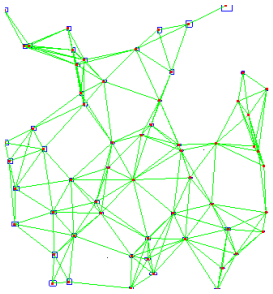
18748 – Wireless Sensor Networks – Spring 2014



Carnegie Mellon University

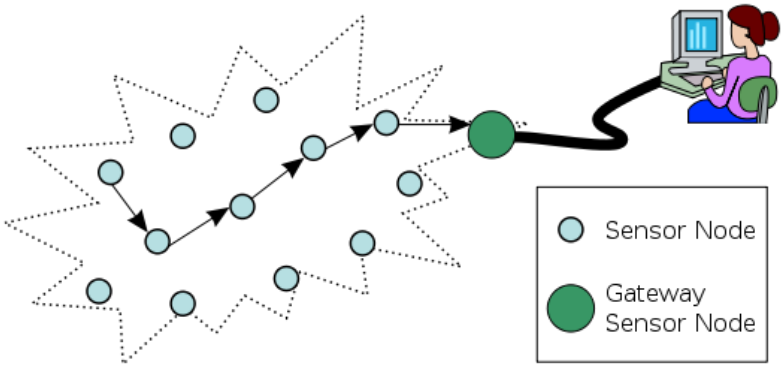
Lab Assignment 3

Due: 18 February 2014, 11:59pm EST

Build Your Own Sensor Network

What is the objective?

- Develop your own custom sensor network.
- Multi-hop mesh network connected to a gateway.
    - Maximum number of hops = 3
    - Maximum number of nodes = 4 (including 1 gateway FireFly node)



Typical multi-hop wireless sensor network architecture (from wikipedia.org)

Requirements:

1. **Update Rate**
    a. Update rates of at-least once every 30 seconds should be supported
2. **Configurability**
    a. Sensor sampling rates should be configurable from the gateway
    b. Network update rates should also be updatable from the gateway
3. **Reflectivity**
    a. Sensor nodes should create neighbor lists at run-time
    b. Neighbor list information should be available at the gateway
4. **Routing Support**
    a. Peer-to-Gateway communication should definitely be routed
    b. Peer-to-Peer communication need not necessarily be routed
    c. Gateway-to-Peer communication need not necessarily be routed

5. **Performance**
    a. Optimize the performance for metrics relevant to your course project. Some metrics (choose from the list or create your own):
        - Throughput
        - Low latency
        - Reliability
            - How can you detect the loss of packets?
        - Energy
        - Mobility
    b. In your lab write-up, clearly specify the following
        i. Why you chose your metrics
        ii. How you optimized for each of them
        iii. Measurement and estimates for each metric (if any)

Design options

- MAC protocol
    - You may work with the B-MAC protocol
    - Other options are also available (e.g. RT-LINK, PCF_TDMA)
- Serial communication
    - Nano-RK UART API
        - Basic Nano-RK UART communication APIs
        - http://www.nanork.org/projects/nanork/wiki/Nrk-api-uart
    - SLIPStream (present inside your projects and tools directory)
        - Infrastructure for communication between the PC and gateway node
        - http://www.nanork.org/projects/nanork/wiki/SLIPstream

Deliverables

1. Source code (for gateway node and other nodes) with comments
2. Write-up describing your architecture, implementation and performance metrics
    - Source code and write-up need to be committed into your repository by deadline
    - Location: <your_repo>/projects/lab3/

Extra credits

- Graphical User Interface to view the topology (as it changes)
    - You can use open source graph visualization tools, such as GraphViz (http://www.graphviz.org/)

References

- B-MAC description: http://www.nanork.org/projects/nanork/wiki/b-mac
- B-MAC APIs: http://www.nanork.org/projects/nanork/wiki/bmac-api
- RT-LINK: http://www.nanork.org/projects/nanork/wiki/rt-link
- PCF-TDMA (Point Coordination Function TDMA): http://www.nanork.org/projects/nanork/wiki/pcf-tdma

Questions and Answers: Please use the discussion forum on Pizza.