

Applications with the WiseNET Ultra-Low Power WSN Solution

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MICS Meeting, 2.12.2005

Some typical application requirements and their impact

Application requirements

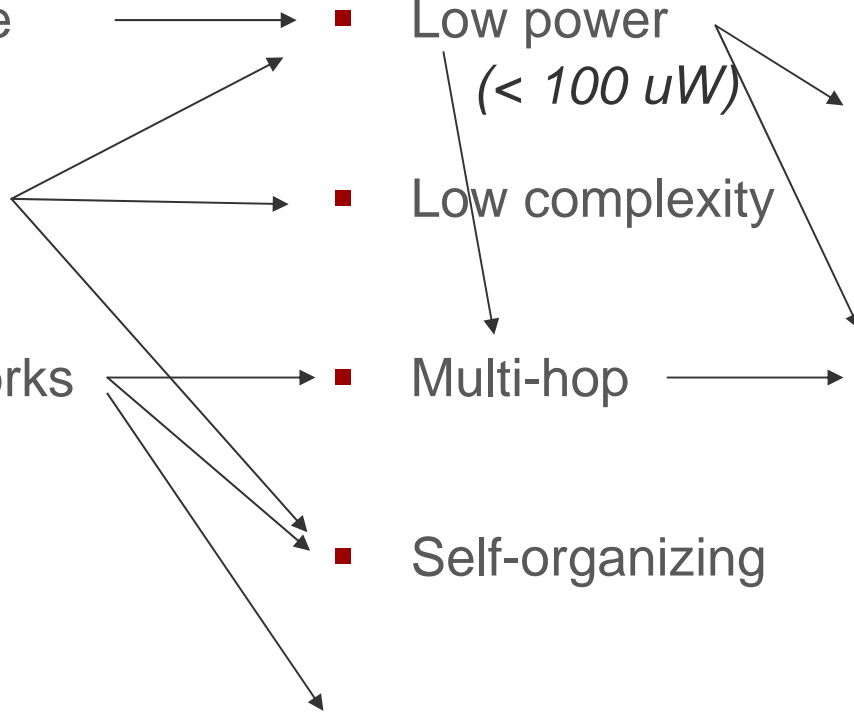
- Long lifetime
- Low cost
- Large networks

System requirements

- Low power ($< 100 \mu W$)
- Low complexity
- Multi-hop
- Self-organizing
- Scalable

Application constraints

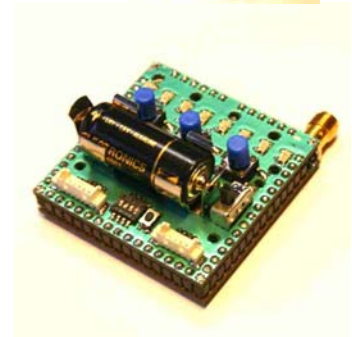
- Relatively high latency
- Low average traffic



The WiseNET System

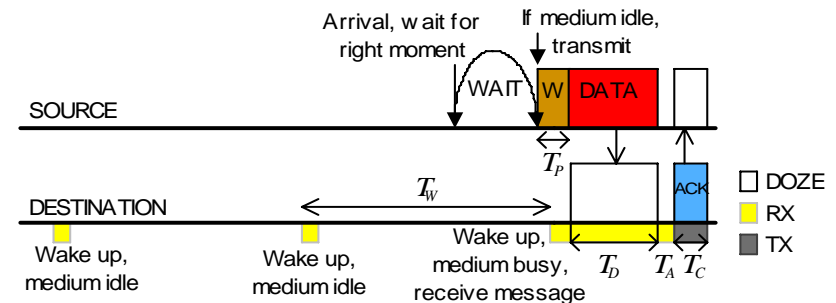
- Hardware

- WiseNode_v1
 - Two chips solution with standard radio and controller.
- WiseNode_v2
 - Single chip ultra-low power radio and 8-bit uController.



- Software

- Hardware Abstraction Layer
- WiseMAC
- Routing
- Demo applications (stats collection, alive status, alarm, ping)

