



Marine Environmental Decision Support: an  
overview of advances in sensors,  
sensor networks, applications and architectures

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# Contents

- Market opportunities & capabilities for advanced maritime sensor networks
- Some recent & ongoing advances in sensor technologies and sensor platforms
- Novel applications in field of water quality:
  - SANY bathing water application & architecture



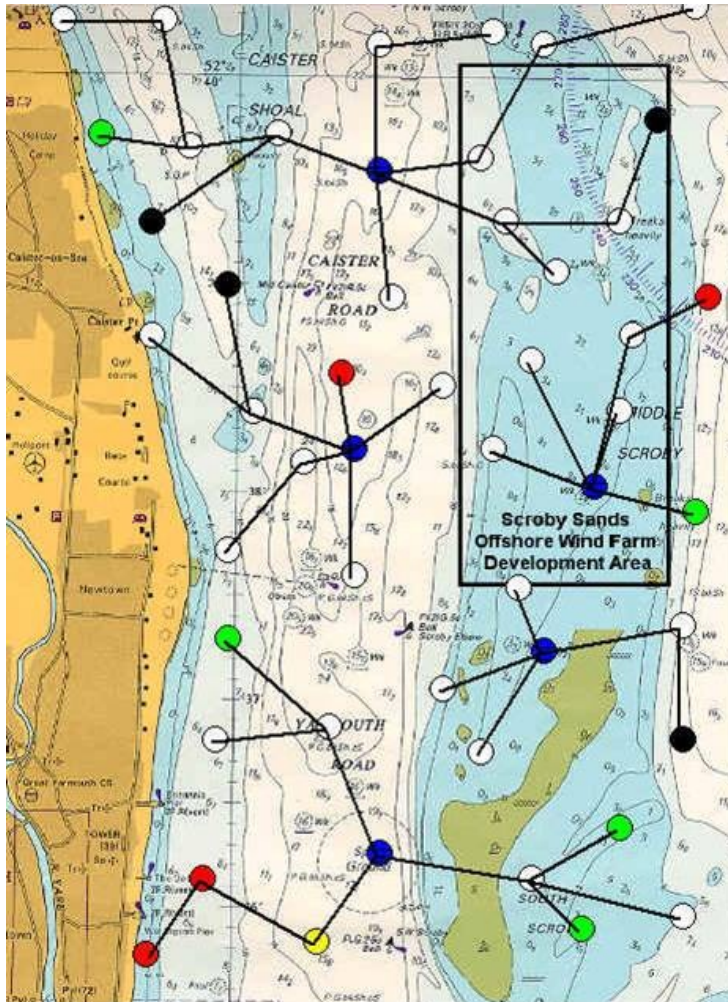
# Marine Environmental Monitoring Priorities

- Tourism
  - Managing water quality
- Optimal response to natural disasters
  - Coastal flooding
- Combating oil & chemical spills
  - Minimise economic impact
- Regulatory compliance
  - Marine Spatial Planning
  - Management plans under Water Framework Directive
  - Revised Bathing Water Directive





