Command and Control, Computers and Communications

ONR Code 30 | October 2012

At a Glance

Network-Centric Warfare/ Interoperability

- Near term:
  - Networking and network management that support mobility inter- and intra- network
  - Management of heterogeneous networks
- Mid term:
  - Ready and secure access to relevant information by appropriate users
  - Distributed cyber warfare
- Far term: full system interoperability

Over-the-Horizon Communications/Gateways

- Near term:
  - Multi-function software radio payload
  - Multi-band satellite communications on the move
- Mid term:
  - Improved high-frequency (HF) communications
  - Directional networking
- Far term: highly connected mobile platoons and individuals

Small Unit Technologies

- Near term:
  - Migration of capabilities to mobile commercial-based platform
  - Extension of services to wireless ad hoc networks
- Mid term
  - Automated provision of tactically relevant information
  - Radios and antennas that automatically adapt to the environment
- Far term: highly efficient and robust handheld communications

Point of Contact

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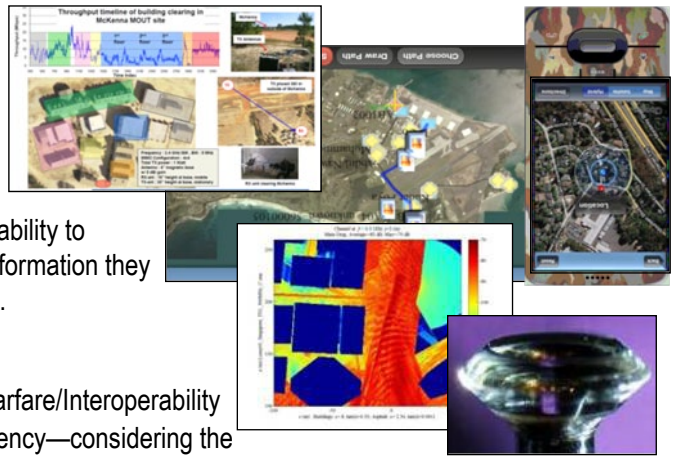
Objective

Technologies to provide tomorrow's small unit naval expeditionary warfighters with the capability to exchange the precise information they need, when they need it.



Imperatives

- Network-Centric Warfare/Interoperability
  - Information efficiency—considering the following elements together to provide the user with only needed information when needed: information abstraction (hiding complexity from users); information assurance; and interaction with the communications network
  - Provide only needed information, reduce retransmissions, reduce overhead and stage information locally to lower user workload, improve latency and decrease load on precious network resources
- Over-the-Horizon Communications/Gateways
  - Advanced HF application of modern signal processing techniques, such as multiple input, multiple output non-contiguous spectrum use and compact antennas to greatly improve the performance and throughput of HF communications
- Small Unit Technologies
  - Communications efficiency—minimizing joules/bit in all circumstances and minimizing detectability
  - Improved quality of dynamic channel estimates
  - Increased spectral efficiency and reuse
  - Directional networking

Research Challenges and Opportunities:

- Managing the user's expectation for infrastructure-intensive commercial smart phone services on sparse, intermittent, low-throughput military networks
- Managing dynamic networks—optimization with sparse, possibly dated information
- Distributed, provable authentication and information security with no physical key mat
- Reducing size of broadband antennas (Chu and Fano limits)
- Improved channel models and estimates (non-Gaussian)
- Automated determination of "value of information" and managing and disseminating information content
- Applicability of cyber warfare to distributed small units
- Fully homomorphic encyption
- Interference alignment
- Photonics for RF processing