



Wireless Environmental Monitoring

Chris DePolo, Kevin Gonzalez, Kevin Kozak; Instructor: Dr. Pong P. Chu
 Department of Electrical and Computer Engineering, Washkewicz College of Engineering
 Cleveland State University

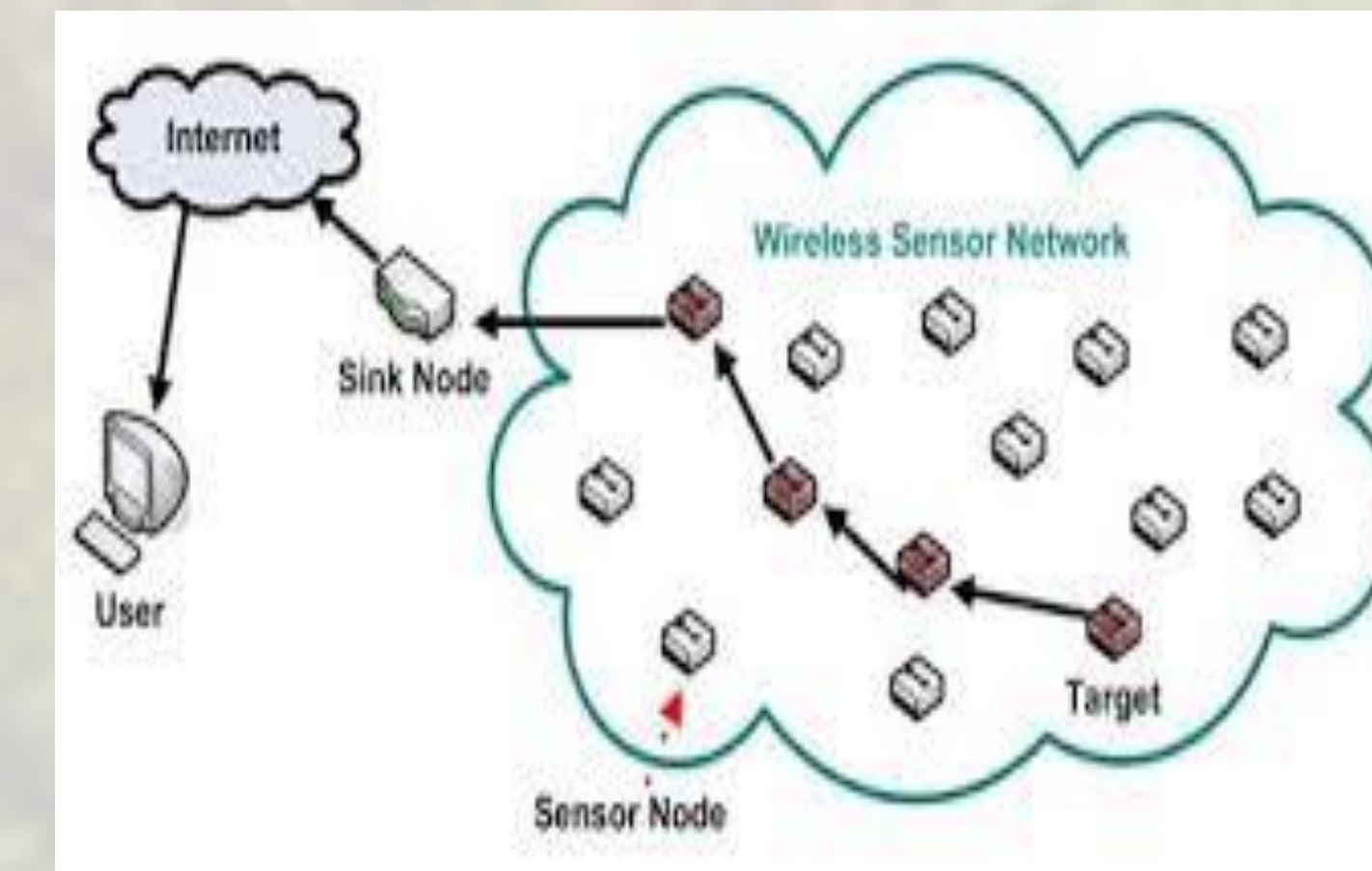


Problem:

- Manual download of data
- Data loss
- Battery life
- Infrequent data collection
- Outdated technology

Objectives:

