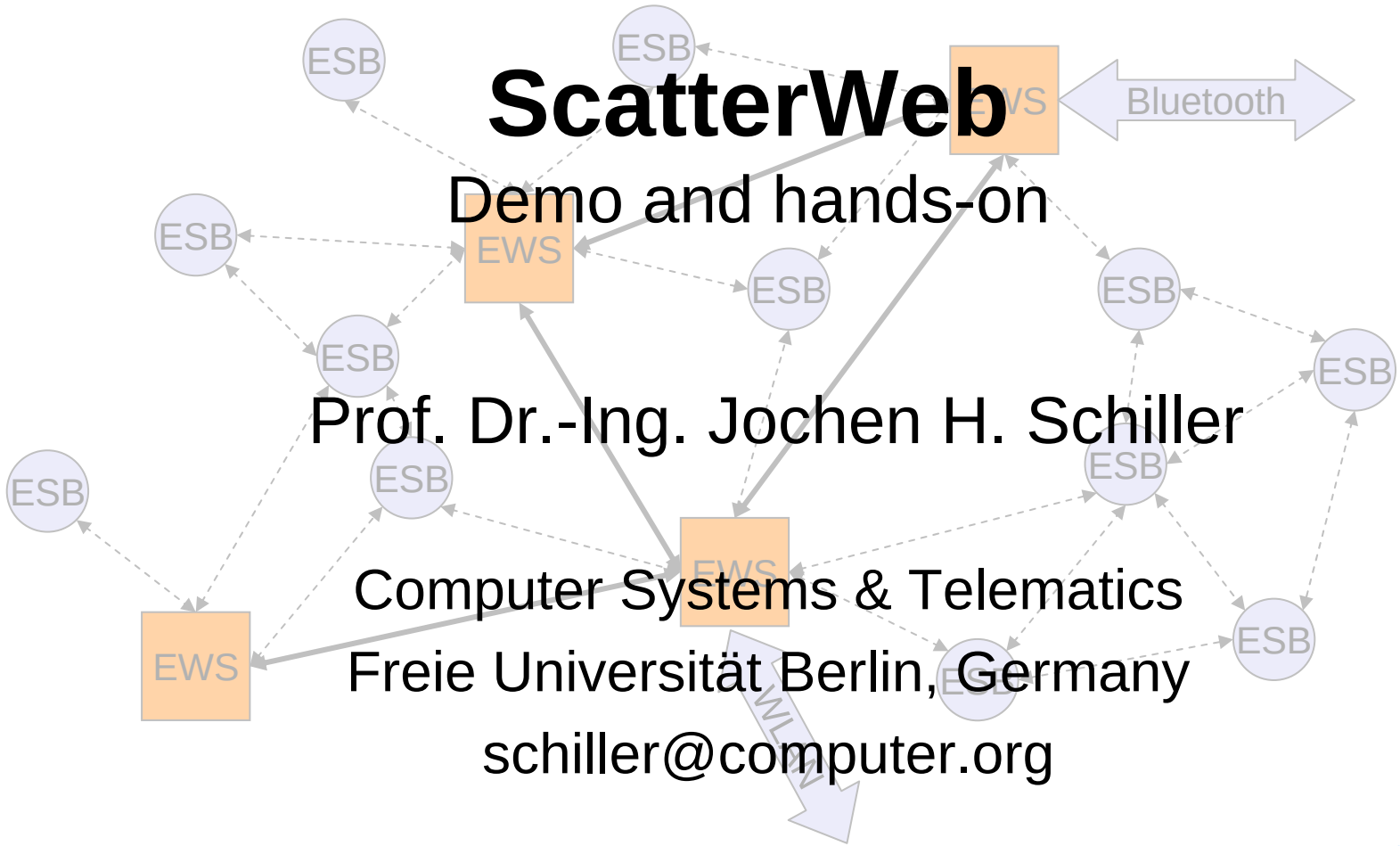

ScatterWeb

Demo and hands-on

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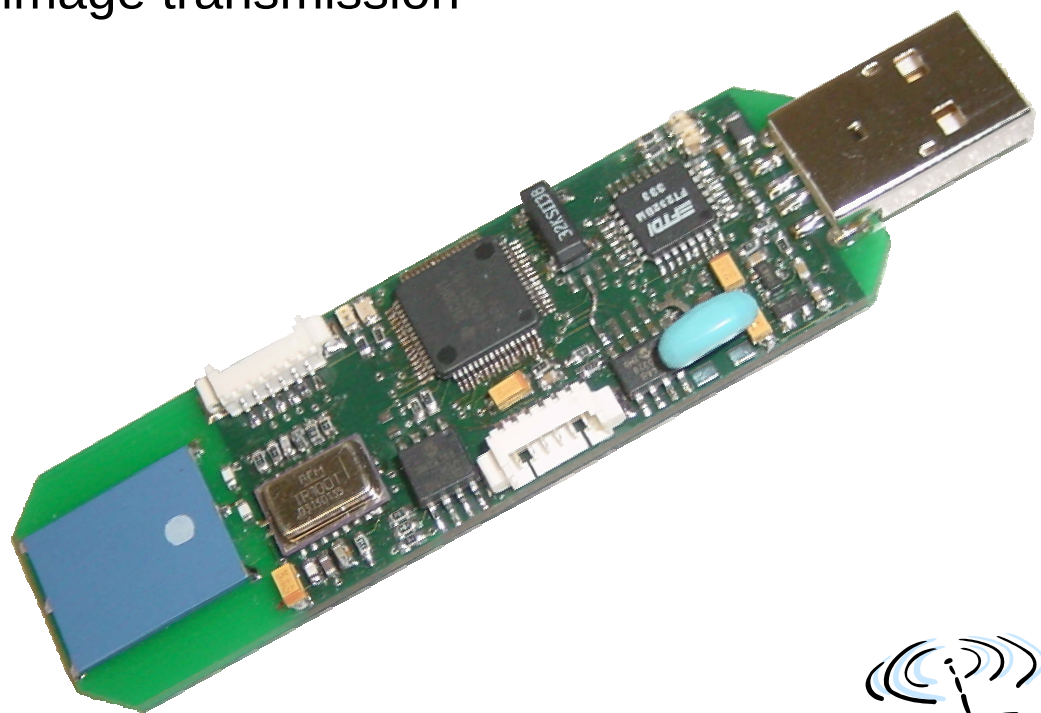
Overview