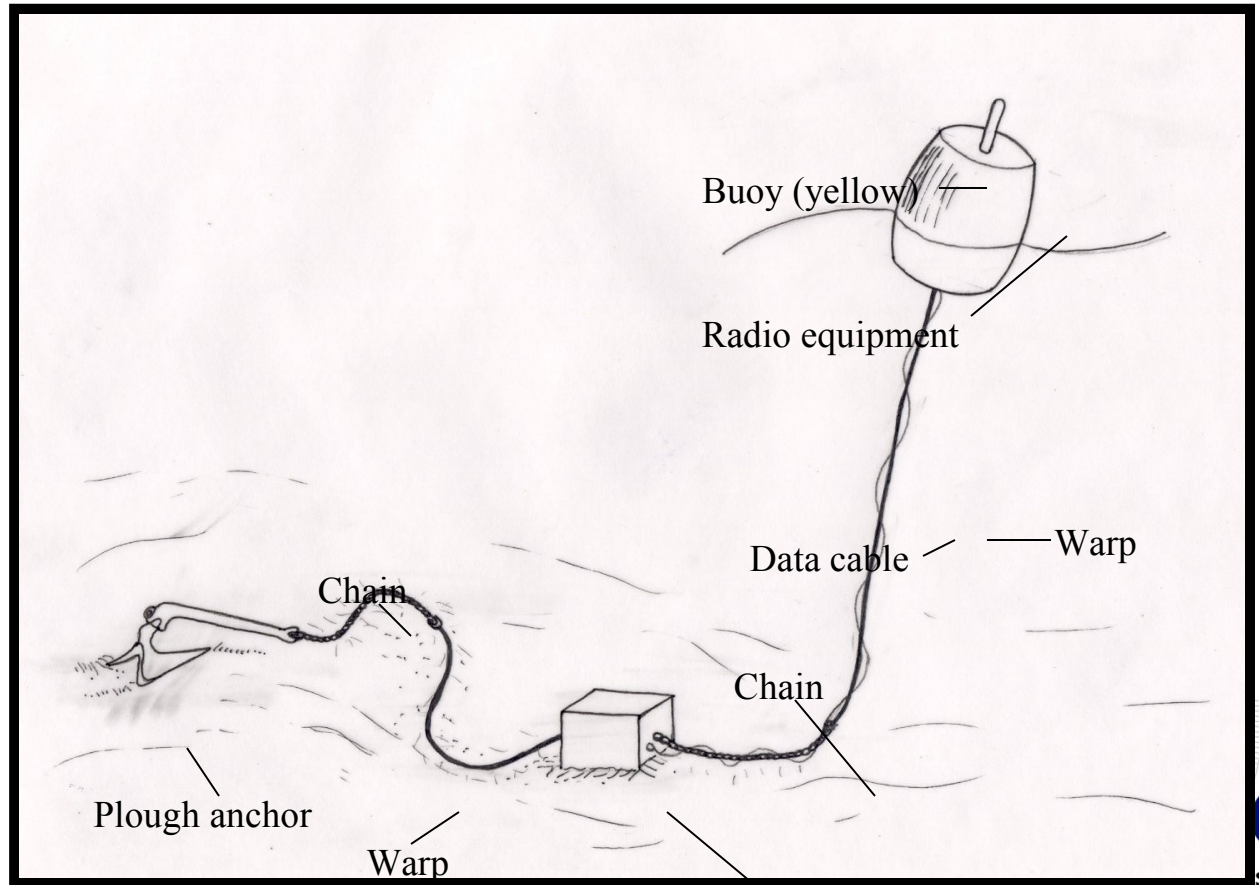
# SECOAS - Self-organizing Collegiate Sensor Networks