- Automated
- Low Power
- Cost Sensitive
- Central Data Collection

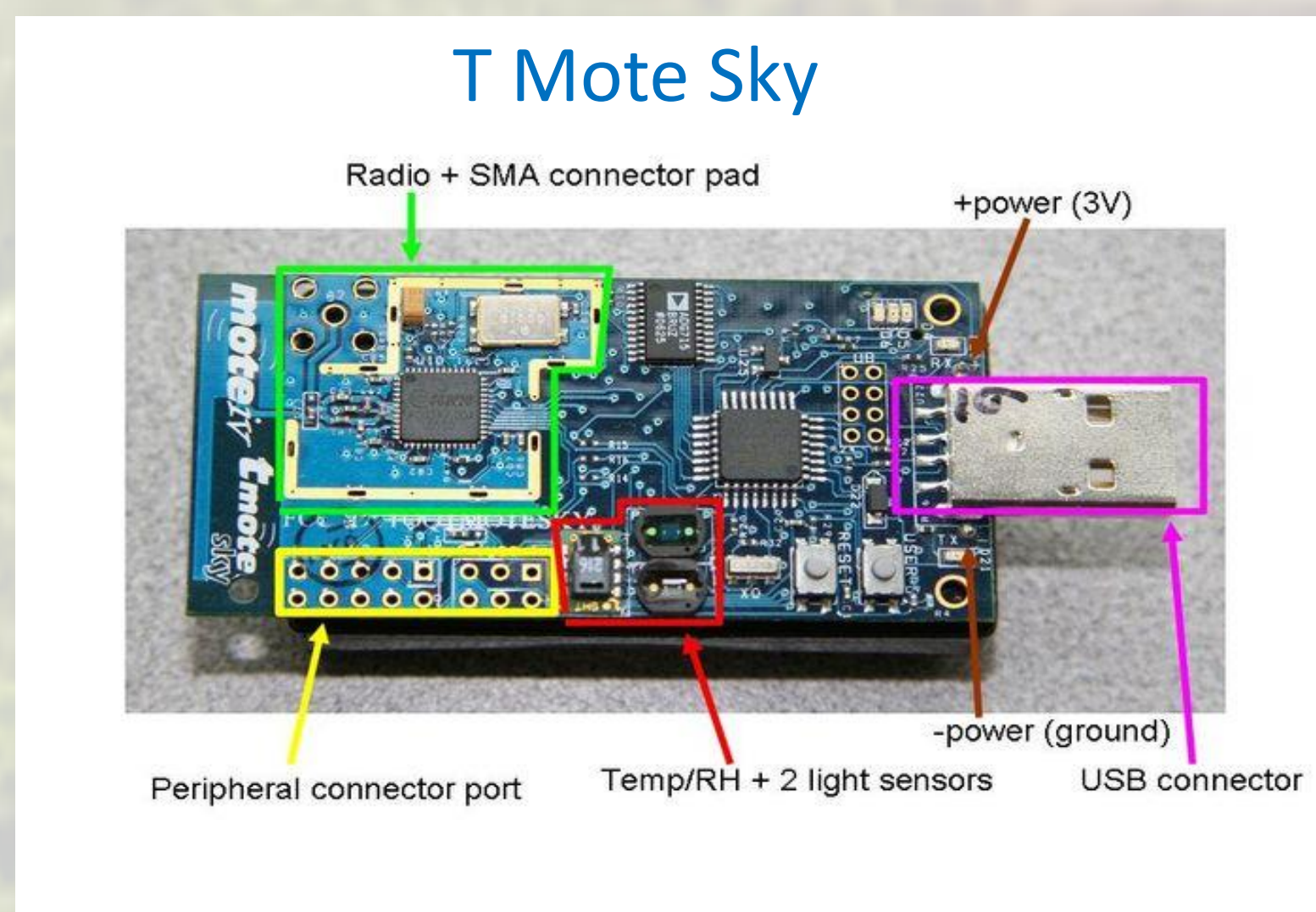
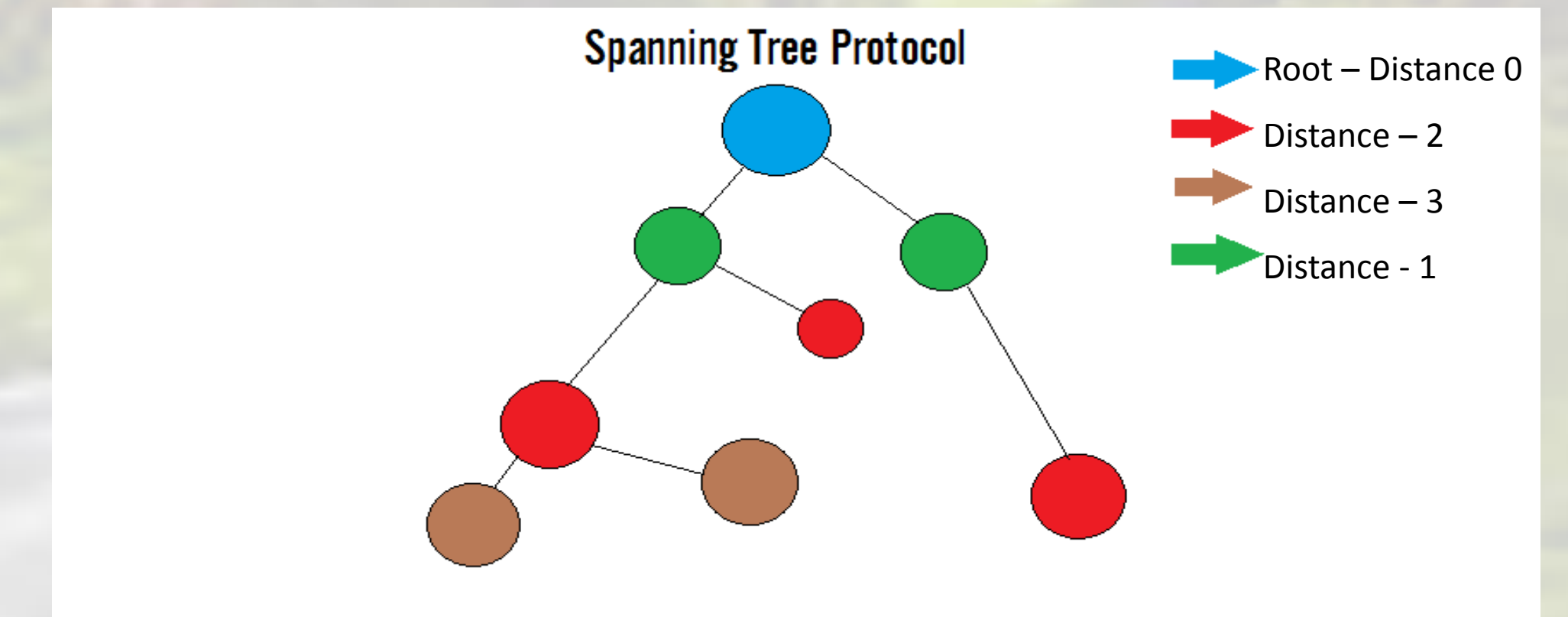