Components for demo

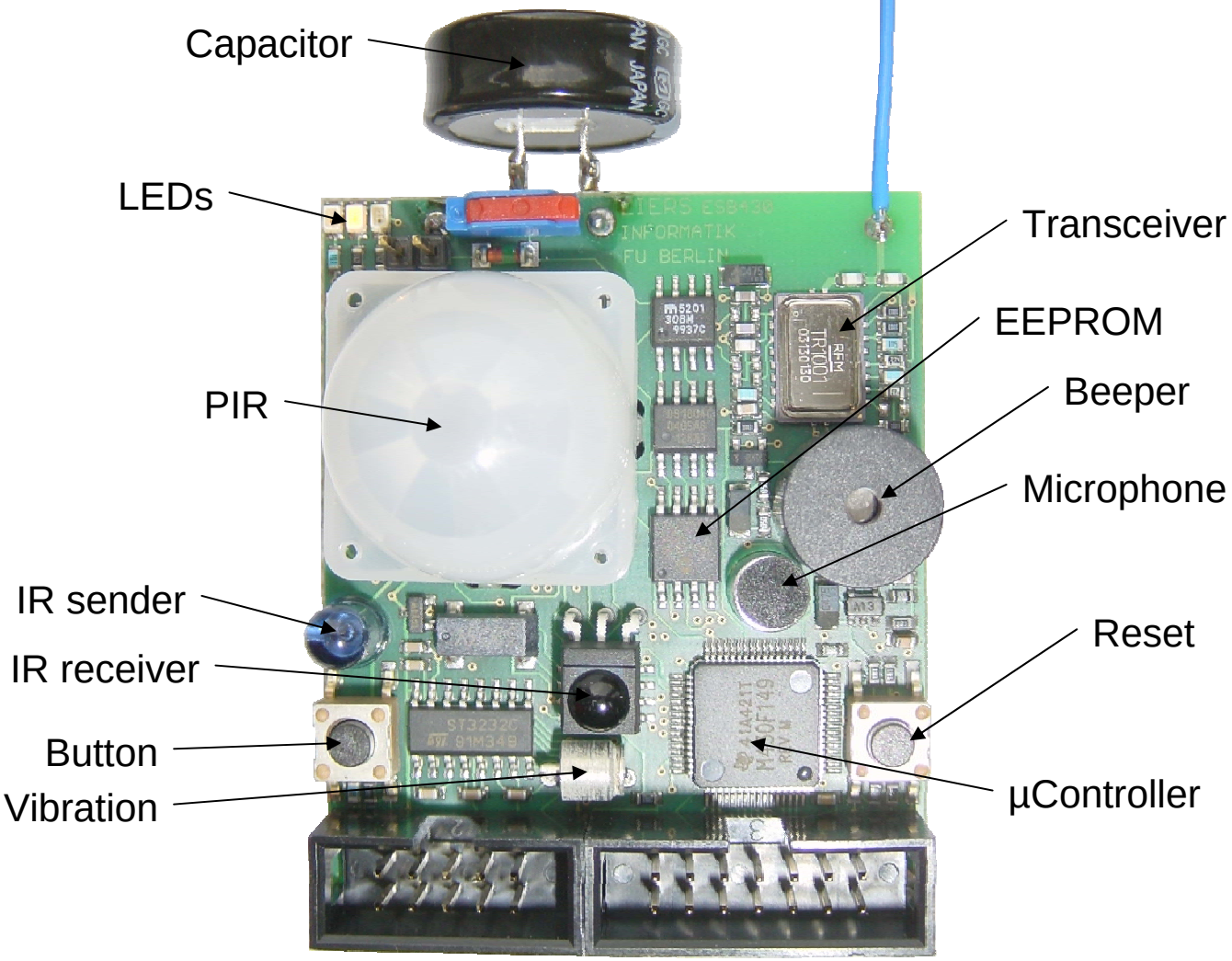
Directed Diffusion for data forwarding

Automatic tree generation and image transmission

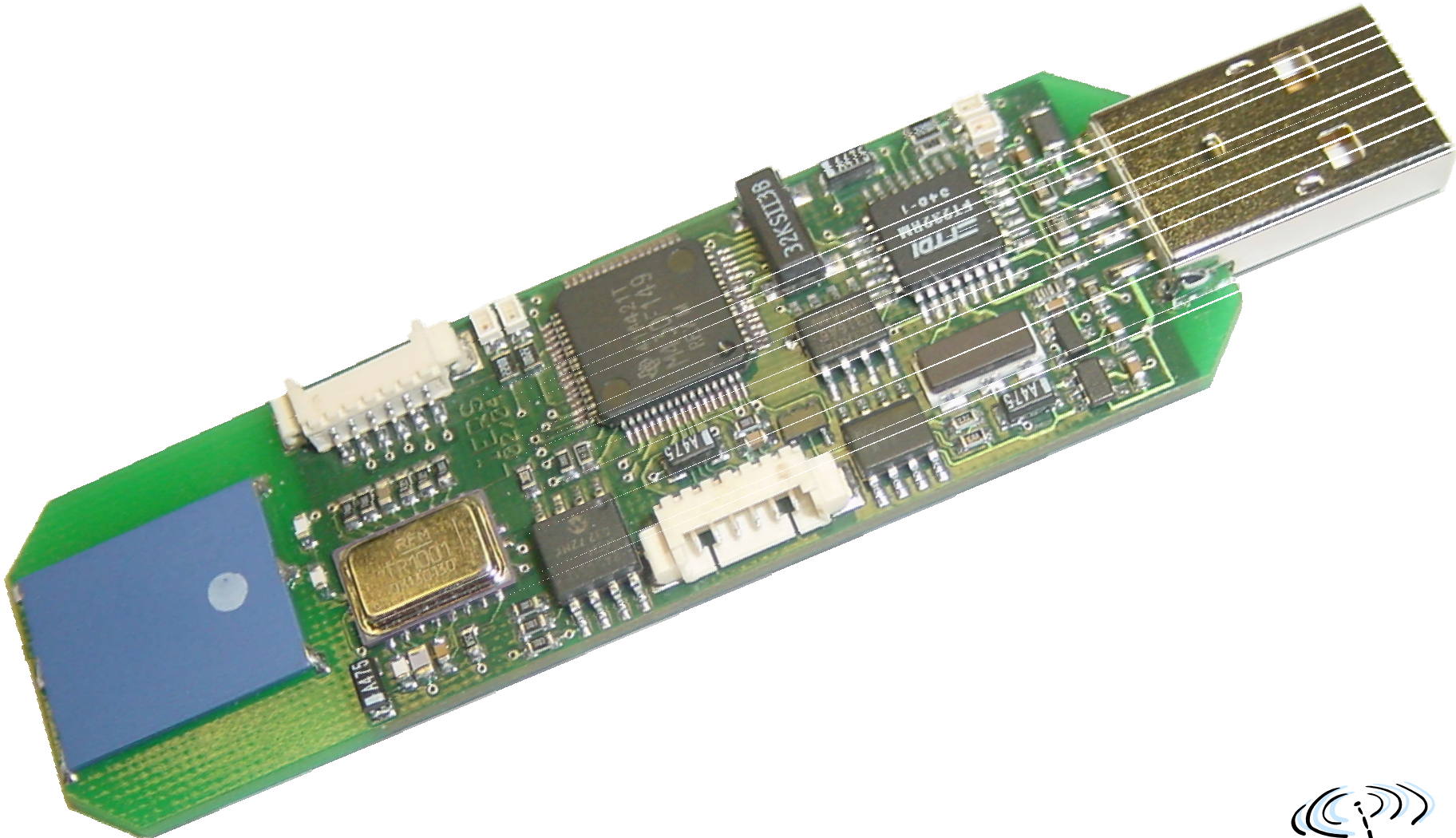
Hands-on, terminal, …



ESB2 Full Featured



ScatterFlasher



Sensor Node with Camera (prototype)