Scroby sands wind farm  
and its impact on  
sedimentation processes

**marine**  
s o u t h e a s t

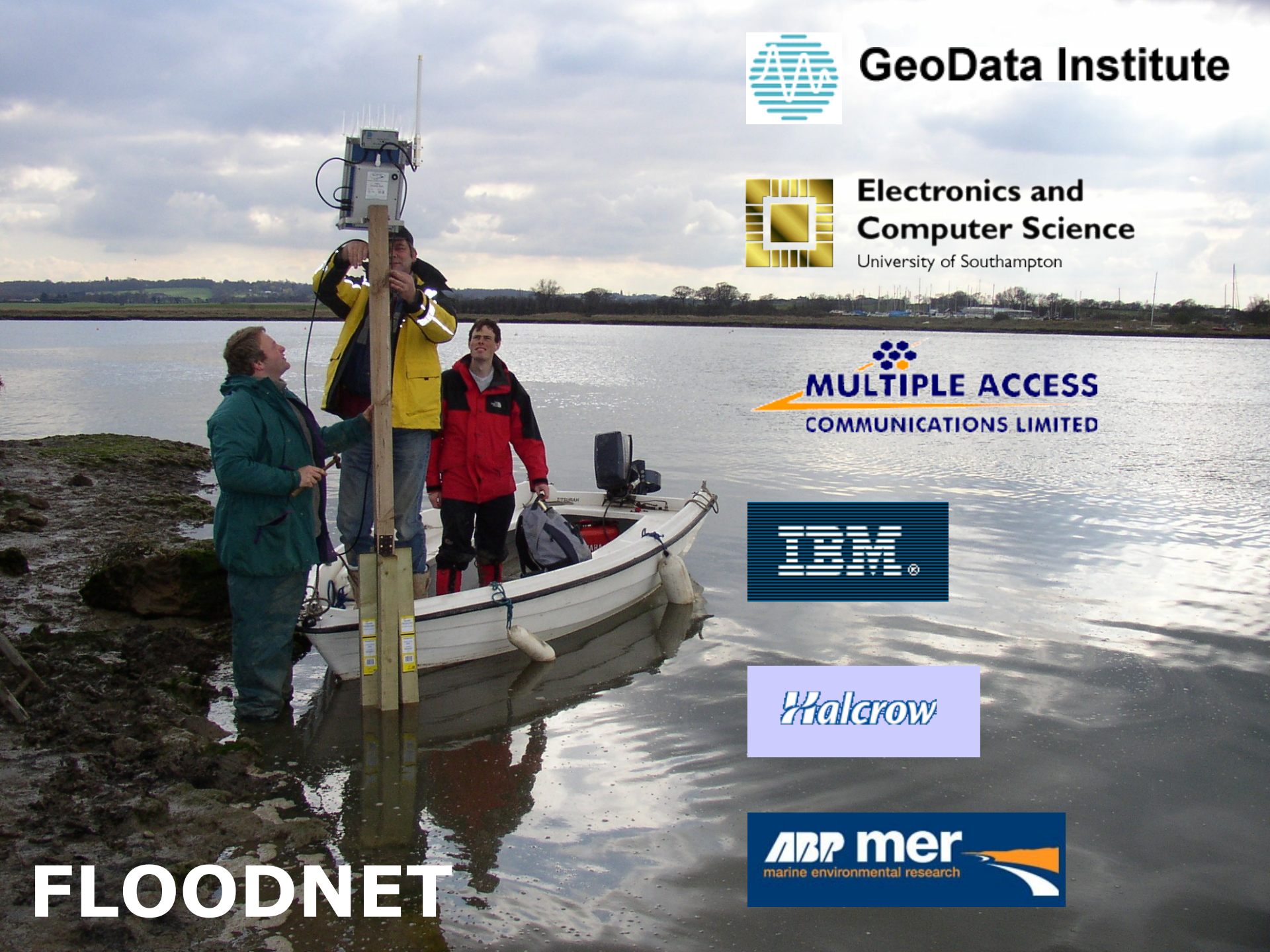
# Mechanical General Arrangement



# Adaptive sampling

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- Measure, delete, combine, forward, sleep
- Use local variability, neighbour variability and internal state
- Self configure using distributed evolutionary “algorithm” (bacteria)
- Can adjust priorities and frequency of actions
- Can form groups (quorum sensing)
- Reward set by user using a diffusion (gossip) protocol – changes drive auto-reconfiguration of genome