Solution:

- Wireless sensor network
- Scalable
- Automated Data Collection
- Low Maintenance

How:

- T Mote Sky wireless motes
- Runs TinyOS – Application written in NesC
- Implements Spanning Tree Protocol
- Connect to existing sensors or any ADC sensor
 - Write drivers for specific sensors
 - Uses Peripheral Connector Ports
- Implements Power Saving protocols



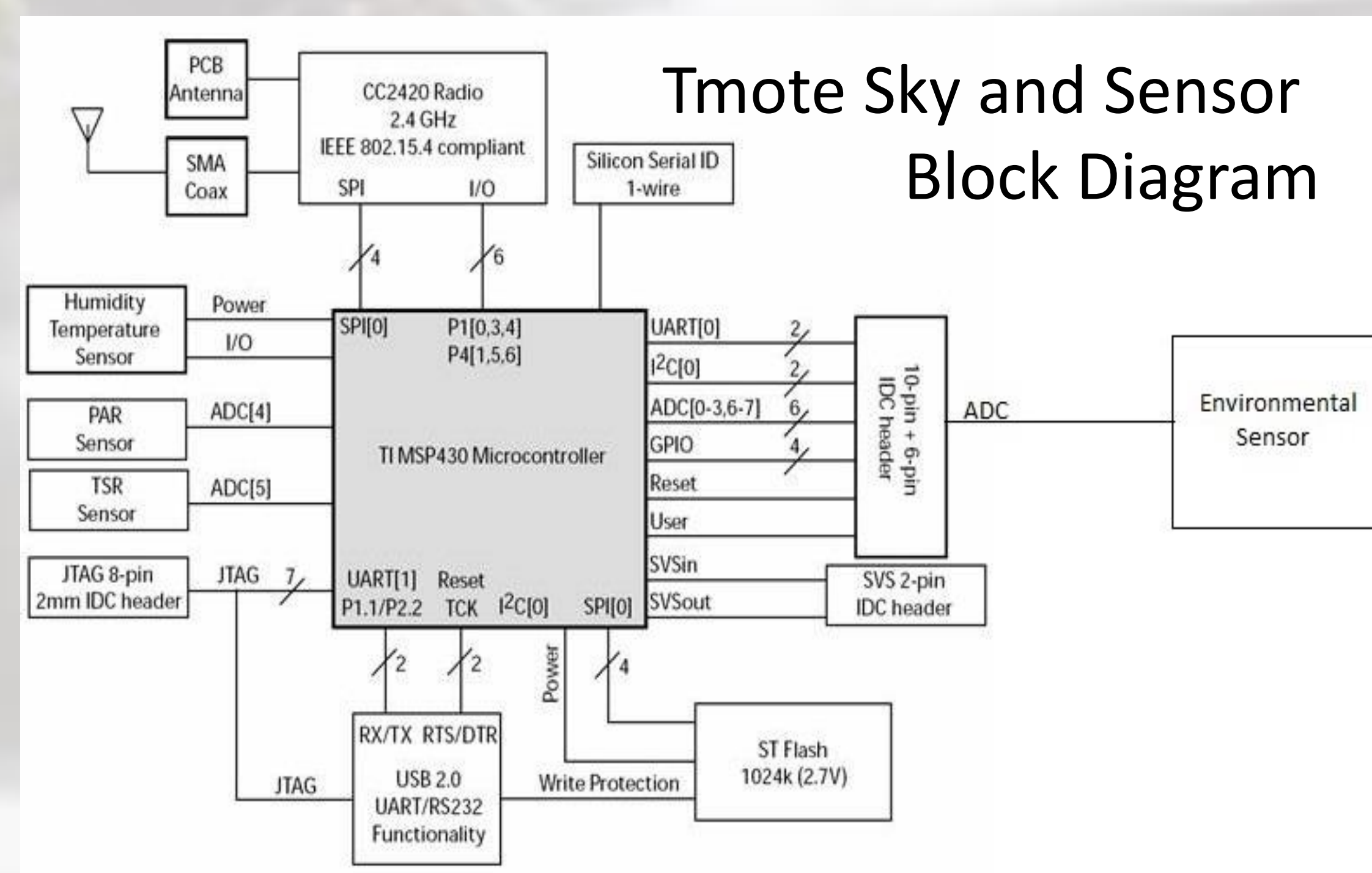
Power Analysis:

