Wireless Environmental Monitoring

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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- Outdated technology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

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

Power Analysis:

<table>
<thead>
<tr>
<th>Description</th>
<th>Rate (mA)</th>
<th>Rate*60</th>
<th>Time (ms)</th>
<th>Time (hr)</th>
<th>Power Used (mAh)</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCU idle - Radio Off</td>
<td>0.0541</td>
<td>3.246</td>
<td>30</td>
<td>0.000008</td>
<td>0.000027</td>
<td>1.572</td>
</tr>
<tr>
<td>MCU Active - Radio Off</td>
<td>1.80</td>
<td>108.00</td>
<td>75</td>
<td>0.000021</td>
<td>0.002250</td>
<td>213.75</td>
</tr>
<tr>
<td>Check for Incoming Messages</td>
<td>21.80</td>
<td>1308.00</td>
<td>25</td>
<td>0.000007</td>
<td>0.009083</td>
<td>3053.81</td>
</tr>
<tr>
<td>Send Data</td>
<td>0.0051</td>
<td>0.306</td>
<td>59840</td>
<td>0.016622</td>
<td>0.005086</td>
<td>4.241</td>
</tr>
</tbody>
</table>

Cost:

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Catalog Number</th>
<th>Quantity</th>
<th>Unit Price</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>802.15.4 TelosB mote Module including</td>
<td>CM5000</td>
<td>12</td>
<td>$96.56</td>
<td>$1,158.72</td>
</tr>
<tr>
<td>temperature, humidity and light sensor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raspberry Pi 1 Model B+ Starter Pack -</td>
<td>2135</td>
<td></td>
<td>$0.00</td>
<td>$0.00</td>
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<tr>
<td>Includes a Raspberry Pi 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Wireless Sensor Node - Solar Kit (Optional)</td>
<td>4XJ185390P</td>
<td>12</td>
<td>$19.99</td>
<td>$119.88</td>
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<tr>
<td>Misc. supplies - Solder, Wire, Etc.</td>
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<td>1</td>
<td>$50.00</td>
<td>$50.00</td>
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<tr>
<td>Duracell AA Batteries - 24 Pack</td>
<td>PC150086D009</td>
<td>1</td>
<td>$10.25</td>
<td>$10.25</td>
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</tbody>
</table>

Total $1,458.85