**GeoData Institute**

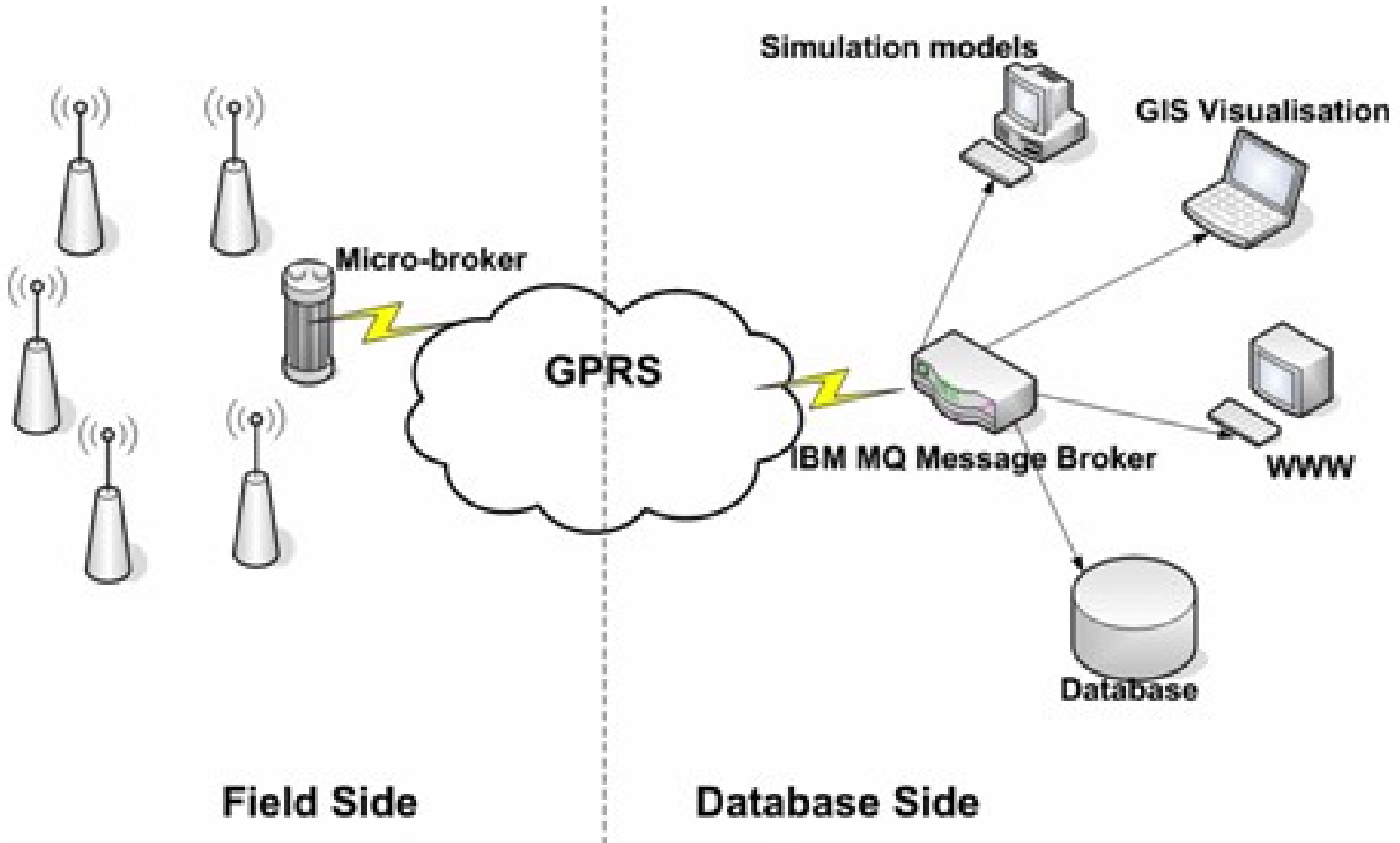


**Electronics and  
Computer Science**

University of Southampton



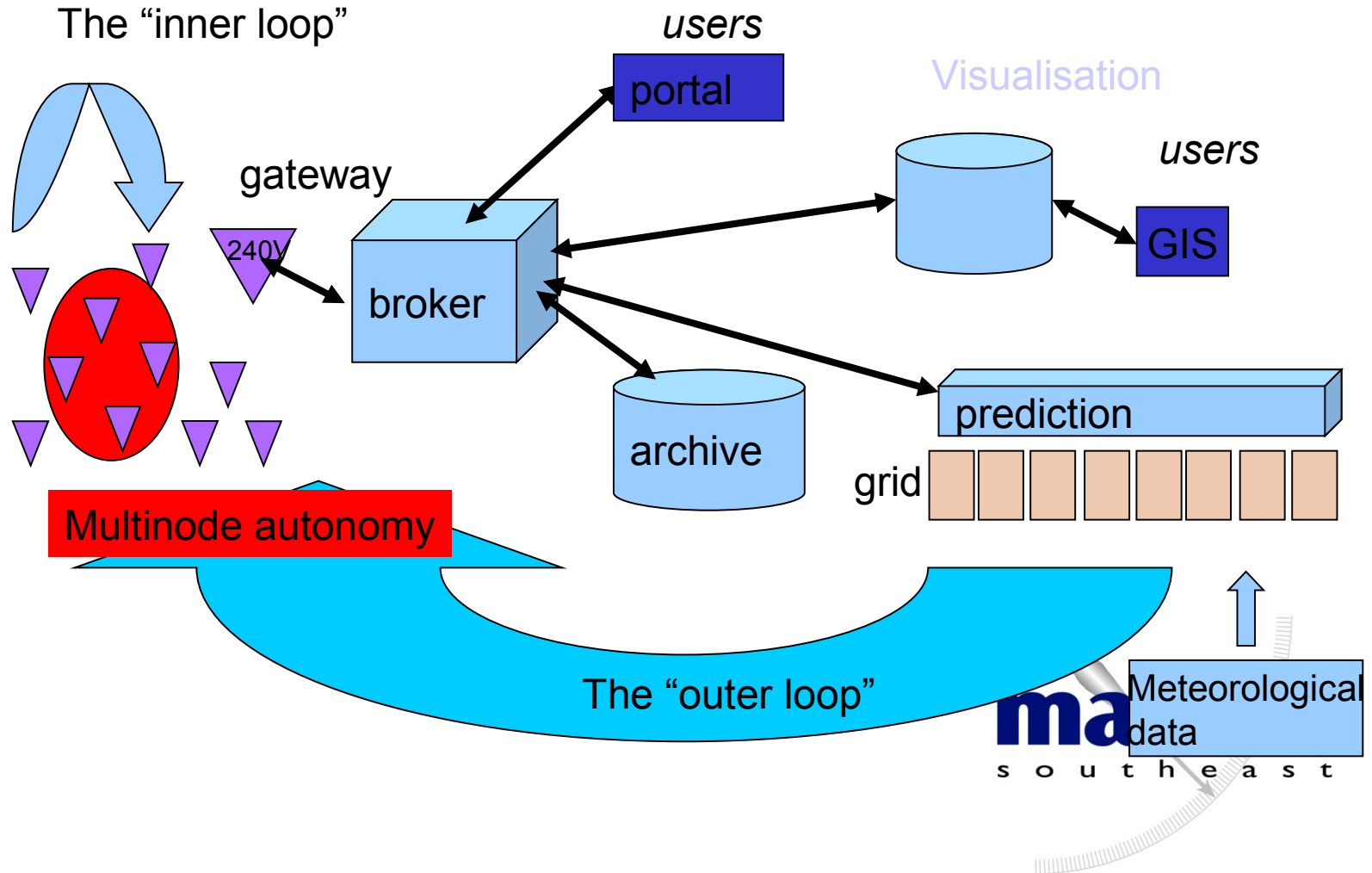
**FLOODNET**



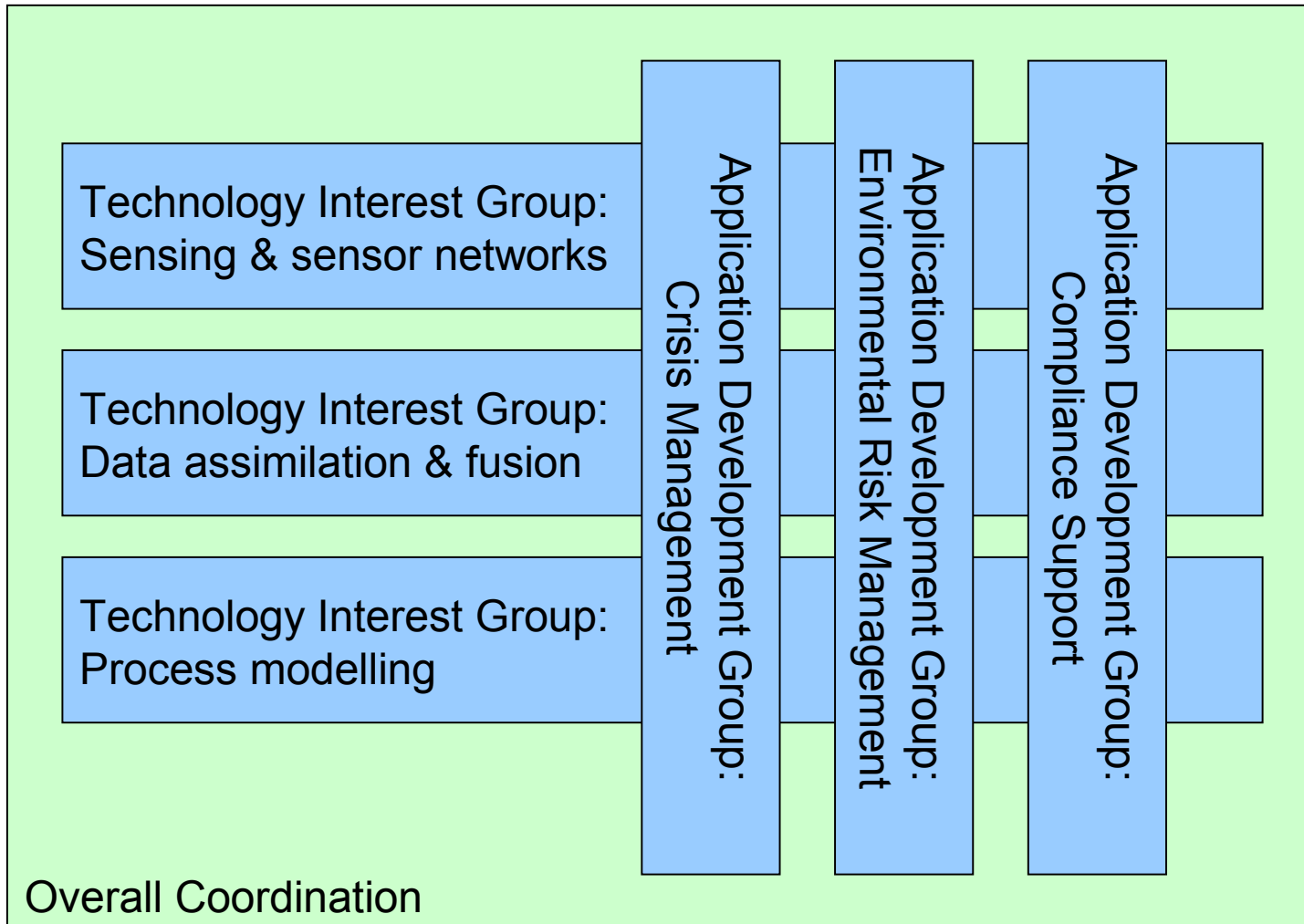
**Field Side**

**Database Side**

# Adaptive Sampling



# EDSnet Pilot Methodology



# Advanced Sensor Technology

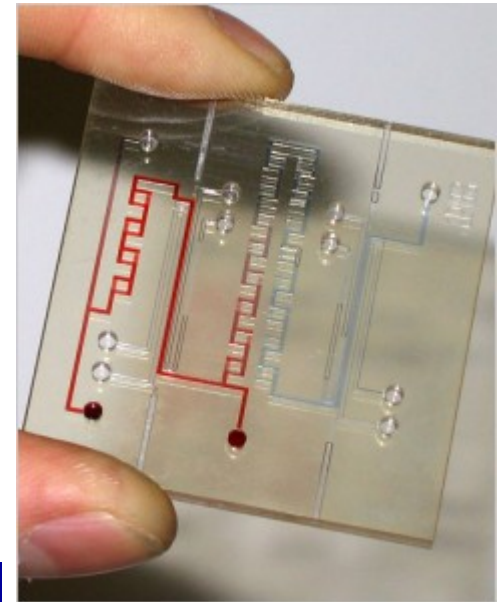
