Code Contribution: Implementation of the B-MAC Protocol for WSN in MiXiM

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Motivation

- Traditional WSN MAC protocols are missing in MiXiM
- B-MAC is standard for TinyOS, Contiki and other WSN operating systems
- Simple, general-use, low power protocol
B-MAC (Low Power)

- Asynchronous protocol
- Wakeup period same for all nodes
- Sender sends long preambles before actual data packets
- Receivers wake-up and stay awake if a preamble is received or go immediately back to sleep
B-MAC in MiXiM

- INIT
  - start_bmac
  - wakeup

- SLEEP
  - wakeup
  - data AND !useMacAcks
  - txOver

- WAIT_PKT
  - data AND useMacAcks AND unicast
  - txOver AND !useMacAcks

- SEND PREAMBLE
  - timeout AND queue
  - sendPreamble

- WAIT_ACK
  - timeout AND txAttempts < maxTxAttempts

- sendAck

- DATA
  - sendPreamble

- TX OVER
  - useMacAcks AND txOver AND unicast

- WAIT TX ACK
  - (txAttempts > maxTxAttempts) OR
    ack received

- DATA
  - sendPreamble

- TX OVER
  - useMacAcks AND txOver AND unicast

- WAIT ACK
  - timeout AND txAttempts < maxTxAttempts

- ACK
  - (txAttempts > maxTxAttempts) OR
    ack received

- DATA
  - sendPreamble
B-MAC in MiXiM

- Inherited from BaseMacLayer
- Easily extendable into X-MAC
- Various parameters to tune and adapt to application requirements

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>slotDuration</td>
<td>secs</td>
<td>1</td>
<td>sleeping period</td>
</tr>
<tr>
<td>checkInterval</td>
<td>secs</td>
<td>0.1</td>
<td>duration of CCA phase</td>
</tr>
<tr>
<td>queueLength</td>
<td>pkts</td>
<td>10</td>
<td>maximum size of MAC queue</td>
</tr>
<tr>
<td>headerLength</td>
<td>bits</td>
<td>10</td>
<td>preamble packet length</td>
</tr>
<tr>
<td>useMacAcks</td>
<td>bool</td>
<td>false</td>
<td>use MAC level acknowledgments</td>
</tr>
<tr>
<td>maxTxAttempts</td>
<td>times</td>
<td>2</td>
<td>used only together with MAC level acknowledgments</td>
</tr>
<tr>
<td>txPower</td>
<td>mW</td>
<td>50</td>
<td>actual transmission power</td>
</tr>
<tr>
<td>bitrate</td>
<td>bps</td>
<td>15360</td>
<td>bitrate of the node</td>
</tr>
<tr>
<td>animation</td>
<td>bool</td>
<td>true</td>
<td>colorize the nodes according to their radio status</td>
</tr>
</tbody>
</table>