Camera facing a mirror

Picture taken and transmitted by a sensor node

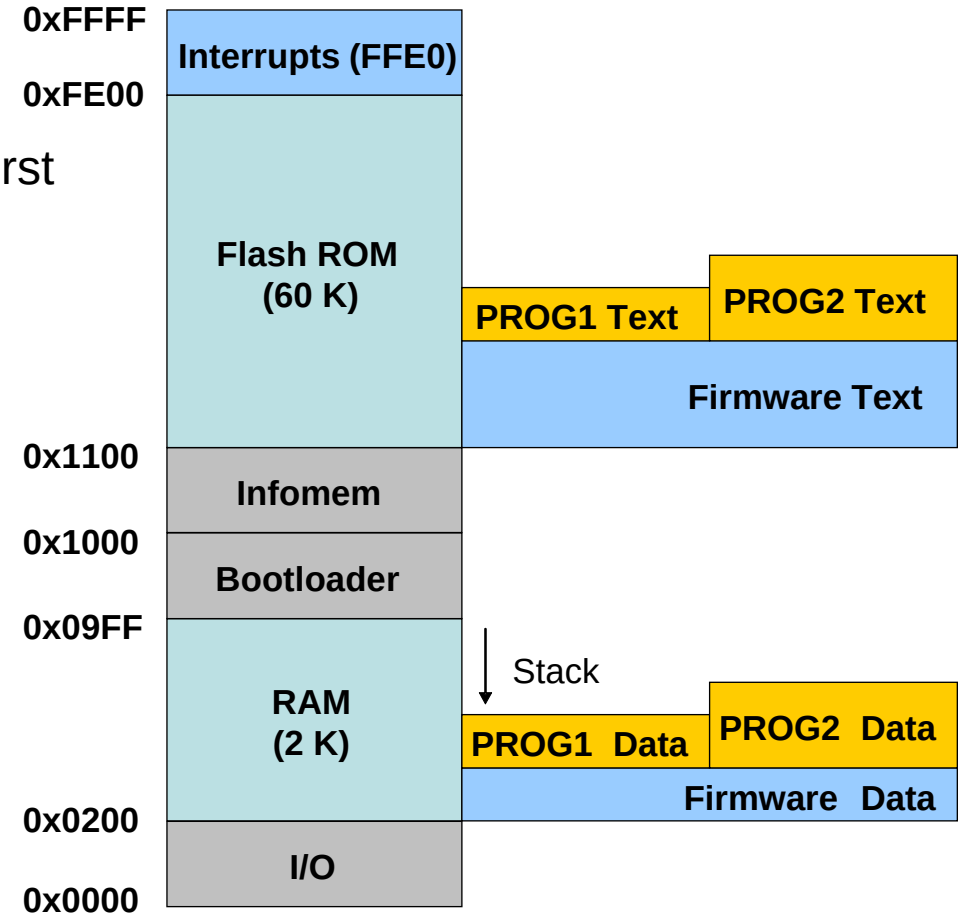
Node Architecture

Separation into firmware and task

- Stable “core”
- SW updates stored in EEPROM first
- Flashing as second step
  - Synchronized (time or command)
  - Checksum

Task

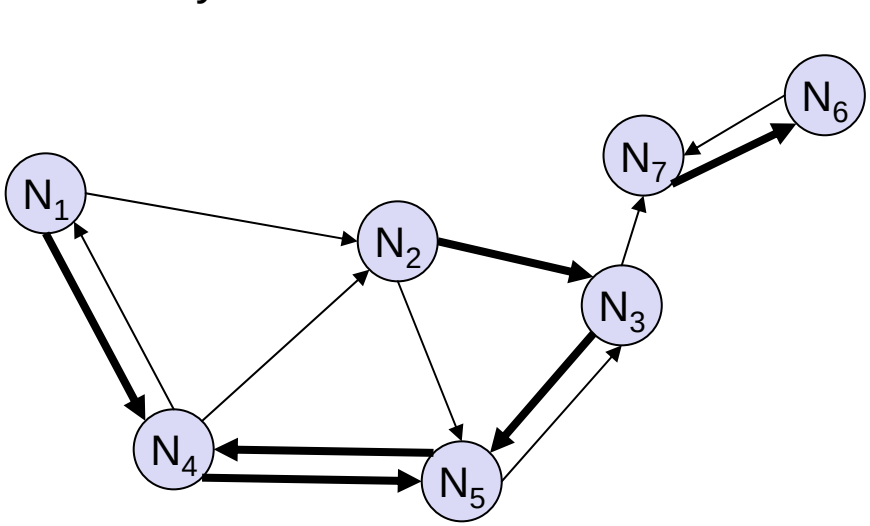
- Linked against firmware
- Can use all functions
- Can register callback functions



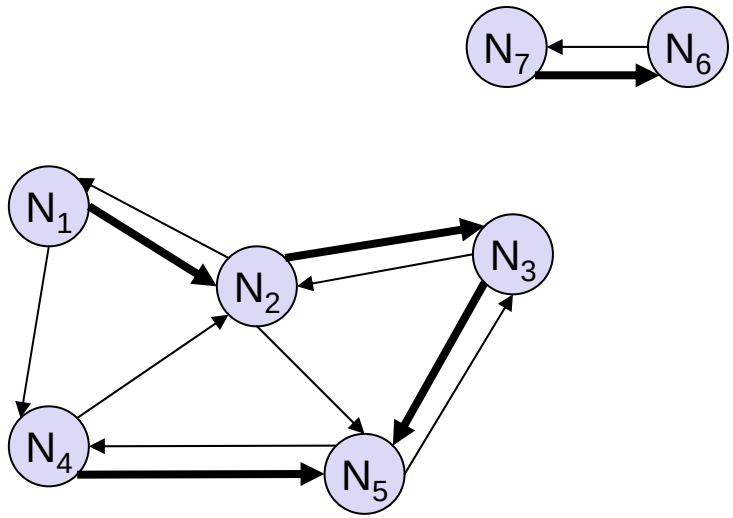
Problem No. 1: Routing

Consider dynamic topology

- Device mobility plus changes in channel characteristics
- Separation and merging of networks possible
- Asymmetrical connections



time = t_1



time = t_2

Good connection
Weak connection

Routing in Ad-hoc-Networks

THE big research tasks for many years

- Far more than 100 different proposals exist
- Simple: Flooding

Reason

- Classical approaches from fixed networks fail
  - Slow convergence, big overhead
- High dynamicity, low bandwidth, low computing power

Metrics for routing

- Minimum
  - Number of nodes, data loss, delay, congestion, interference, …
- Maximum
  - Stability of network, run-time of battery driven nodes, coherence of network, …

