

POWER PROFILE

Power consumption for a node

Global Constants

Power required to turn on mcu,sensor and radio
 $(P_{off \rightarrow on})_{mcu}, (P_{off \rightarrow on})_{sensor}, (P_{off \rightarrow on})_{radio}$

Power in idle state for mcu,sensors and the idle and receive state for radio
 $(P_{idle})_{mcu}, (P_{idle})_{sensor}, (P_{idle})_{radio}, (P_{rx})_{radio}$

Power for different modes and switching between them
 $(P_{on \rightarrow sleep})_{mcu}, (P_{sleep})_{mcu}, (P_{sleep \rightarrow on})_{mcu}, (P_{on \rightarrow sleep})_{radio}, (P_{sleep})_{radio}, (P_{sleep \rightarrow on})_{radio}$

Power for proccssing packet, sending packet and reading sensor
 $P_{procss_packet}, P_{send_packet}, P_{read_sensor}$

An array of total Power of the node over time and the time at which the power changes P_{total} , timex

Functions/Equations

Turn On Node $(P_{on})_{node} = (P_{off \rightarrow on})_{mcu} + (P_{off \rightarrow on})_{sensor} + (P_{off \rightarrow on})_{radio}$

Idle State $P_{idle_state} = P_{mcu_state} + P_{radio_state} + P_{sensor_state}$

MCU $P_{mcu_state} = (P_{idle})_{mcu}$

Radio $P_{radio_state} = RX * (P_{rx})_{radio} + (1 - RX) * (P_{idle})_{radio}$

Sensor $P_{sensor_state} = (P_{idle})_{sensor}$

$RX =$ Whether Radio in Recieve state or idle state

Sleep Node $P_{sleep} = P_{mcu_state} + P_{radio_state} + P_{sensor_state}$

MCU $P_{mcu_state} = (P_{on \rightarrow sleep})_{mcu} + (P_{sleep})_{mcu}$

Radio $P_{radio_state} = (P_{on \rightarrow sleep})_{radio} + (P_{sleep})_{radio}$

Sensor $P_{sensor_state} = 0$

Wakeup Node $P_{wakeup} = P_{mcu_state} + P_{radio_state} + P_{sensor_state}$

MCU $P_{mcu_state} = (P_{sleep \rightarrow on})_{mcu}$

Radio $P_{radio_state} = (P_{sleep \rightarrow on})_{radio}$

Sensor $P_{sensor_state} = (P_{off \rightarrow on})_{sensor}$

Sense Send Message $P_{message} = P_{mcu_state} + P_{radio_state} + P_{sensor_state}$

MCU $P_{mcu_state} = P_{procss_packet}$

Radio $P_{radio_state} = P_{send_packet}$

Sensor $P_{sensor_state} = P_{read_sensor}$

Update Power $P_{total_i+1} = P_{total_i} + P_{consumed}$