

# Service Oriented Architecture for Heterogeneous Ad hoc Wireless Sensor Networks

## INNOVATION

Multi-level SOA (Service Oriented Architecture) that bridges the gap between high-level Command and Control applications and networks of low-level sensor/actuators.

## WHO SHOULD BE INTERESTED IN

System designers of software integration architectures for sensor/actuator networks.

## NEXT STEP

Deployable services  
Addition of security and localisation functions.

## Main Technological Contributions

### wsn-SOA: A Lightweight SOA for Wireless Sensor Networks

- **Brings** the benefits of the SOA paradigm to multi-level sensor/actuator networks in an efficient manner.
- **Features** service discovery, network self-organisation, publish/subscribe mechanism and multicast invocation capabilities.
- **Implemented** under TinyOS (lightweight open-source component-based operating system) running on Crossbow MICAz. Provides services such as presence detection and ambient parameters retrieval.

### Bridging wsn-SOA and Web Services

- **DPWS** (Devices Profile for Web Services) enables Web Service messaging, discovery, description, and eventing on resource-constrained devices.
- **The gateway** provides bidirectional wsn-SOA-DPWS service translation, aggregation, discovery and management. It has been implemented in JAVA CDC Foundation Profile using the OSGi framework.
- **The graphical command and control unit** enables automatic and dynamic management of all devices and services using this gateway.

## Wireless sensor nodes: Crossbow MICAz motes

- Atmel ATmega128L microcontroller running TinyOS.
- 2.4 GHz Zigbee (IEEE 802.15.4) radio featuring high speed (250 kbps) and hardware security (AES-128).
- Various sensor boards hosting (Light, Temperature, Barometric, Pressure, Acceleration/Seismic, Acoustic, Magnetic, GPS...).



## Gateway: Crossbow Stargate

- 400MHz Intel Xscale® Processor, 64MB RAM, 32MB Flash running Linux.
- Various connectors: PCMCIA, Compact Flash, USB, Ethernet, JTAG, Serial.
- Zigbee connectivity through MICAz hosting.



## Camera: Axis 213 PTZ

- Pan, tilt, zoom network camera with built-in 26x optical zoom, auto focus lens + 12x digital zoom.
- Simultaneous Motion JPEG and MPEG-4.
- 100 MHz CPU, 32 MB RAM, 4 MB Flash running Linux.

