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A Sensor-cyber Network Testbed for Plume Detection, Identification, and Tracking

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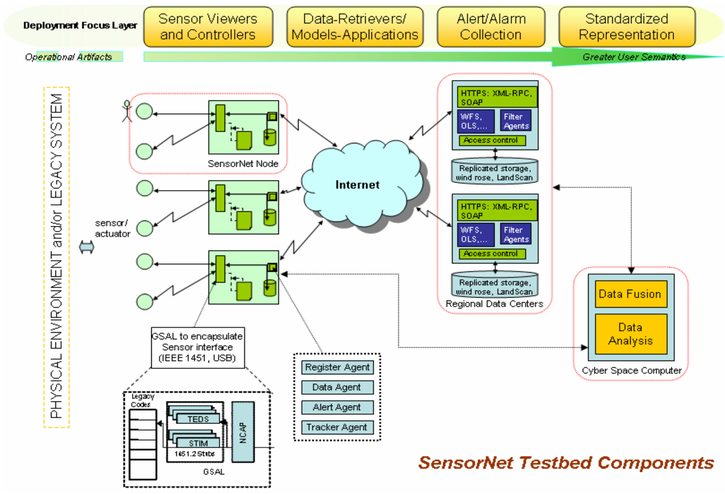
Sensor-cyber Network Project

- Near ***real-time*** detection, tracking, analysis and visualization of plume propagation (chemical, radiational and biological)
- Sensor testbed design and implementation
- References:
  - Systems Support for Radiational Plume Detection, Identification, and Tracking Sensor-cyber Networks (DITSCN), In *Proc. NSF Workshop on Cyber-Physical Systems,* Austin, TX, Oct. 2006.
  - SensorNet: *www.sensornet.gov*

SensorNet System Architecture



SensorNet Testbed Components

Research Tasks and System Features

- **Convergence** between physical and cyber spaces.
- Support for **deeply embedded operations**.
- Ability to integrate system components in a **plug-and-play manner**, through the use of open data, control and communication interfaces.
- Features:
  - Timely report of sensor data to a cyber space computer for near real-time data analysis, tracking and visualization.
  - Sensor tasking based on plume dispersion models and threat-based coverage.

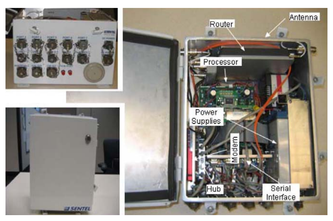
Physical Space

- **RFTrax RAD Sensor** to detect the presence and intensity of the radiational plume source.
- **WMS Wind Sensor** to monitor the wind speed and direction.
- **Communication Channel**
  - Sensor data communicated through RS-485 or *multi-hop* wireless 802.11x interfaces to the Sensor-Net Node.
  - *IEEE 1451* interface to configure sensors at runtime.
- **Capturing** the effects of wind speed and direction on the spread of radiational plume source.

RFTrax RAD Sensor

Plume Source

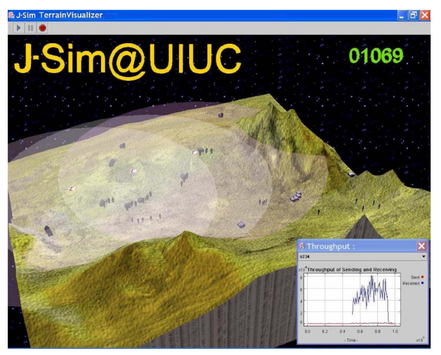
WMS Wind Sensor



SensorNet Node

Cyber Space

- **Data Analysis** and **Visualization** at J-Sim (emulating the cyber space).
- Realistic **SCIPUFF** plume dispersion model support for analysis and rendering of plume propagation in a real terrain.
- **Sensor Tasking** for threat-based sensor coverage of the area.



Sensor Mobility

- **ER-1 Robots** supporting autonomous and programmable movement are guided by the cyber space, using commands sent over 802.11x wireless network.
- **Tasking** enables sensor mobility to increase the coverage of a high-risk location.

ER – 1 Robots

Funded by Office of Naval Research/ORNL.

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