SEA-MAC: A Simple Energy Aware MAC Protocol for Wireless Sensor Networks for Environmental Monitoring Applications

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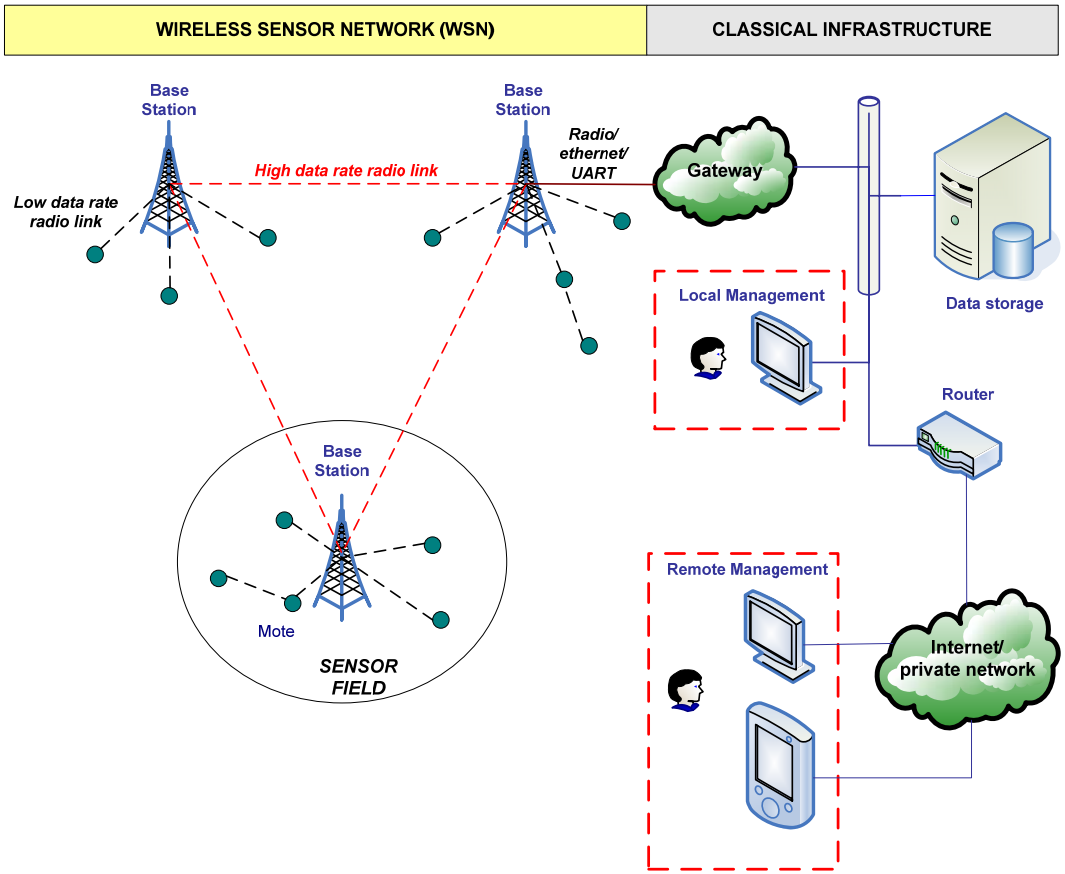
Environmental Monitoring



Wireless sensor networks consist of battery-operated sensor devices with computing, data processing, and communication components.

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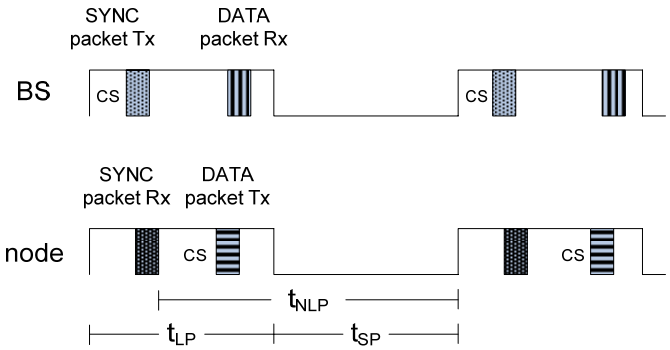
Energy conservation is a critical issue in wireless sensor networks since batteries are the only energy source to power the sensor nodes.

