

Wireless Networking in Resource Constrained Environments

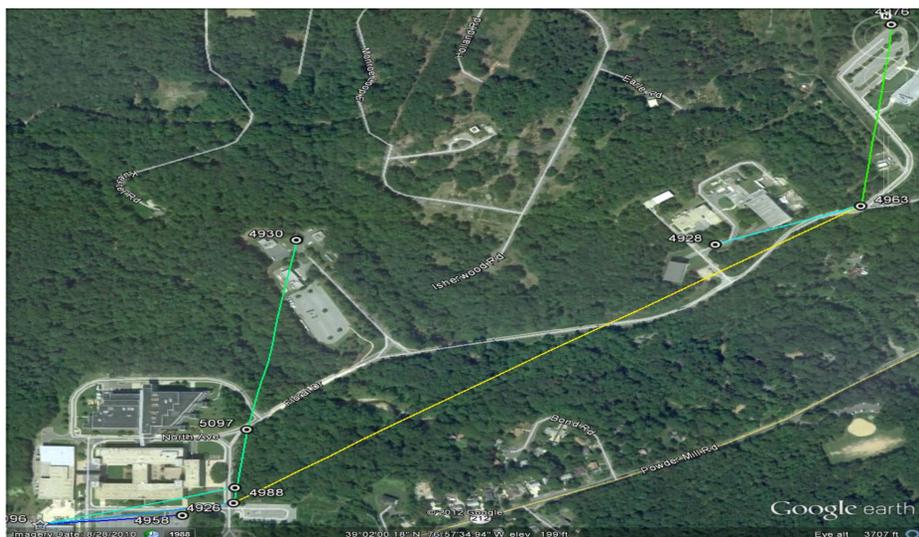


**S&T Campaign: Information Sciences
Networks and Communications**

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Research Objective

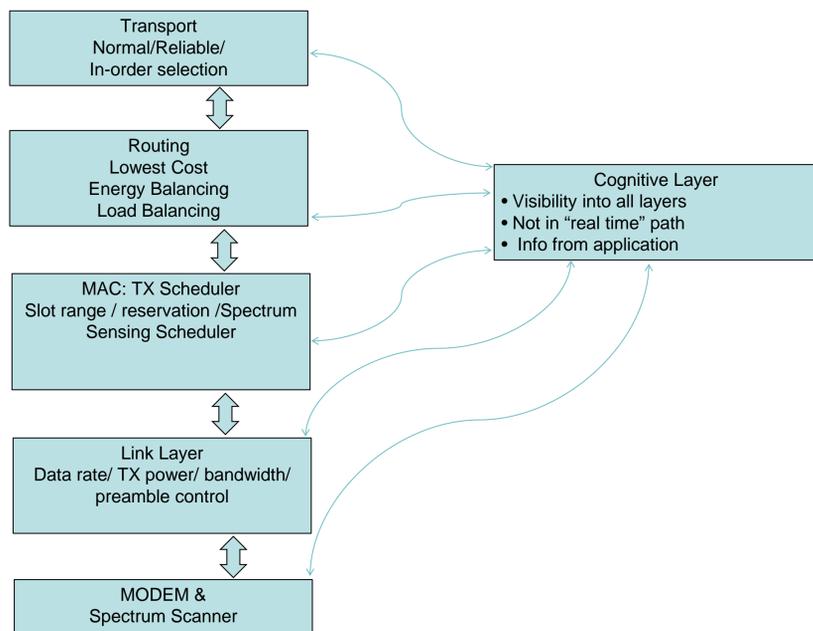
- Adaptive algorithms and radio hardware that provide robust and energy efficient communications under varied conditions using cognitive and dynamic spectrum access techniques for both sensor and soldier radios



ARL Campus Sensor Network

Challenges

- Appropriate cross layer metrics to monitor in protocol stack to allow intelligent adaptation of operating parameters via a cognitive supervisory layer
- Adaptive, throughput efficient Media-Access-Control and multi metric routing
- Networking in heterogeneous networks with multiple transmission medium



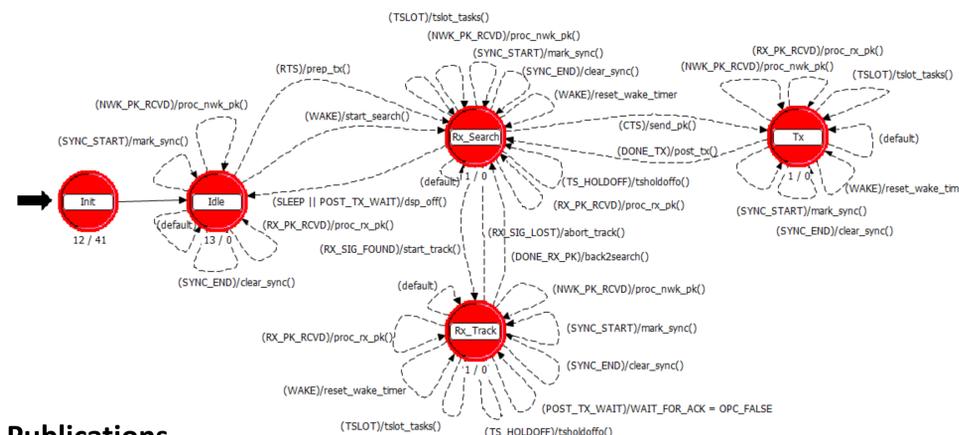
Protocol Stack with Cognitive Supervisory Layer

ARL Facilities and Capabilities Available to Support Collaborative Research

- Full suite of RF characterization instrumentation such as Real-time spectrum analysis, Vector Signal Generation, and Bit-Error-Rate measurement tools
- MATLAB modeling of Physical layer waveform coupled with Vector Signal Generation to validate modeling results on actual hardware
- OPNET modeling of all layers of mesh networks including high fidelity physical layer effects
- Highly instrumented wireless over-the-air testing and analysis capabilities
- Expertise in energy efficient mesh networks hardware and protocols
- Experience in hybrid networking with multi-modal physical channels
- Results to date include sleep enabled tactical transceiver hardware and matching protocols that support long mission duration via it's .7 to 3 Watt-hour/day energy consumption with typical sensor traffic

Complementary Expertise/ Facilities/ Capabilities Sought in Collaboration

- Channel emulation hardware & techniques that supports large mesh networks
- Expertise in cognitive cross layer optimization techniques
- Design and manufacturing capabilities to develop cost effective tactical grade transceivers that supports these energy efficient cognitive tactical mesh networks



- Publications**
 - "A Medium Access Control Protocol for Energy-Constrained Tactical Wireless Sensor Networks," Classified US Military Communications (CUMC) Conference, Nov 2013
 - "A Custom Transceiver Pipeline for Tactical Wireless Ad Hoc Networks," in Proc. of OPNETWORK2013, Aug 2013.
 - Modeling and Simulation of a Tactical Wireless Sensor Network Radio, proc. MILCOM Oct 2012