**BTnodes – A Distributed Platform for Sensor Nodes**

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**BTnodes**

**Hardware**

- 8-bit microcontroller, 8 MHz / 8 MIPS  
- 244 kB RAM, 4 kB EEPROM, 128 kB Flash  
- Bluetooth radio  
- Generic sensor and I/O interfaces  
- Power management  
- Clock-frequency scaling  
- Unit cost (200 devices): $ 110

**Basic Communication Features**

- Spontaneous networking  
- High bandwidth (~1Mbit/s)  
- High-level communication interface  
- Error detection and correction  
- Device & service discovery  
- Over-the-air “serial-port” (RFCOMM)  
- Voice channels

**Application Building Blocks**

**Integration into Computing Environment**

- Make use of off-the-shelf devices without modification  
  - Mobile phones  
  - GPS receivers, surveying systems  
  - Printers, cameras (video and still)  
  - PDAs, laptops  
  - Network access points  
- Typically using over-the-air “serial port” and AT commands

**Input and Actuation**

Gateways connect sensor patches to applications and support infrastructure

**Dissemination and Use**

**Programming**

- Lightweight BTnode software  
  - Standard C language  
  - Event-based programming model  
  - Portable host platforms (Linux, Win/Cygwin, x86, iPAQ, MAC OS X)  
- Easy to learn (½-day Hackfests)  
- Over-the-air programming

**Projects**

- 200 BTnodes deployed in 16 research groups in CH, DE, DK, SE, FI, GB, US, ...  
- External projects with BTnode platform  
  - TinyOS port (contrib/tinybt)  
  - BTnode software ported to other uCs (ST10, ARM)  
  - BTnode hardware used as reference implementation

**Prototypical Application Scenario**

- Clustered or self-organized patches of sensors  
- Self-healing backbone infrastructure for sensor networks (TreeNet)  
- Sensor network front-end (e.g. for data browsing)  
  - directly through laptops and PDAs  
  - through Internet gateway

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