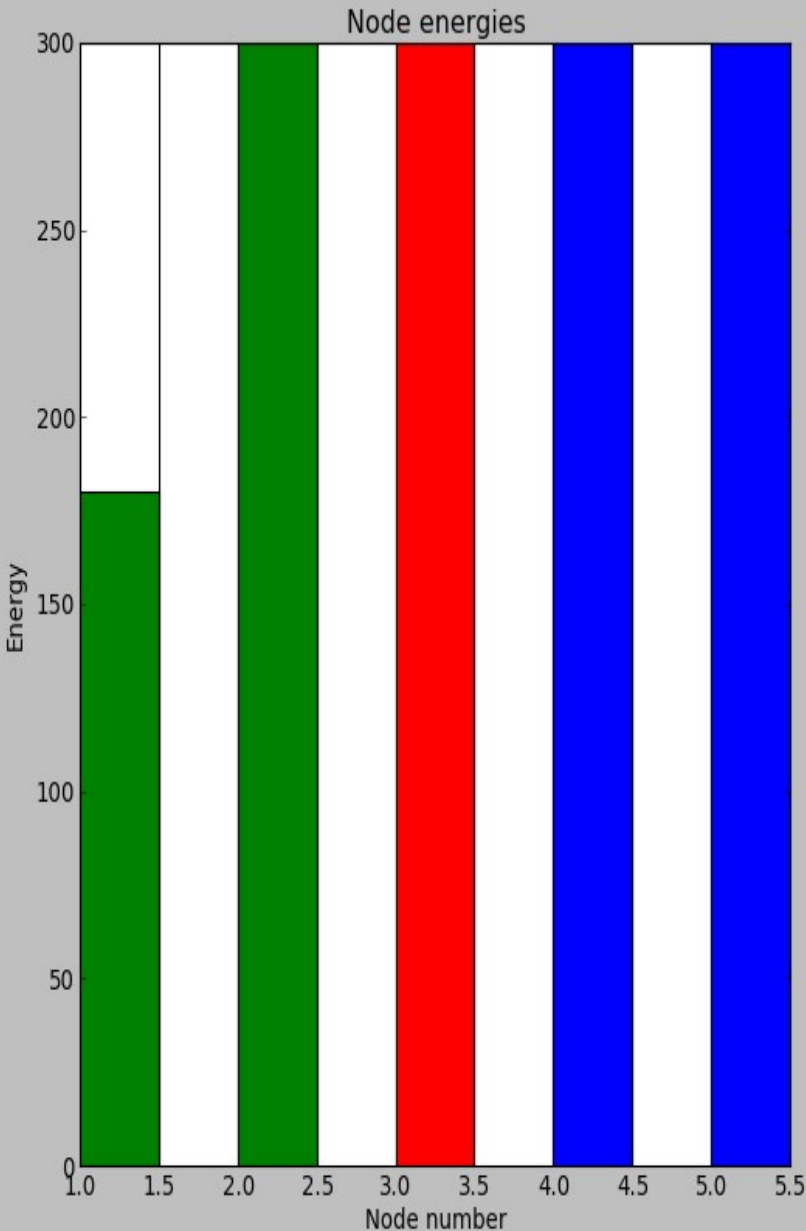
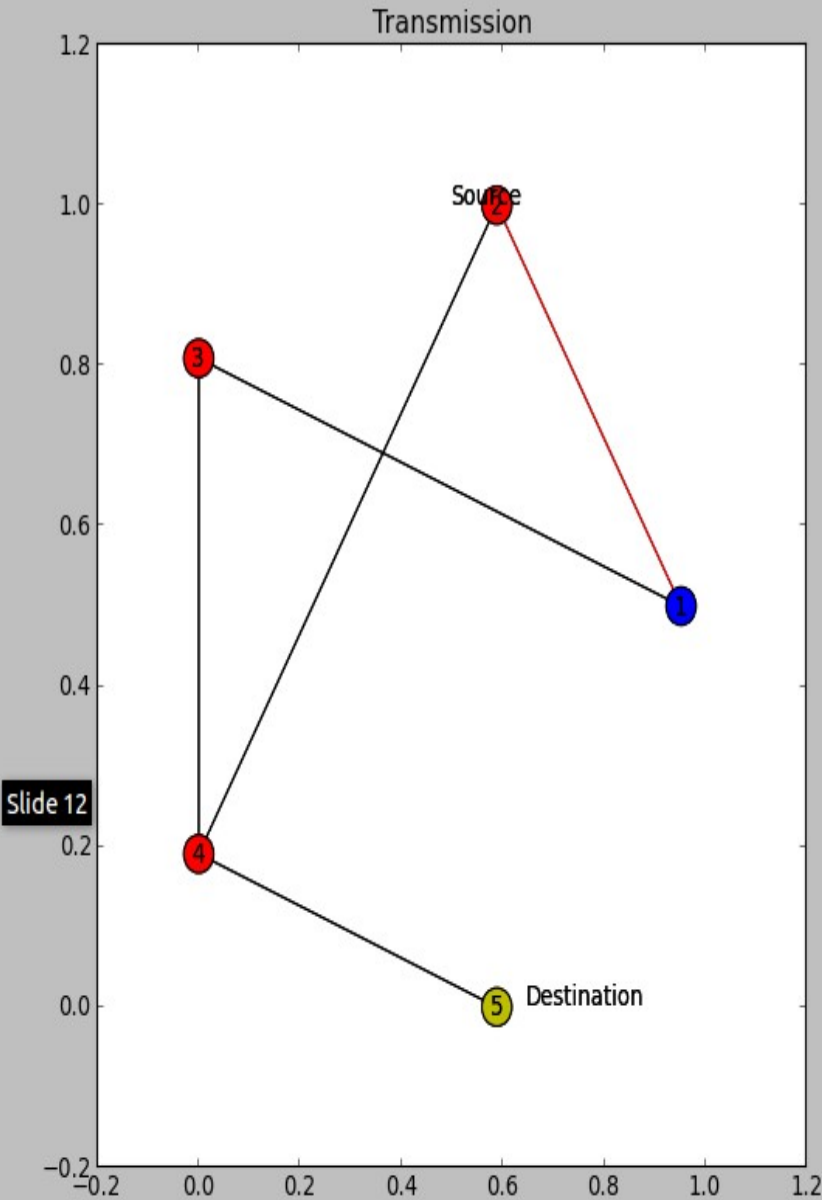
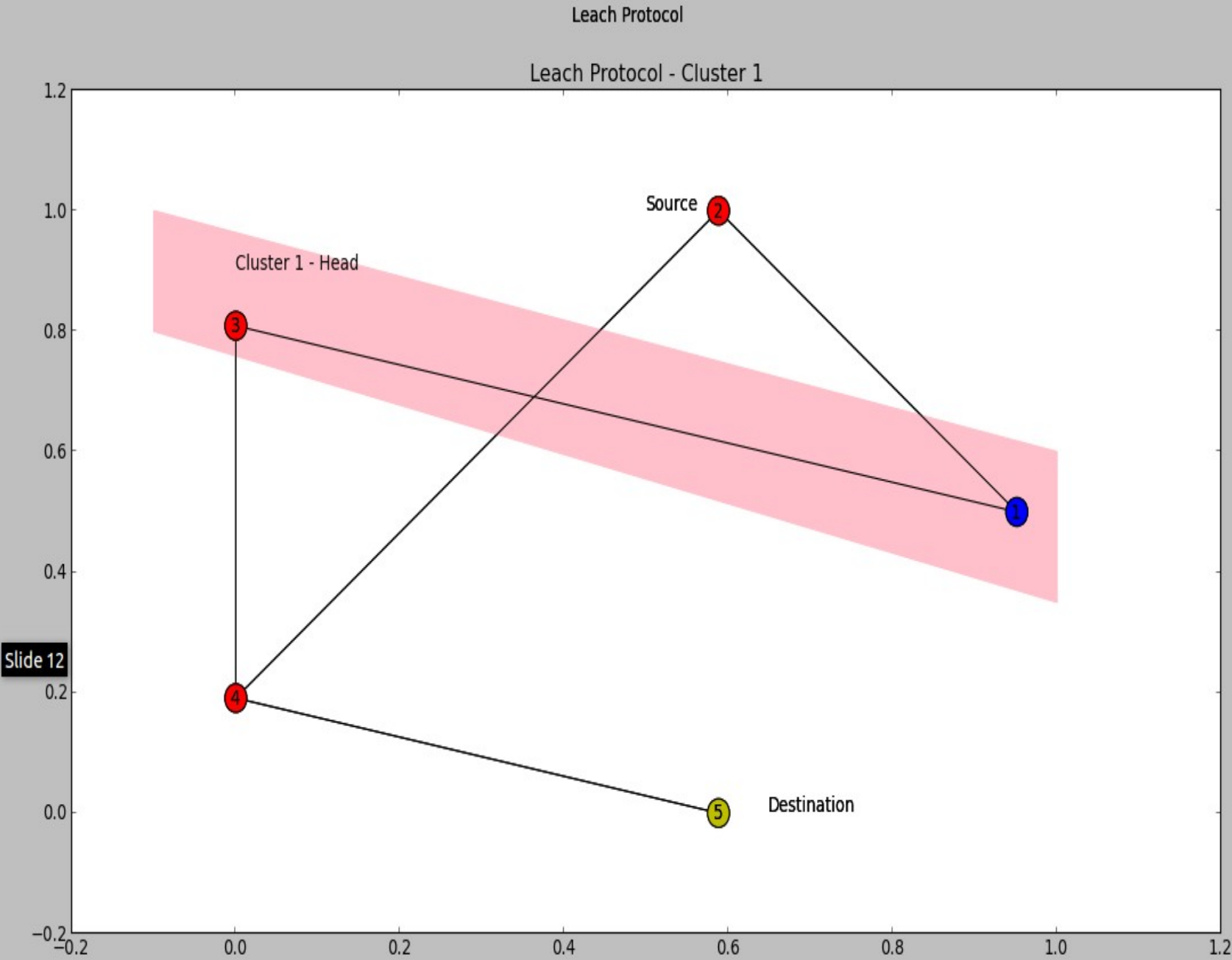
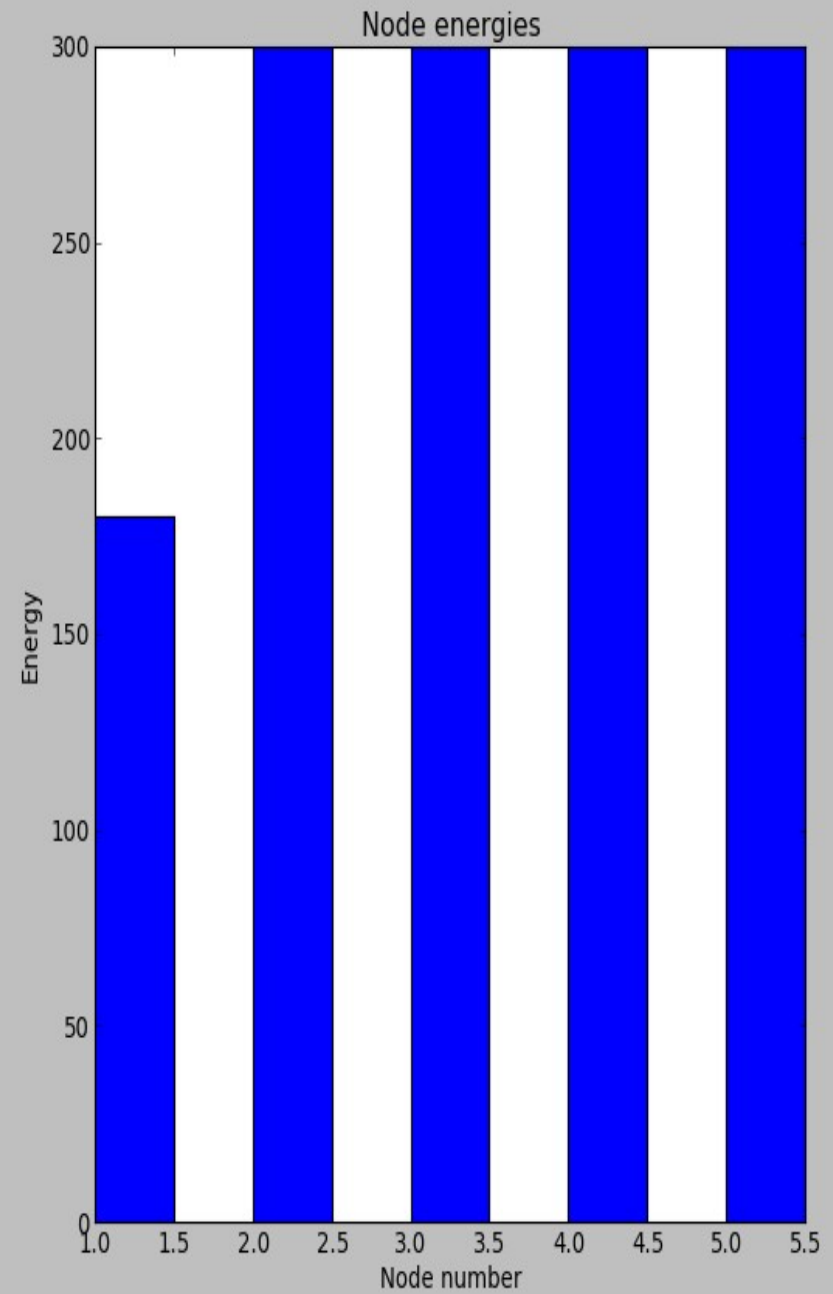
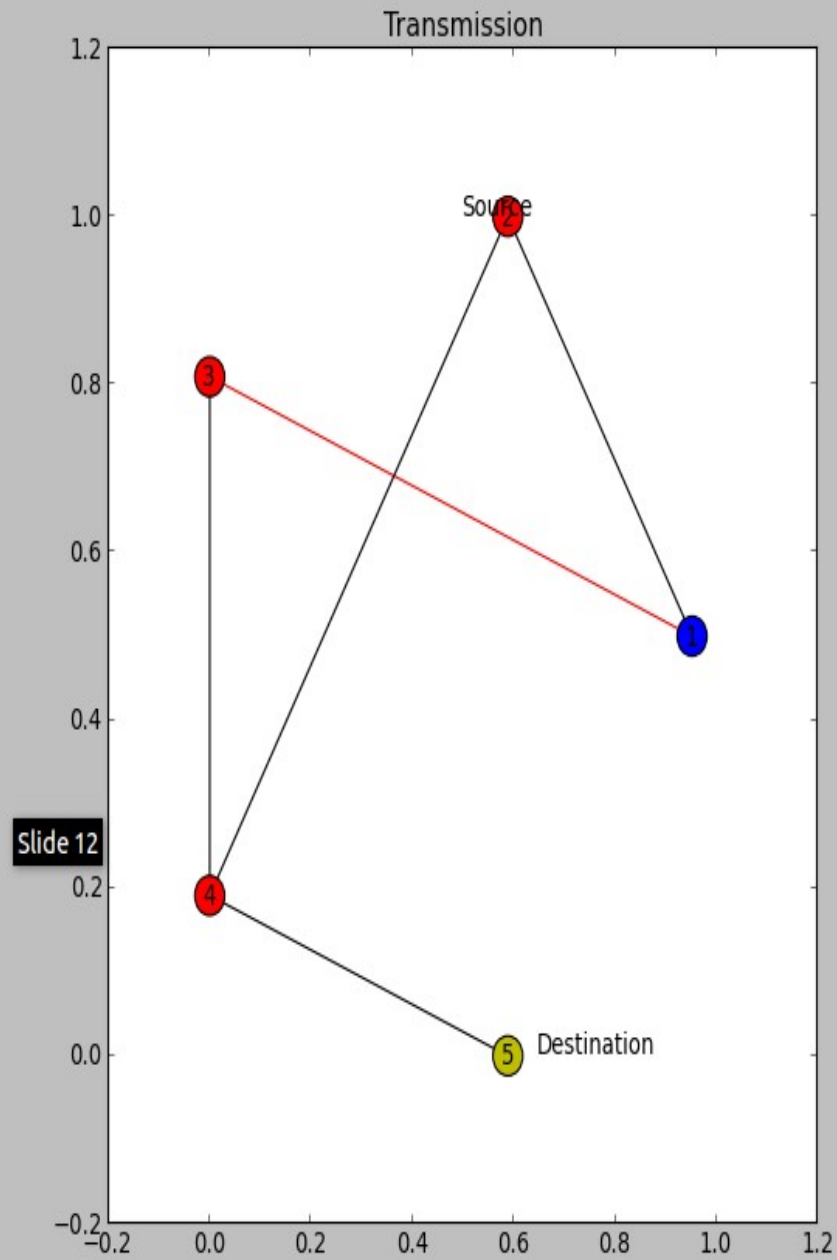


Figure 1



Leach Protocol



COMPARISON OF RESULTS

From the previous example demonstrated in the simulator we find out that because of the random cluster head choosing strategy of LEACH protocol the average energy of the nodes is higher in the case of GEAR compared to LEACH

GENERALIZATION OF THE OBSERVATION

- We can generalize the observation to say that GEAR protocol leads to longer life time of the nodes compared to LEACH protocol because of energy considerations.
- It also has a Recursive routing strategy that proves this further.

Thank you!

