



# Netted Sensors (NS) Workshop October 24 -26, McLean VA

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# Overview of 1<sup>st</sup> Day Activities (1)

## ● Applications and Scalability:

– Hard part is “operationalizing” mote hardware package

- Big mismatch between mote design (processor, sensors, antennas, packaging, etc.) and DoD operational needs/schedules
- Mote platform hard to make robust – little invested in DoD R&D in this area

– Challenges:

- |   |   |   |
|---|---|---|
| <ul style="list-style-type: none"><li>• Hardware durability</li><li>• Communications</li><li>• Power management</li><li>• Sensor sensitivity</li><li>• Sensor concealment</li><li>• Self-localization</li><li>• Target classification</li></ul> | <ul style="list-style-type: none"><li>• Security</li><li>• Adaptive networks</li><li>• Reducing size thru nano</li><li>• Scaling to nets-of-nets</li><li>• Distributed Processing</li></ul> | <ul style="list-style-type: none"><li>• Leverage nano</li><li>• Leverage bio-memetics</li><li>• Molecular self-assembly</li></ul> |
|---|---|---|

Short-Term

Mid-Term

Long-Term



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# Overview (2)

- Need flexible reconfiguration through software centric solutions:
  - Fabric model to support multiple applications
  - Energy is an issue, so how to make fabric model more efficient
- Lot of interesting work being done at US Army CERDEC:
  - From alternative power sources to RFID tags and small GPS-enabled PIR/acoustic sensor nodes
  - CRADAS established with local universities
- Talk of using swarm-based models to manage large sensor networks:
  - Information-based sensor management – maximizing channel capacity
  - Self-organizing coherent systems – emulating “SAR-like” behavior with swarm-based sensor models
- **Sensors and Platforms:**
  - Crossbow:
    - Nice summary of applications for environmental monitoring and pipeline monitoring, maintenance, and security
    - Sees evolution towards digital sensors, radio in silicon, and smart antennas
    - To what question are we trying to provide an answer? (push-pull paradox)





# Overview (3)

- Ember:
  - Good discussion of Zigbee (802.15.4) contrasted with 802.11
- Millennial Net:
  - Good discussion of challenges facing community: scalability, robustness & reliability, low-power consumption, latency, network management, etc.
- NVESD:
  - Outlined a number of operational needs
  - Important sound bite: “Look at the end user for clues”
- **Keynote speaker – Dr. Ted Bially:**
  - Nice overview of DARPA netted sensors programs
  - Stressed the need to utilize the power of the network
  - Challenges: power, mobility, auto-calibration, composition, mobile software, and robustness
  - Thoughts:
    - How do you control platforms autonomously when communications can’t handle the load?
    - What about distributed network processing for ISR (fingerprinting, change detection, etc.)?
    - Spatial diversity?





# Overview (4)

- **Distributed Computing and Processing:**
  - Three themes: Mobile networks, distributed tracking, and distributed (grid-based) computation
  - Highlighted recent advances in the use of mobile networks (aka robots) for environmental monitoring, perimeter security, and building surveillance
  - Nice summary of issues and challenges related to distributed tracking (primarily at Tier 2): highlighted association as a key problem; multi-hypothesis tracking approaches appear to work well but may be resource constrained
  - Overview of Globus Toolkit: open-source software for grid enterprises – facilitates collaboration between computers, networks, sensors, and databases using components that handle information, resource, and data management using common/standard protocols and interfaces
    - Can it be scaled down to small sensor networks?



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# Overview (5)

## ● Information Management:

- Stressed importance of sensor information management – with the goal of making sensors intelligent – discussed three components: sensor database management, data mining, and security policy integration
- Nice overview of IBM technologies relating to netted sensors:
  - Discussions of the enterprise service bus, micro-brokers, autonomic sense and response, complex event processing, etc.
- Nice overview of XML-based sensor model language (SensorML) for in situ and remote sensing



# Agenda for October 25

25-Oct

- 0700 - 0800**            **Registration and Continental Breakfast**
- 0800 - 0820**            **Logistics, Summary of Day 1, and Day 2 Agenda**  
[Dr. Garry Jacyna \(MITRE\)](#)
- 0820 - 0950**            **Fusion and Resource Management (FRM)**
- 0820 - 0825 [Session Introduction - Dr. Walter Kuklinski \(MITRE\)](#)
- 0825 - 0845 [Dr. Venu Veeravalli \(University of Illinois at Urbana-Champaign\)](#) "*Design of Sensor Systems With Fusion for Detection Applications*"
- 0845 - 0905 [Dr. David Castanon \(Boston University\)](#) "*Resource Management in Sensor Networks*"
- 0905 - 0925 [Ms. Barbara Broome \(Army Research Laboratory\)](#) "*Actionable Intelligence for the Warfighter*"
- 0925 - 0950 Round Table Discussions / Speaker Questions and Answers
- 0950 - 1010**            **Break**
- 1010 - 1200**            **Information Assurance and Security (IAS)**
- 1010 - 1015 [Session Introduction - Dr. Vipin Swarup \(MITRE\)](#)  
[Dr. Virgil Gligor \(University of Maryland\)](#) "*On the Evolution of Adversary Models in Security Protocols - from the Beginning to Sensor Networks*"
- 1015 - 1035
- 1035 - 1055 [Dr. Radha Poovendran \(University of Washington\)](#) "*Secure Range-Independent Localization for Wireless Sensor Networks*"
- 1055 - 1115 [Dr. Anup Ghosh \(DARPA\)](#) "*Challenges in Mobile Networking and Unattended Devices*"
- 1115 - 1135 [Mr. Jeffrey Leach \(IBM\)](#)
- 1135 - 1200 Round Table Discussions / Speaker Questions and Answers
- 1200 - 1230**            **Keynote Address**  
[Dr. Neil Gershenfeld \(MIT\)](#) "*Statistical-Mechanical Engineering*"
- 1230 - 1330**            **Lunch**
- 1330 - 1430**            **Poster Session and Exhibits**
- 1430 - 1600**            **Communications & Networks (CN)**
- 1430 - 1435 [Session Introduction - Dr. Ali Saidi](#)
- 1435 - 1455 [Dr. Anthony Ephremides \(University of Maryland\)](#) "*A Problem of Sensing in a Network Environment*"
- 1455 - 1515 [Dr. Jason Redi \(BBN\)](#) "*Cross-Layer System Design for Sensor Networking*"
- 1515 - 1535 [Dr. Anathram Swami \(Army Research Laboratory\)](#) "*Networked Signal Processing*"
- 1535 - 1600 Round Table Discussions / Speaker Questions and Answers
- 1600**                    **Adjourn**