Enabling Technologies for Spectrum Operations

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SPECTRUM OPERATIONS

- Instrumented nation
  - Informed spectrum management
- Instrumented coasts and borders
  - Autonomous anomaly detection
  - Distributed radio algorithms
- Instrumented battlefields
  - Enhanced RF situational awareness
  - ISR sensor-actuator networks
DENSE RF SENSOR NETWORKS

- High-resolution Low-latency RF Situational Awareness
- Compress the sense-act loop
- Implications
  - Economics
    - Sensor-Actuator Node Costs
    - Network Charges
  - Performance
  - Security
ENABLING TECHNOLOGY

Powerful Edge Sensors

Secure Pipe

Powerful Backend Fuser

• High-performance computing
  • At both ends of the stack
COGNITIVE SDR-ON-CHIP

RF/analog/digital front end
+
High-bandwidth compute engines

- Keep IQ on chip
- On-chip: Analyze, Demod, De-FEC
- Send reports, not samples
BENEFITS

• Performance
  • Real-time, Low-latency, High-bandwidth
  • Low-power (2 W wide-band spectrum sensing)
  • Highly-flexible software-defined radio on-chip
    • Very low algorithm implementation overhead
  • Autonomy: No external host computer needed

• Economics:
  • Control node cost
  • Control network charges
    • IQ stays within the radio IC
    • On-chip computed intelligence goes to the cloud
SECURE SENSOR NETWORK

• High-performance *implies* responsibility
  • Want situ-awareness *not* another attack vector
  • Secure tasking
  • Secure reporting

• Backend fusion
  • RF propagation-aware
  • Supercomputer-enabled