Die Vielfalt von Ad-hoc-Routing-Protokollen

Flat

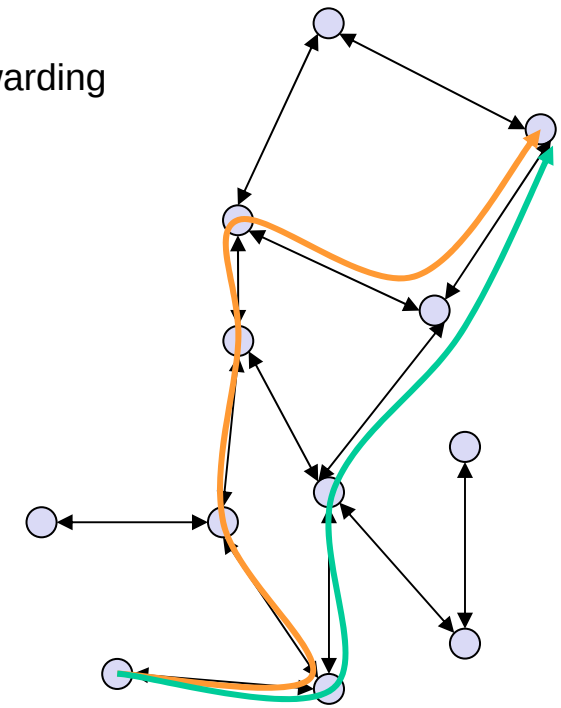
- Proactive – permanent maintenance of routes
  - FSLS – Fuzzy Sighted Link State
  - FSR – Fisheye State Routing
  - OLSR – Optimized Link State Routing Protocol
  - TBRPF – Topology Broadcast Based on Reverse Path Forwarding
- Reactive – route establishment on demand
  - AODV – Ad hoc On demand Distance Vector
  - DSR – Dynamic Source Routing

Hierarchical

- CGSR – Clusterhead-Gateway Switch Routing
- HSR – Hierarchical State Routing
- LANMAR – Landmark Ad Hoc Routing
- ZRP – Zone Routing Protocol

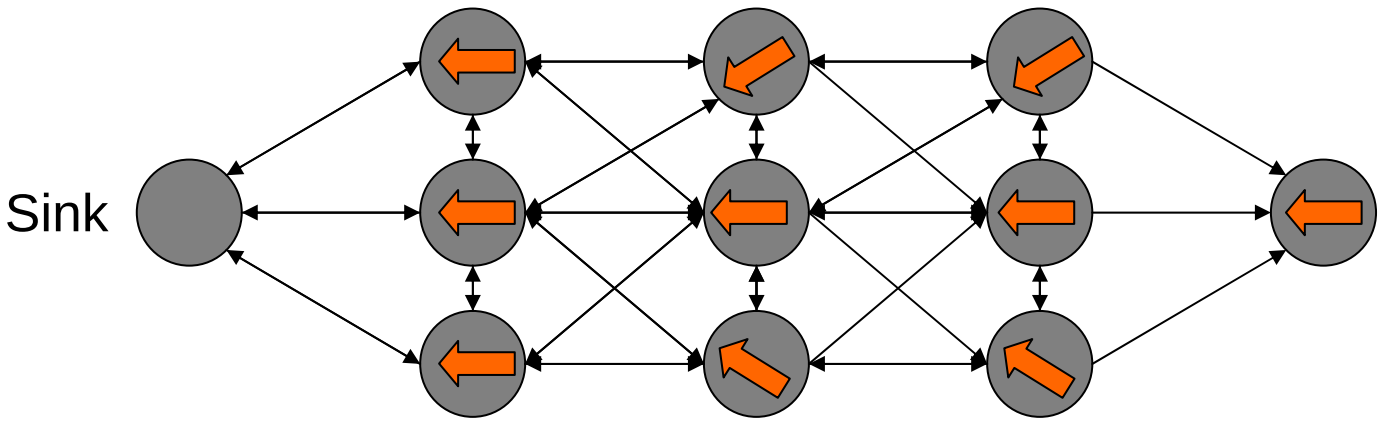
With geo-location support

- DREAM – Distance Routing Effect Algorithm for Mobility
- GeoCast – Geographic Addressing and Routing
- GPSR – Greedy Perimeter Stateless Routing
- LAR – Location-Aided Routing



Routing in Sensor Networks

Implementation of (simplified) directed diffusion scheme [Intanagonwiwat, Govindan, Estrin, Heidemann, Silva, 2003]



Solar-aware directed diffusion
[Voigt, Ritter, Schiller, demo at ACM sensys 2003]

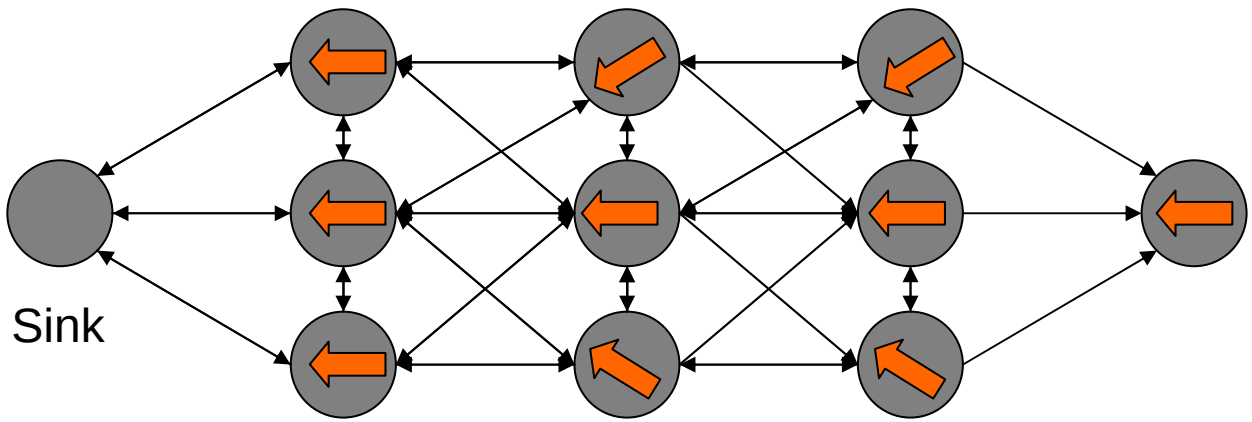
Localized Interactions

Interest Messages

- Interest in sensor data: Attribute/Value pair
- Gradient: remember direction of interested node

