



COST

**European Network on New Sensing Technologies for Air
Pollution Control and Environmental Sustainability - *EuNetAir*
COST Action TD1105**

WGs and MC Meeting at Rome, 4-6 December 2012

Action Start date: 01/07/2012 - Action End date: 30/06/2016

Year: 2012-2013 (*Starting Action*)



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Scientific context and objectives in the Action

- Sub-WG2.3 Scientific Context & Challenges:
 - Functional characterization, design, realization and management of new cost-effective wireless sensor-systems for AQC
 - Active monitoring & control
 - Low power design & energy efficiency
 - Network planning and management mechanisms & tools
 - Utilization and mapping of standards
- Matching WG2 Action:
 - Objectives:
 - Report/Protocols for integration of portable gas sensor-systems for AQC
 - Protocols for development of wireless sensor network for AQC
 - Deliverables:
 - Recommendations for AQC wireless sensor networks management



Current Research Activities

- Active monitoring and control of sensors to enhance:
 - Reliability degree
 - Calibration requirements
 - Processing capabilities
 - Communication efficiency
 - Re-configuration mechanism
- Low power electronics for optimum performance - minimum power dissipation
 - VLSI and RF/mixed analog chip design
(Collaboration with Applied Electronics Laboratory (APEL), University of Patras)
- Power efficient techniques based on:
 - Middleware utilization
 - Energy efficient protocols
 - Communication parameters handling



Current Research Activities

- Planning tools for the placement of the nodes and implementation of localization techniques.
- Middleware architectures for composability:
 - Handling of the heterogeneity of various interfaces and cooperating objects
 - Seamlessly connecting heterogeneous networks and communication techniques
- Utilization of standards (WiFi, Bluetooth, Zigbee, IEEE1451):
 - Handling in a more structured way the increasing number of sensor nodes
 - Achieving global WSN access at the networking level

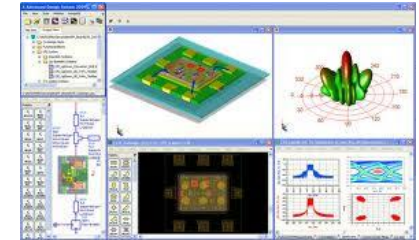
Research Facilities

- Laboratory equipment to support embedded hardware and firmware development

- Hardware schematic and PCB design entry stations:
Cadence, ADS, Mentor Graphics



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- Oscilloscopes and digital logic analysers



- Microcontroller development systems and tools
Atmel STK500, STK600 (AVR microcontroller)



Research Facilities

- Infrastructure for research and development of hybrid wired/wireless industrial networks and low power wireless sensor networks

- Protocol simulators and analysers:

Omnet++, NS2, OPNET, Tossim/TinyOS, Contiki/Cooja

- Software development tools:

Microsoft Visual Studio, Eclipse, Netbeans

- Industrial network systems and tools:

Echelon LonWorks, LabVIEW

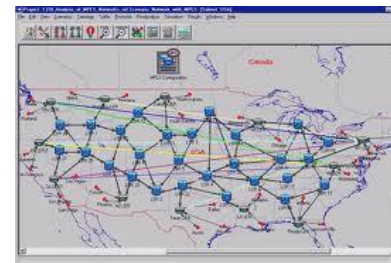
- WSN nodes and systems:

Wasp mote, Shimmer, TelosB, Iris, Mica2, eKo Pro Series

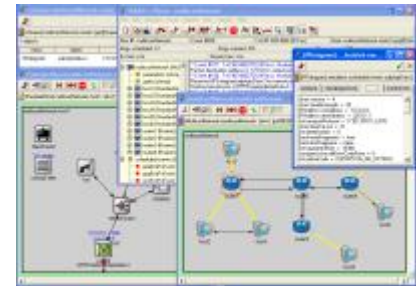


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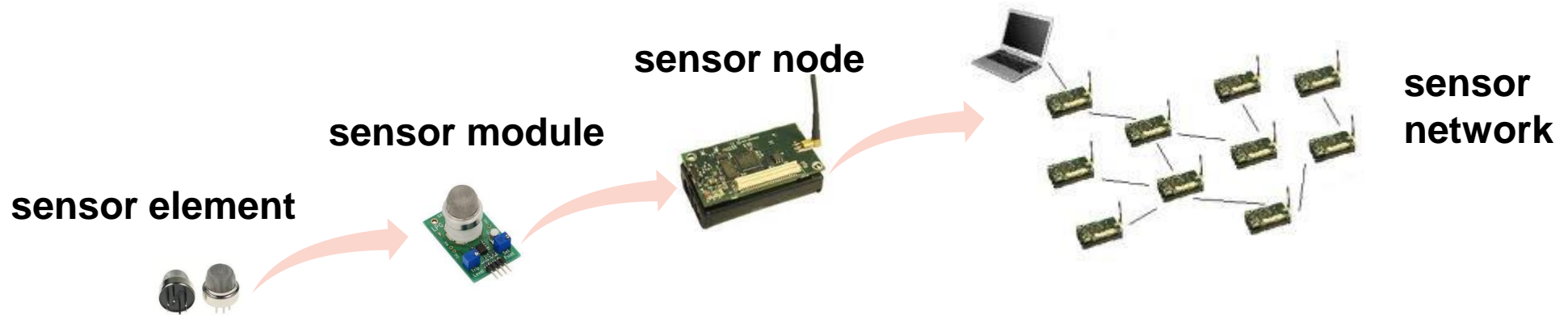
OPNET



OMNET++



Suggested Priorities for future research



- Investigation of the integration effect of novel sensor element level materials and techniques on AQC sensor systems
 - Closely linked to WG1 activities
- Study of sensor elements active control techniques on all levels:
 - Sensor module → enhanced electronics (i.e. for self-monitoring)
 - Sensor node → improved selectivity and stability via information correlation
 - Sensor network → enhanced reliability, auto-configuration/calibration



Suggested Priorities for future research

- **Multi-sensor integration**
 - Adoption of standards to describe sensor properties (i.e. IEEE1451)
 - System level models study, to achieve interoperability - seamless integration
- **Low power technology**
 - Study of intelligent techniques to minimize power consumption (i.e. by exposing the hardware to the upper layers)
- **Networking technology and protocols**
 - Study of approaches which improve efficiency and performance of the system and the applications
- **Data processing**
 - Study of techniques which improve data accuracy, system robustness and efficiency