Open Research Issues in IoT

Towards cyber-physical systems

A rapidly expanding, open-ended universe of discourse

Björn Pehrson <bjorn@pehrson.se>
SA0BXI Systems,
Makerere University 2016-09-02

Special Issue: IoT Challenges

- Google for it and you get more than you can digest

Perspectives of IoT

- Applications: agriculture/geophysics, bioscience/health, automotive,...→ cyber physical systems (CPS)
  - Requirement analyses
  - Sensor development, evaluation, calibration, drivers
- Computing: ubiquitous, mobile, pervasive, embedded systems hw/fw/sw/os
- Communication: wsn, iot
  - Protocol stacks: rest/http/coap, tcp/ipv6,rpl, ieee802
  - Radio propagation properties (signal strengths, pdr)
  - link capacity (iperf3)
- Power: consumption, sources and storage
  - Undervolting....

Standardization efforts

- Application standardisation bodies
- Data management, Big data analysis
- IETF: 6lowpan, 6Lo, 6tisch, ….
- IEEE: 802.15.4e tsch
  - packet vs circuit switching, deterministic links, pdr
- Embedded Systems (open community de facto)
  - Processor architectures, performance benchmarks, e.g. lmbench
  - OS: linux, tinyOS, contiki, riot, openwsn...
- Real time requirements

Wimea-ICT AWS

- Local wireless sensor network at each Observation station with Sink-node/Gateway to Internet
- Basic configuration with four nodes
  - 3 autonomous broadcasting nodes plus sink/gateway
  - 10m,2m,gnd,sink
- Power supply
  - Load requirements of components, source, storage
  - Low power gateway and uplinks, radio duty cycling

Research Issues

- Uplink alternatives
  - Stability, timing, power consumption
  - Mesh/olsr
  - NAT penetration
- Minimizing gateway power consumption
- Minimizing need for human intervention
- WSN nodes Routing with data aggregationin Duty Cycled Ultra-Low Power WSN
- Power supply
  - Innovative storage and regulators
- Robustness