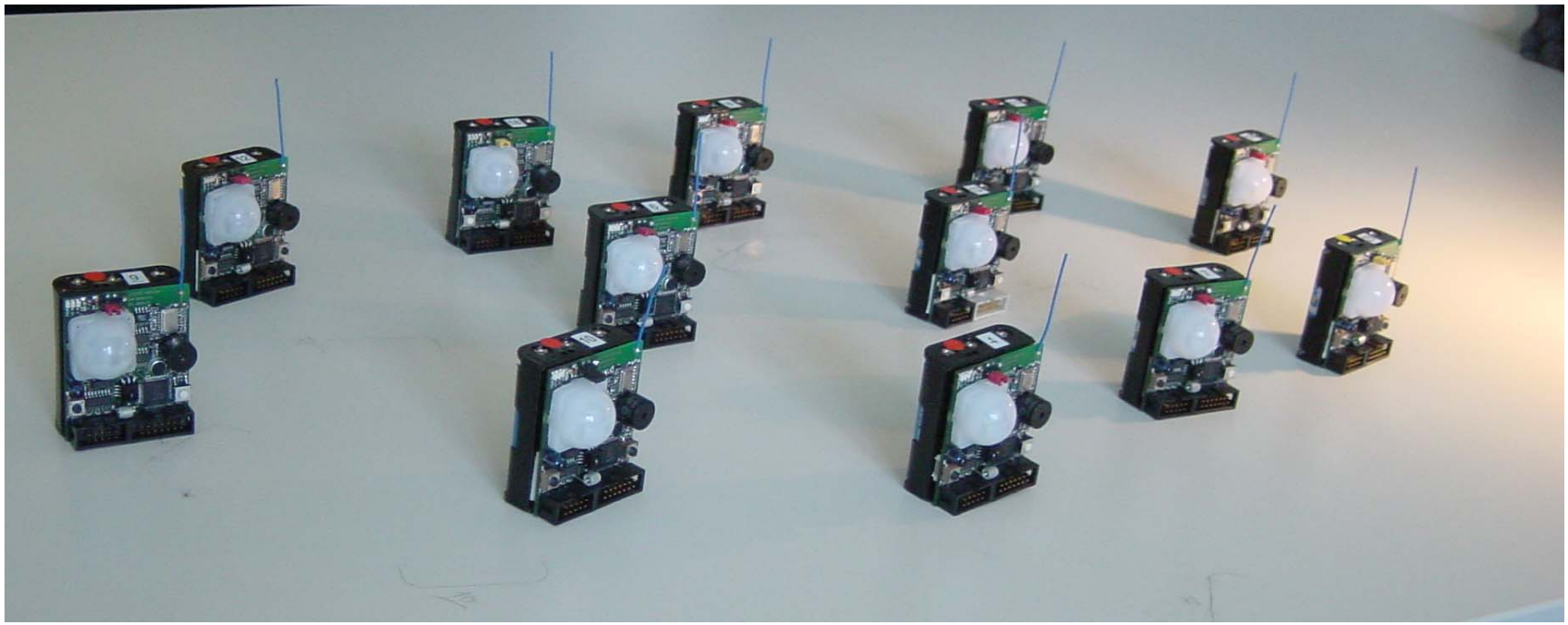
Data Messages

- Send back data using gradients
- Hop count guarantees shortest path



Solar-aware routing …

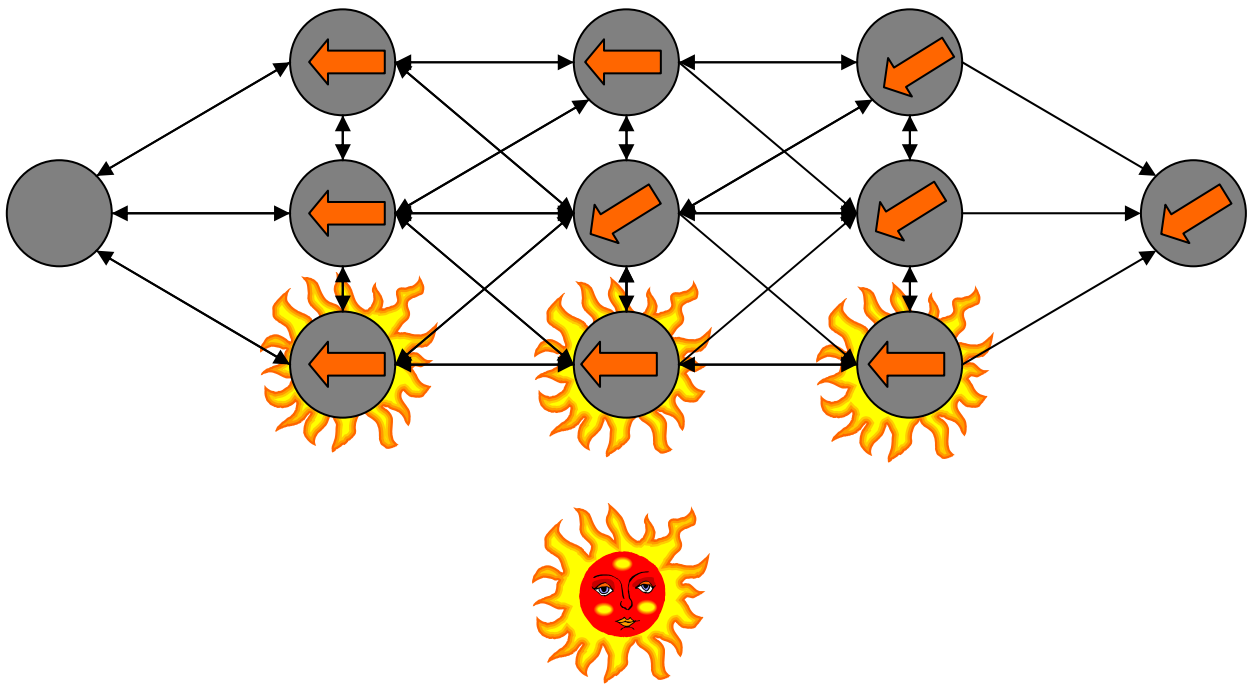
Only sensors with sufficient energy forward data for other nodes