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- Low-cost sensing packages, eg
  - Triskel (UK)
  - NKE (F)
- Micro-miniature sensor devices, eg
  - Faecal biosensors by Univ of Surrey & Chelsea Instruments
  - Proposed for CAMS project (Anglo-French)



# Ongoing Sensor Advances

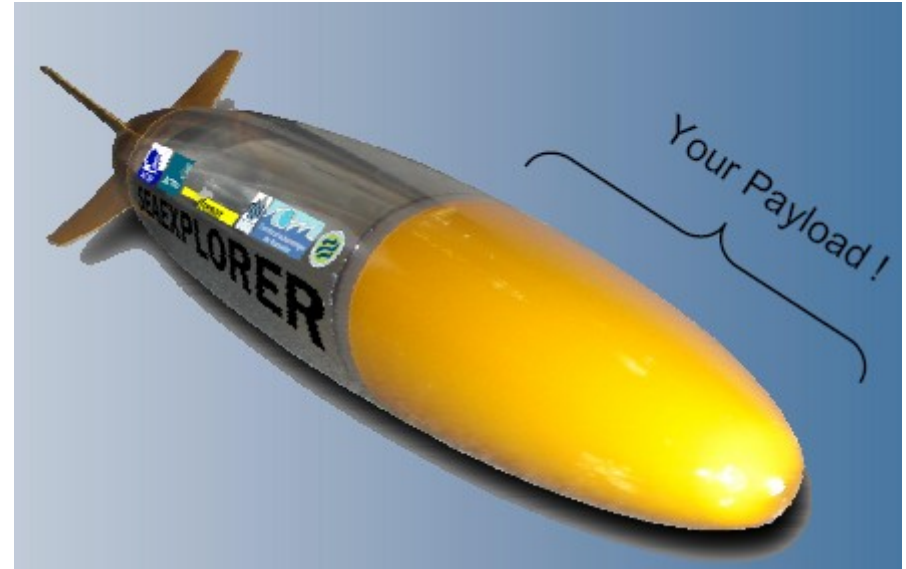
- Key goal is miniaturisation, low power & low cost
- Smart membrane technology:
  - pH sensitive and enzyme embedded (eg for nitrate & phosphate)
- HydroMIP gel for protein sensitivity, coupled with QCM detector
  - Highly selective biosensors
- Lab-on-chip chemical & biochemical sensors
  - Nutrients & pollutants
  - phytoplankton



# Advanced Platform Technology

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- Autonomous vehicles eg
  - Acsa glider (F)
  - SASS (UK)
- Capable of surveying large areas at low cost
  - Marine Protected Areas etc
- Planned Advanced Technology Centre in autonomous systems at Lee-on-Solent



# Environmental Decision Support Systems

Sensors & sensor networks



The collage includes: a yellow buoy with a sensor tower on the water; a satellite in orbit; a handheld electronic device displaying '7000'; and a white research vessel.