Our goal is to develop a **new MAC protocol for wireless sensor networks deployed for environmental monitoring.**

Proposed scheme



Time schedule in SEA-MAC

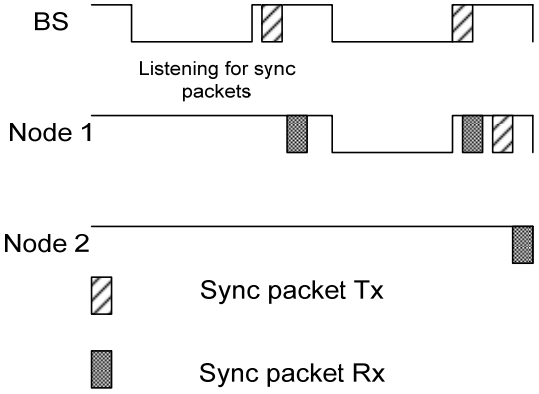


Fig. 2. SEA-MAC synchronization.

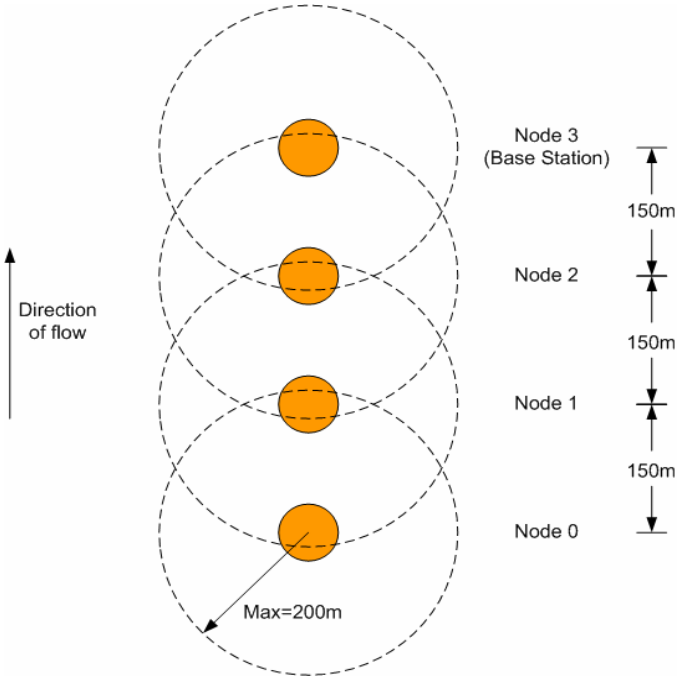
In SEA-MAC schedule, nodes only wake up when a sample from environment is taken. No periodic sleep/listen schedule will be necessary .

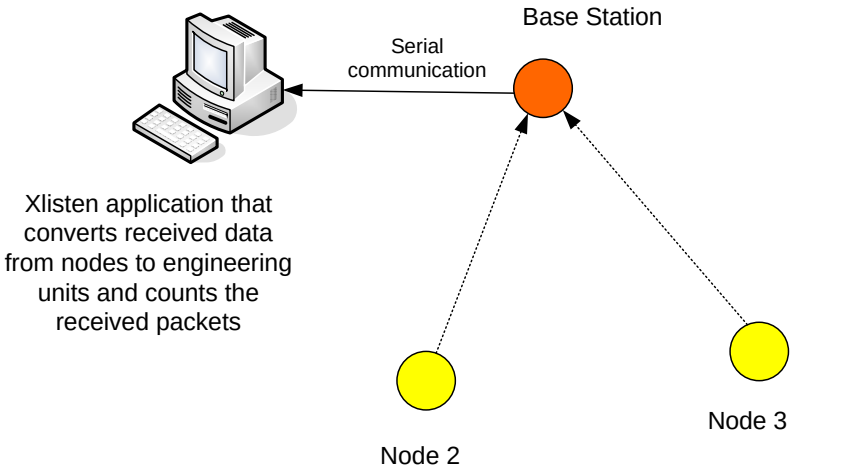
Nodes running SEA-MAC, upon being turned on, turn on their radios to listen for synchronization (sync) packets from the BS. The BS is the only node that can start and maintain synchronization while the other nodes only disseminate synchronization in a multihop environment.