Typical Power Cycle (1 minute) - Based on 4800 mAh source of Two AA Batteries

Description	Rate (mA)	Rate*60	Time (ms)	Time (hr)	Power Used (mAh)	Totals
MCU idle - Radio Off	0.0541	3.246	30	0.000008	0.000027	1.572 mAh used in 1 hour
MCU Active - Radio Off	1.80	108.00	75	0.000021	0.002250	
Check for Incoming Messages	21.80	1308.00	25	0.000007	0.009083	
Send Data	19.50	1170.00	30	0.000008	0.009750	
Standby - Sleep	0.0051	0.306	59840	0.016622	0.005086	

Cost:

Item	Catalog Number	Quantity	Unit Price	Total
802.15.4 TelosB mote Module including temperature, humidity and light sensor	CM5000	12	\$96.56	\$1,158.72
Raspberry Pi 1 Model B+ Starter Pack - Includes a Raspberry Pi 1	2125		\$0.00	\$0.00
Wireless Sensor Node - Solar Kit (Optional)	KIT80949P	12	\$19.99	\$239.88
Misc. supplies - Solder, Wire, Etc.		1	\$50.00	\$50.00
Duracell AA Batteries - 24 Pack	PC1500BKD09	1	\$10.25	\$10.25
Total				\$1,458.85



Future Work:

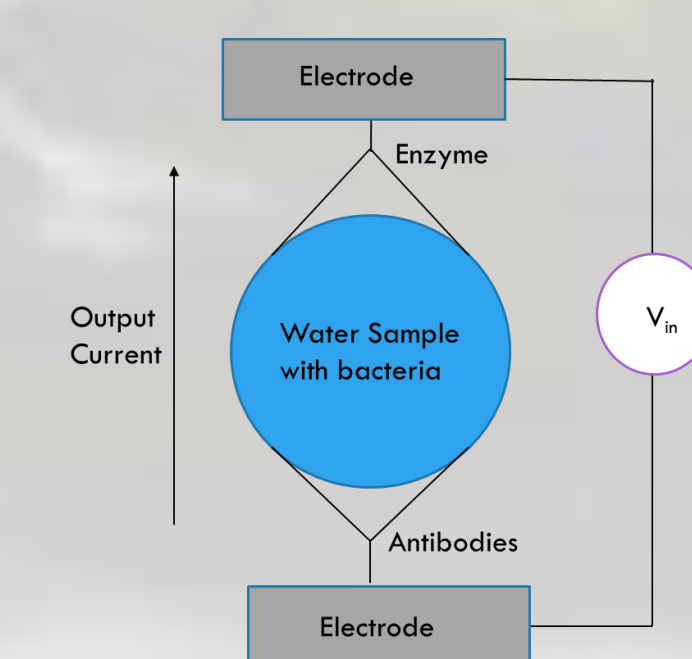
- Solar panel/rechargeable batteries for power source
- Optimize network for full scale
 - Power savings
 - Data transfer protocol
- Integrate other sensors
- Weatherproof enclosure



Solar Panel



Enclosure



Biosensor