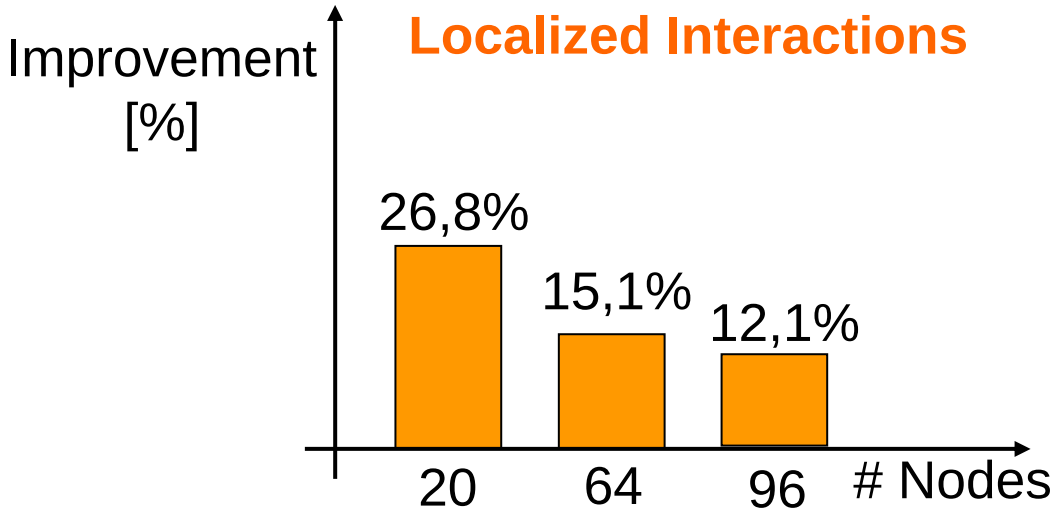
Solar-aware Routing

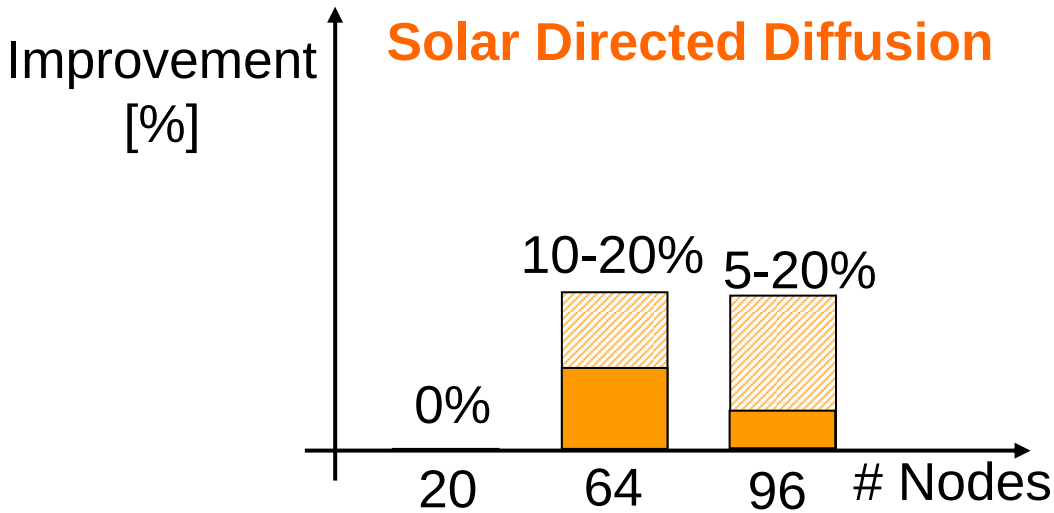
Solar-powered node

- Send status updates to neighbors
  - Either proactive or when sniffing ongoing traffic
- Have neighbor nodes reroute traffic



