Reliable Low-Power Communications for Mobile Ad Hoc Networks

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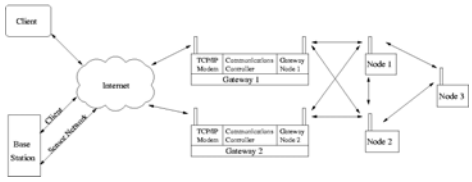
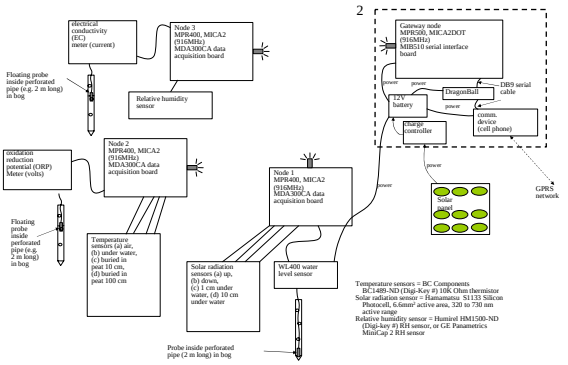
Network Overview

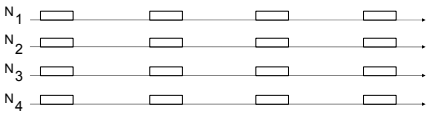


UNB Woodlot Bog Environmental Sensor Web



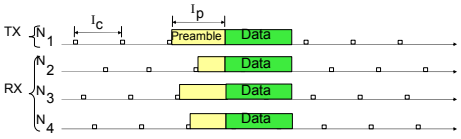
Low-Power Medium Access Control (MAC)

Slotted MAC (eg: SMAC, ZigBee)



Synchronize four nodes, N1 to N4 to sleep and wake up on a predefined schedule

Sampling MAC (eg: BMAC)



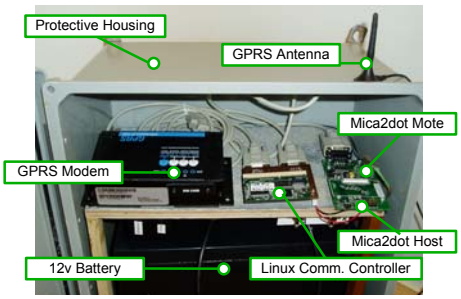
- Channel Check Interval (I_c) < Preamble Interval (I_p)
- Algorithm:
  - Wake up every I_p
  - Check channel
  - If preamble then receive data
  - If channel clear and data ready then send data

Current UNB Team

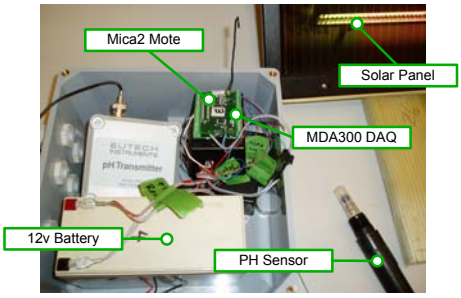
- Bradford G. Nickerson, Faculty of Computer Science, GEOIDE investigator, software architecture
- Paul Arp, Faculty of Forestry and Environmental Management, environmental science, experiment design, forest soils, forest ecosystems
- John-Paul Arp, Computer Science graduate Student
- Bruce Miller, ECE technical support, system integration, circuit board hardware design & build
- Rob Leblanc, ECE undergrad, power supply design, gateway power monitoring design & build

Sensor Network

Gateway



Sensor Node

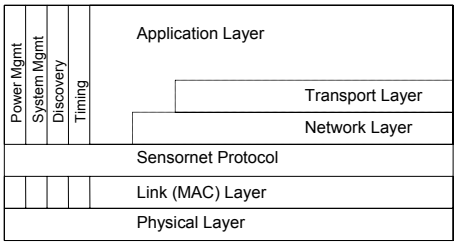


Evolving The Wireless Sensor Network (WSN) Stack

OSI Stack	TCP/IP Stack	Typical WSN Stack
Application	Application	Application
Presentation		
Session		
Transport	Transport	Transport
Network	IP	Network
Data Link	Host to Host	Data Link
Physical		Physical

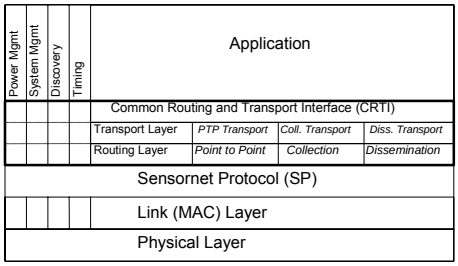
To reduce energy consumption, WSN applications must have direct control over layers of the stack.

Sensornet Protocol (Polatre 2005)



The Sensornet Protocol (SP) separates the network and Link layer through a set of common interfaces.

Proposed Stack



This work proposes a common routing and transport interface, allowing applications to easily use multiple routing protocols in a single application

Motivation

- Classical networking stacks are not well suited to very low power and mobile networks
  - This makes reliable application development hard
- Expand the range of applications that can be generated using the Sensor Web Language (SWL)

Objectives

- Simplify development and use of reliable communications in low power wireless networks
  - Separate Link and Network layer using the Sensornet protocol
  - Seperate Application and transport Layers using a Common Transport Interface
  - Allow for the co-existence of multiple transport and routing protocols
- Test architecture In a real world sensornet deployment
- Simulate architecture at different scales (eg: 4 to 512 nodes) and levels of mobility

Anticipated Result

- Reusable software components that simplify the implementation of reliable low power communications for mobile ad hoc networks

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