# Emerging Research

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Wireless Communications
and Networks

*Emerging Communication Research*

# MIS Directorate Organization

**Mathematical and Information Sciences**

## Mathematics

- Computational Mathematics
- Probability and Statistics
- Modeling of Complex Systems
- Discrete Mathematics and Computer Science
- Automation, Simulation and Related MCS

## Computing and Information Sciences

- Communications and Network
- Software and Knowledge Based Systems
- Systems and Control
- Information Assurance
- Information and Signal Processing

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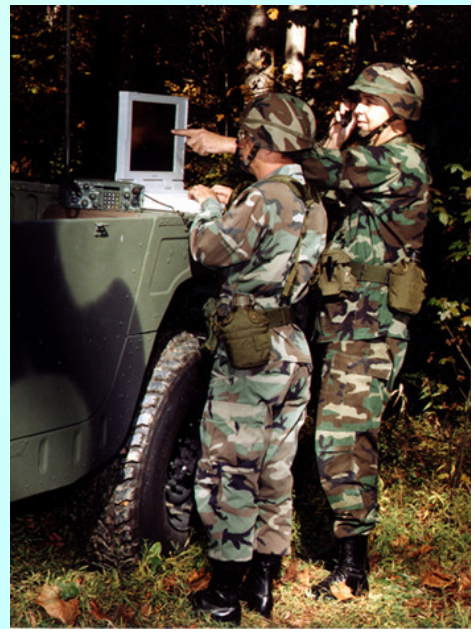
# ARO Research Interests

- **Research Objectives**
  - Create technologies with which to design and implement highly mobile MANET wireless tactical and sensor communications networks needed by the Army. This requires high throughput with low probability of intercept / detection (LPI/LPD) / Anti-Jam (AJ) capabilities.
- **Key Ideas**
  - MANET
    - Highly mobile: connectivity and channel issues
    - No centralized control or base station
    - LPI / LPD AJ
    - Near far interference
    - Various QoS Requirements
  - Sensor Networks
    - Extremely low energy
    - Networked to IP world via gateway
    - Potentially 1000's of nodes



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# ARO Research Interests

- **Areas to emphasize**
  - Cross layer between physical and MAC (and above)
  - Frequency hop
- **Areas not emphasized**
  - DS / CDMA cellular
  - Wired communications
  - Long haul point-to-point wireless
  - Satellite communications

***Sponsored Research in DoD Unique Problems***

# New Thrusts

## Currently Funding:

- **Fundamental limits of Wireless Mobile Ad-Hoc and Sensor Networks**
- **Networking with antenna arrays**
  - **Both MIMO and directional transmit beamstearing**

## Potential new areas:

- **Low energy combined sensor, sensor fusion, communications**
- **High fidelity simulation of very large networks**
  - **100's or 1000's of nodes**
  - **Each interfering with each other: each link must be calculated**

# Funding

## Single Investigator Process (typical)

- White papers sent in late spring summer (50)
- Proposals encouraged for submission September
- Proposals should be received by November (10)
- Proposals reviewed by peers and Army scientists
- Funding in May (3-4)
- Usually 1 student / 1 month (release or summer)

***Single investigator funding very limited at this time***