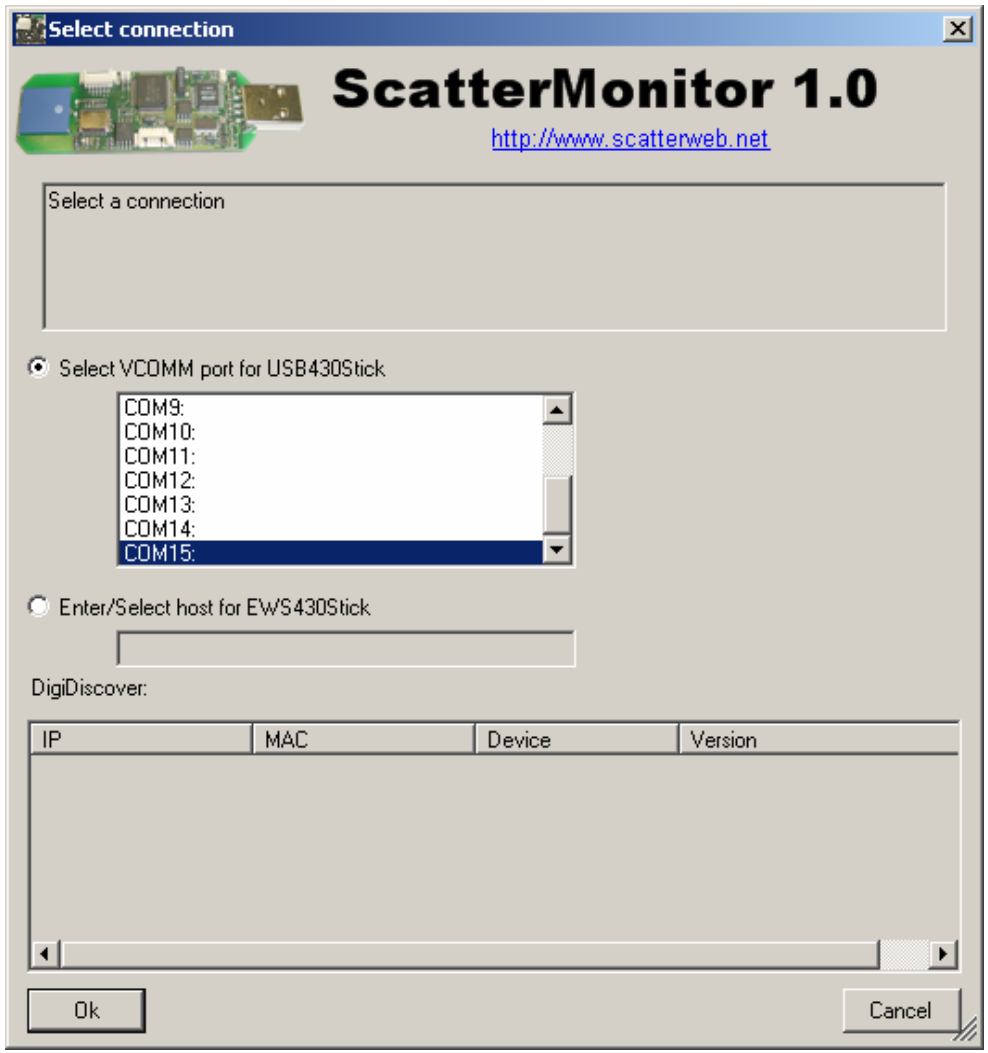
Simulation Results



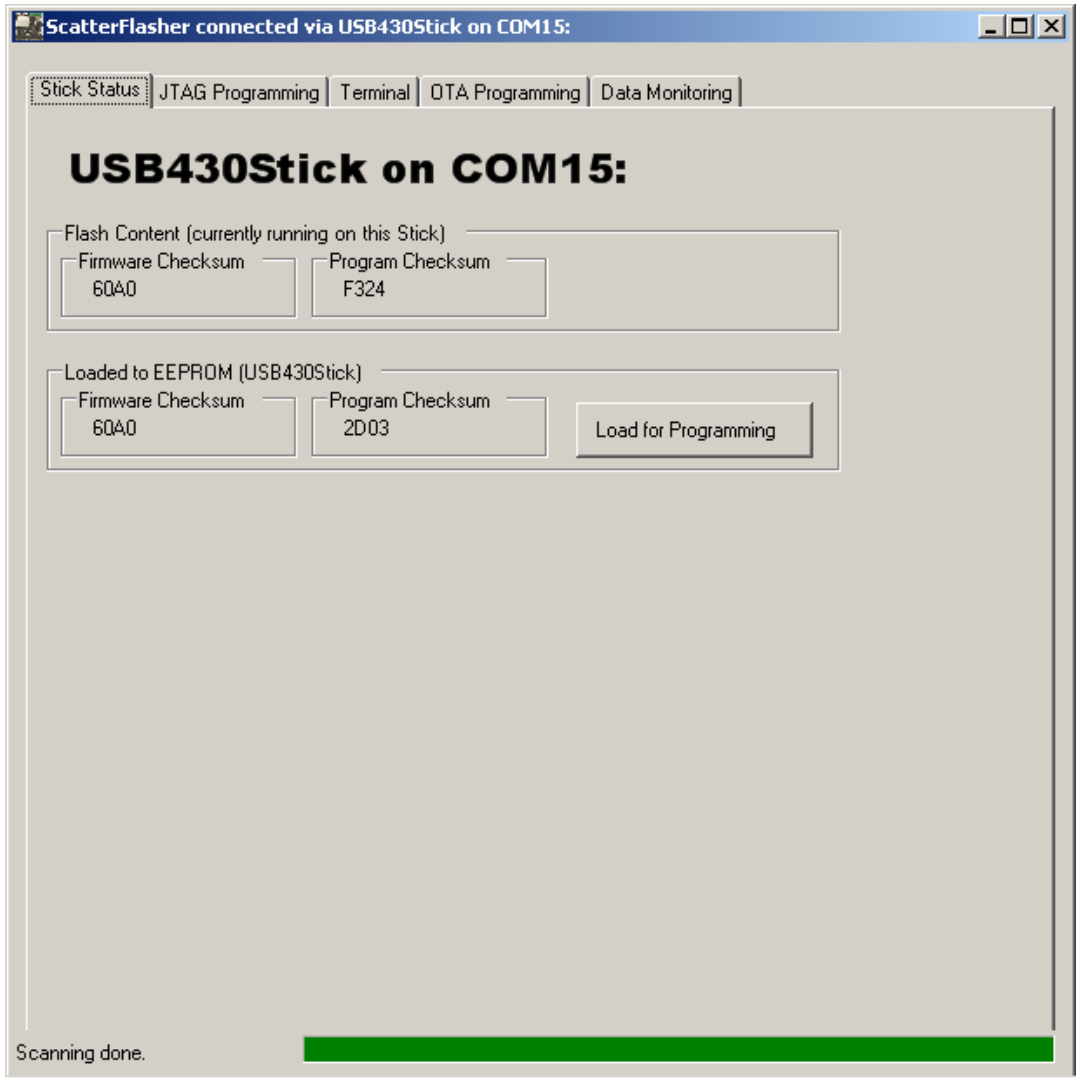


Metric:
number of messages transmitted using battery

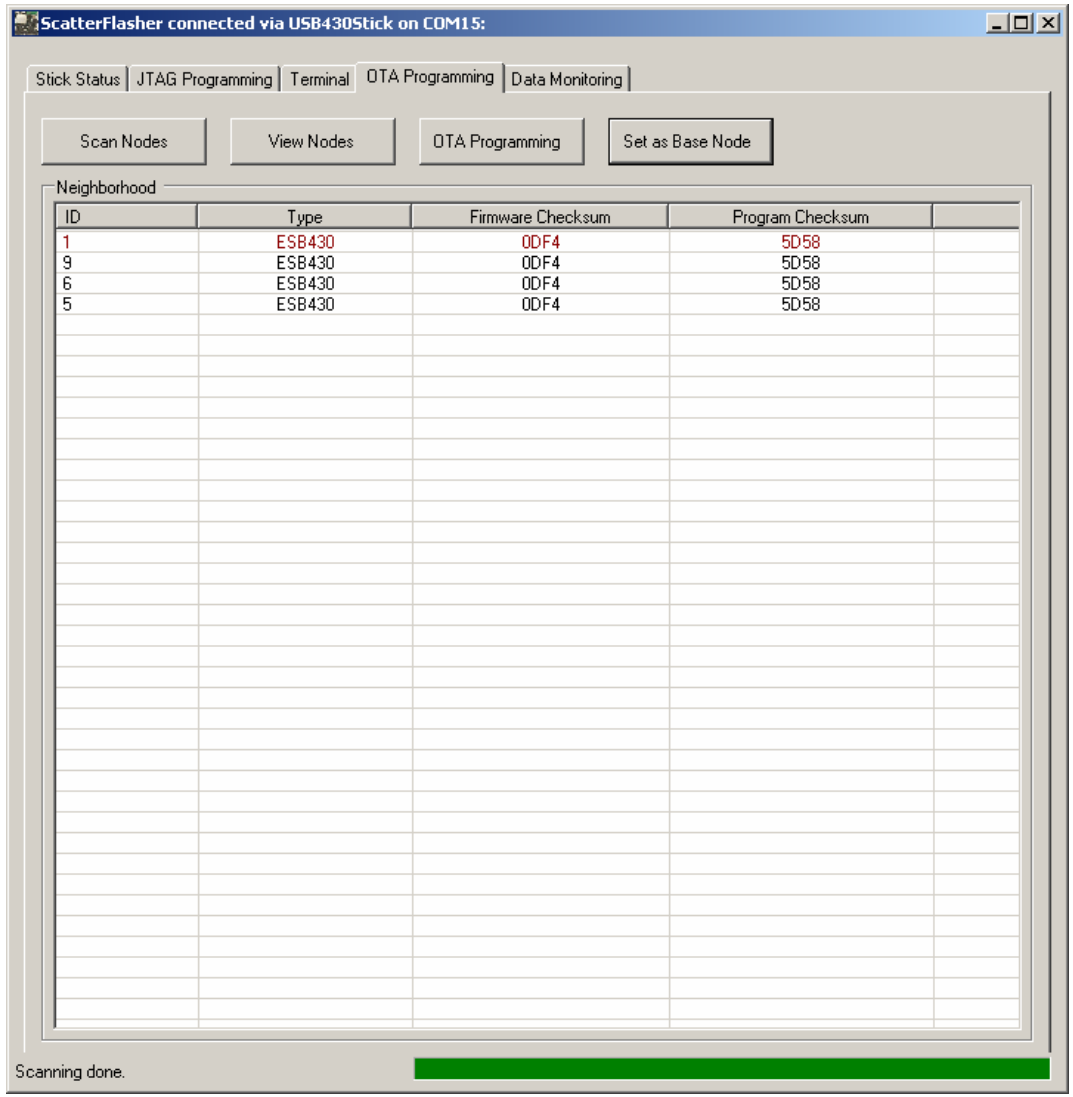
Software for Controlling the Sensor Network 1