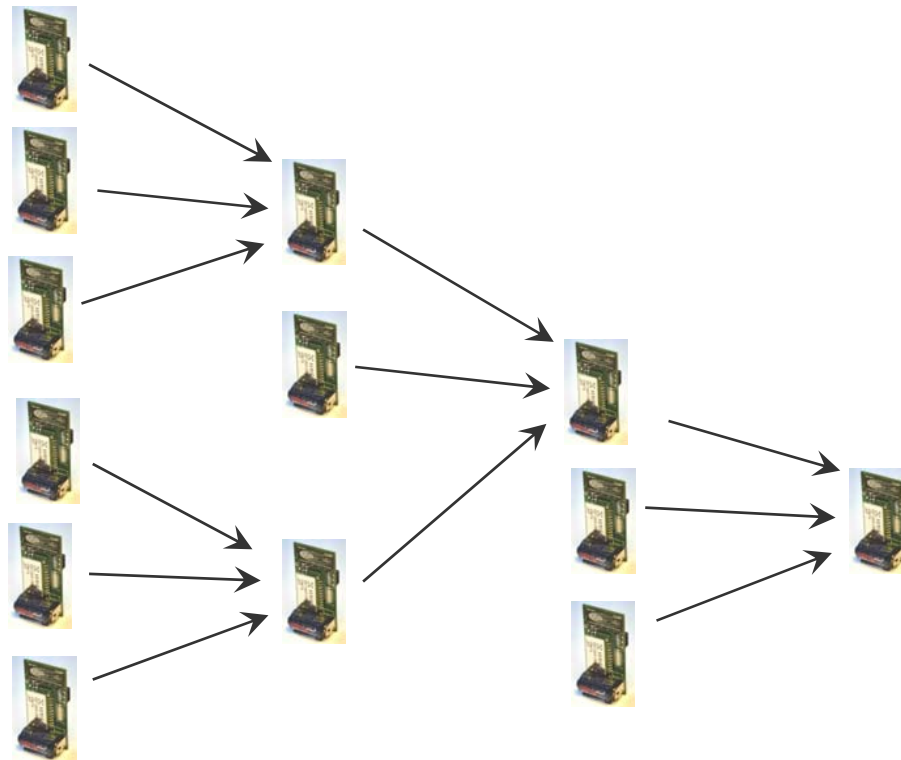


Strength and weakness of WiseNET, from an application point of view

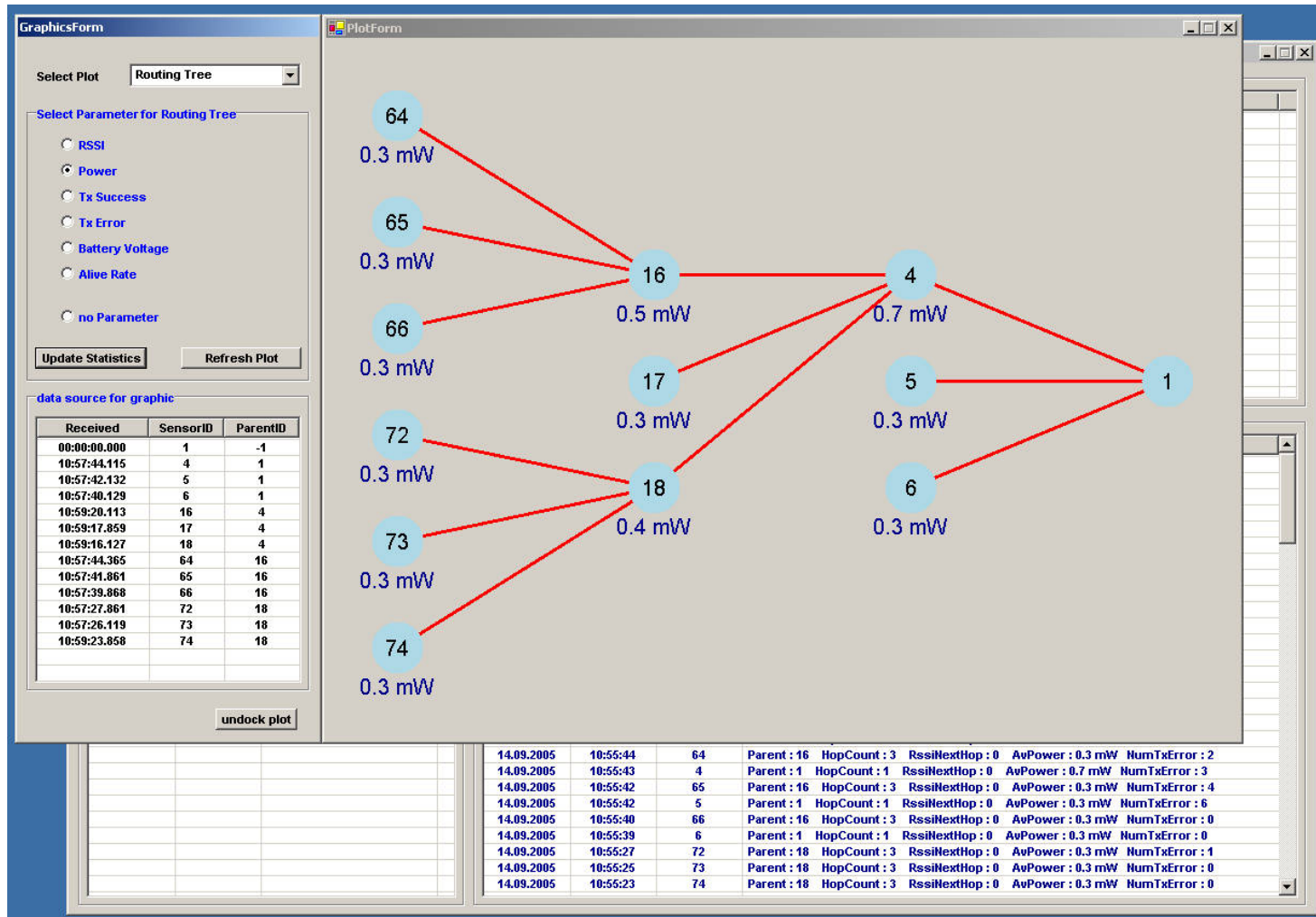
	Strengths	Weaknesses
Processor	Low power Byte interface towards radio	Little program and data memory → simple applications
Radio	Ultra low power	Bit rate limited to ~ 100 kbps → applications with low traffic
WiseMAC	Extremely power efficient for unicast → enables multi-hops over battery operated relays Flat topology → Comfortable foundation for routing	Power inefficient for broadcast → routing costly → suitable for applications with little mobility

Example application 1: periodic data collection in a static network

- Each node transmits a 32 bytes measurement and statistics packet every 2 minutes.
- No data fusion nor aggregation



Example application 1: periodic data collection in a static network



The software used to analyze and display the data received from the sensor network has been implemented by our research partner, Siemens Schweiz AG. We thank them for their effort.

Example application 2: safety critical sensor network

- Alarms must be transmitted with low latency (e.g. 3 seconds)
- Central controller must be informed rapidly of the failure of any node (e.g. within 2 minutes).
- System must usually operate in protected bands with:
 - Low bandwidth (e.g. 25 kHz → low data rate)
 - Low duty cycle (e.g. 0.1%, little data can be transmitted)
- Challenge
 - Detect failures within a few minutes while keeping the low duty cycle constraint
 - Avoid false failure detections

Code size