Energy consumption:

$$E = P_{listen}\ t_{csl}\ r_{data} + \left(P_{tx} + (n-1)\,P_{rx}\right) L_{data}\ t_B\ r_{data} + P_{rx}\ L_{sync}\ t_B\ r_{sync} + P_{sleep}\ (1 - t_{cls}\ r_{data} - L_{data}\ t_B\ (n)\, r_{data} - L_{sync}\ t_B\ r_{sync}) \quad (6)$$

Tools used

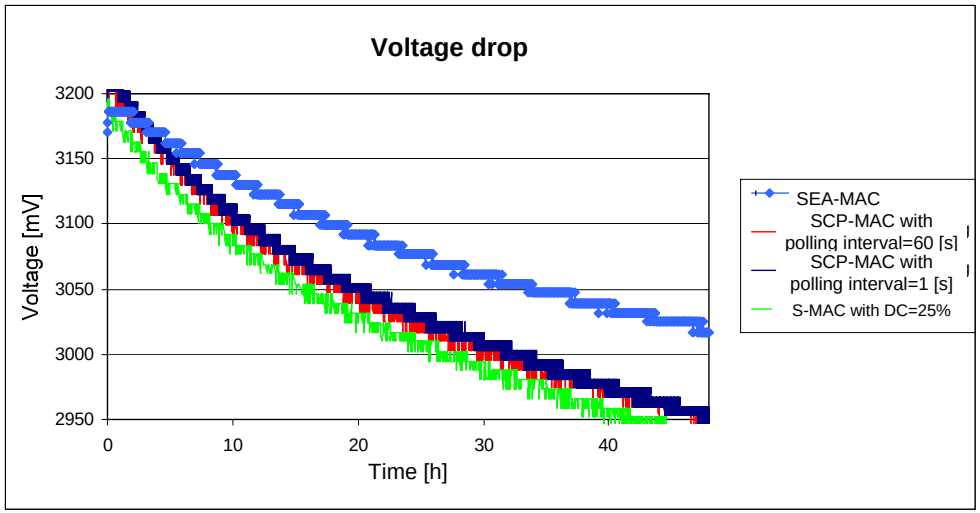




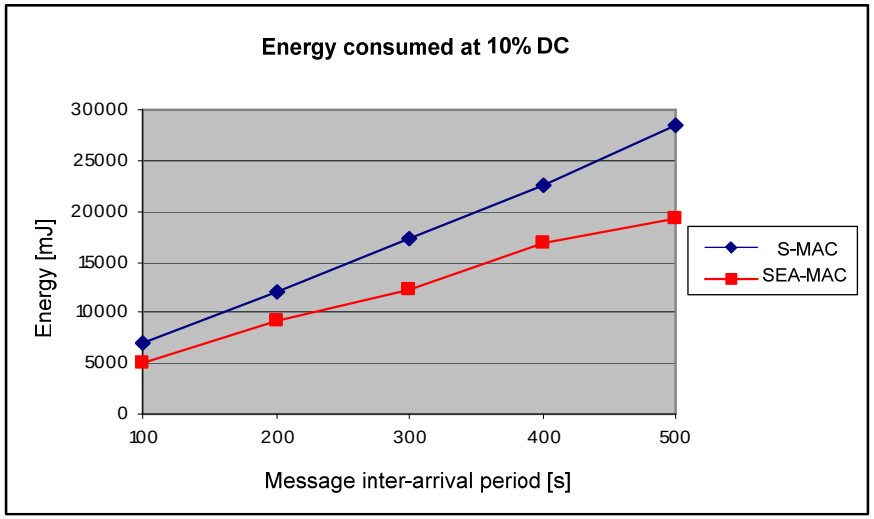
Network configuration used in simulation using network simulator-2 (ns-2)

Network configuration for implementation using mica2 and mica2dot motes.

Results



Implementation results: Voltage drop in 48 hours of test



Simulation results: Energy consumption of SEA-MAC and S-MAC.