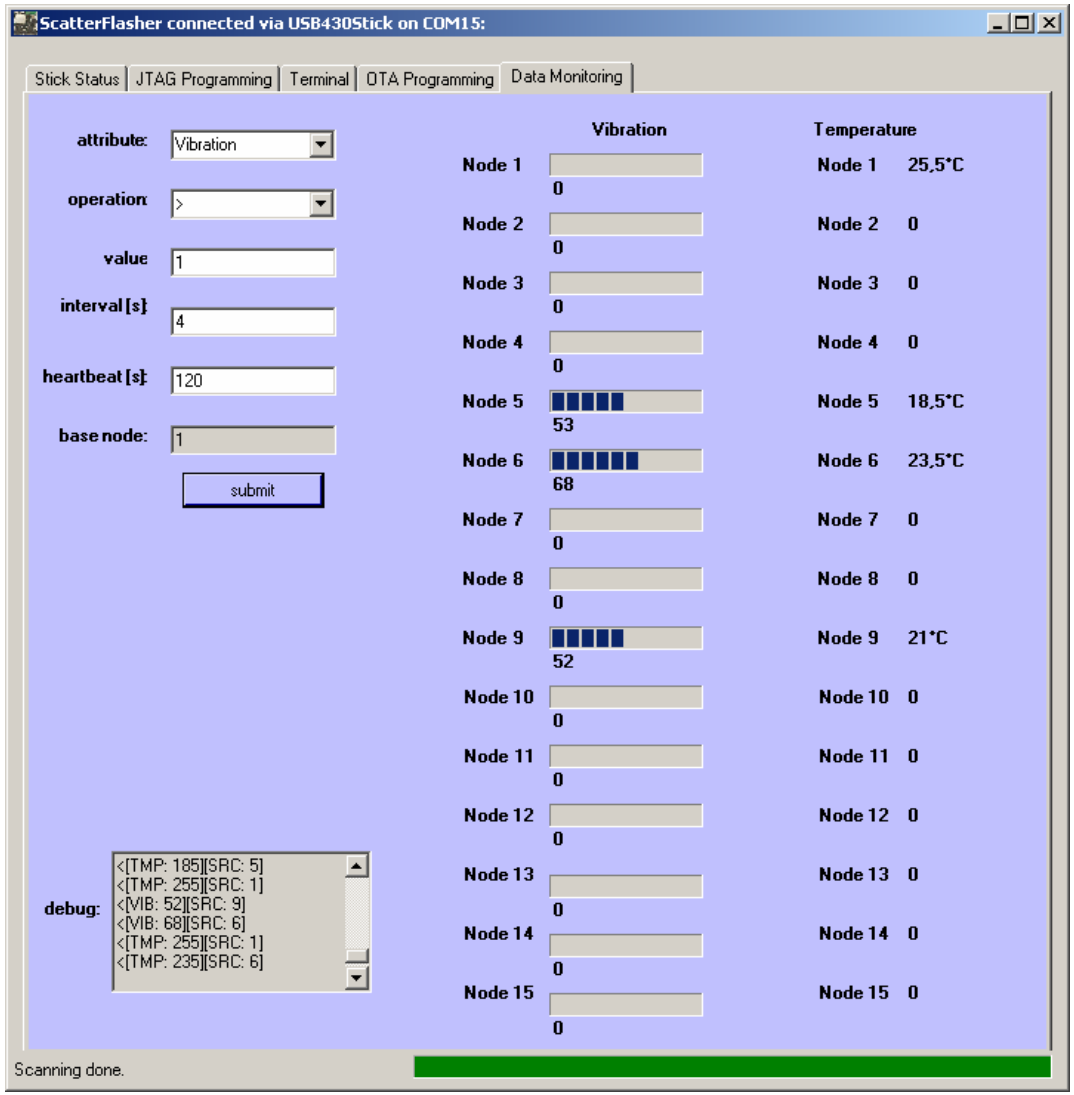
Software for Controlling the Sensor Network 2



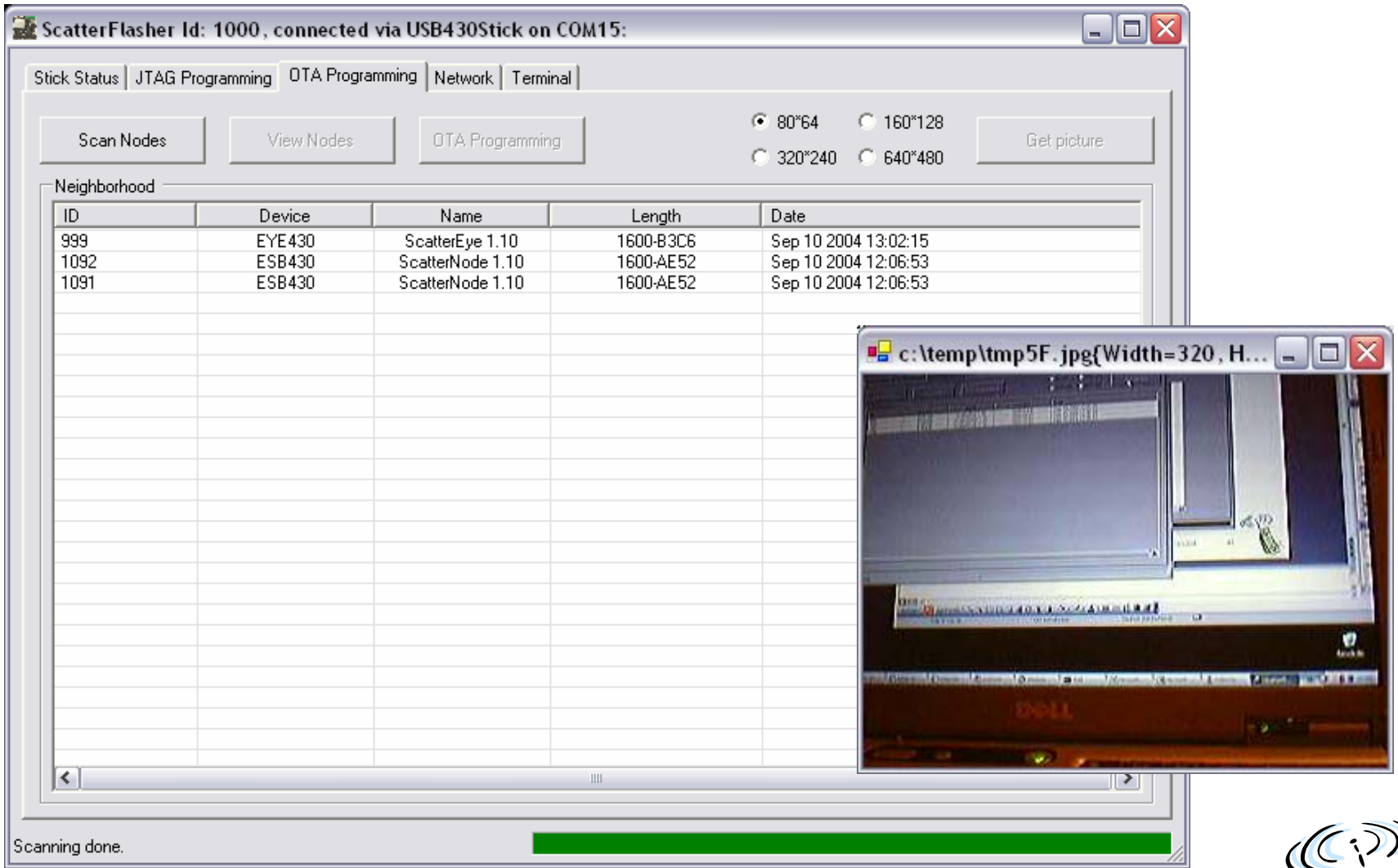
Software for Controlling the Sensor Network 3



Software for Controlling the Sensor Network 4



Software for Controlling the Sensor Network 5



Software for Controlling the Sensor Network 6