

Mobile Ad Hoc Networking for the Transformed Army (MANTA)

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 MSR

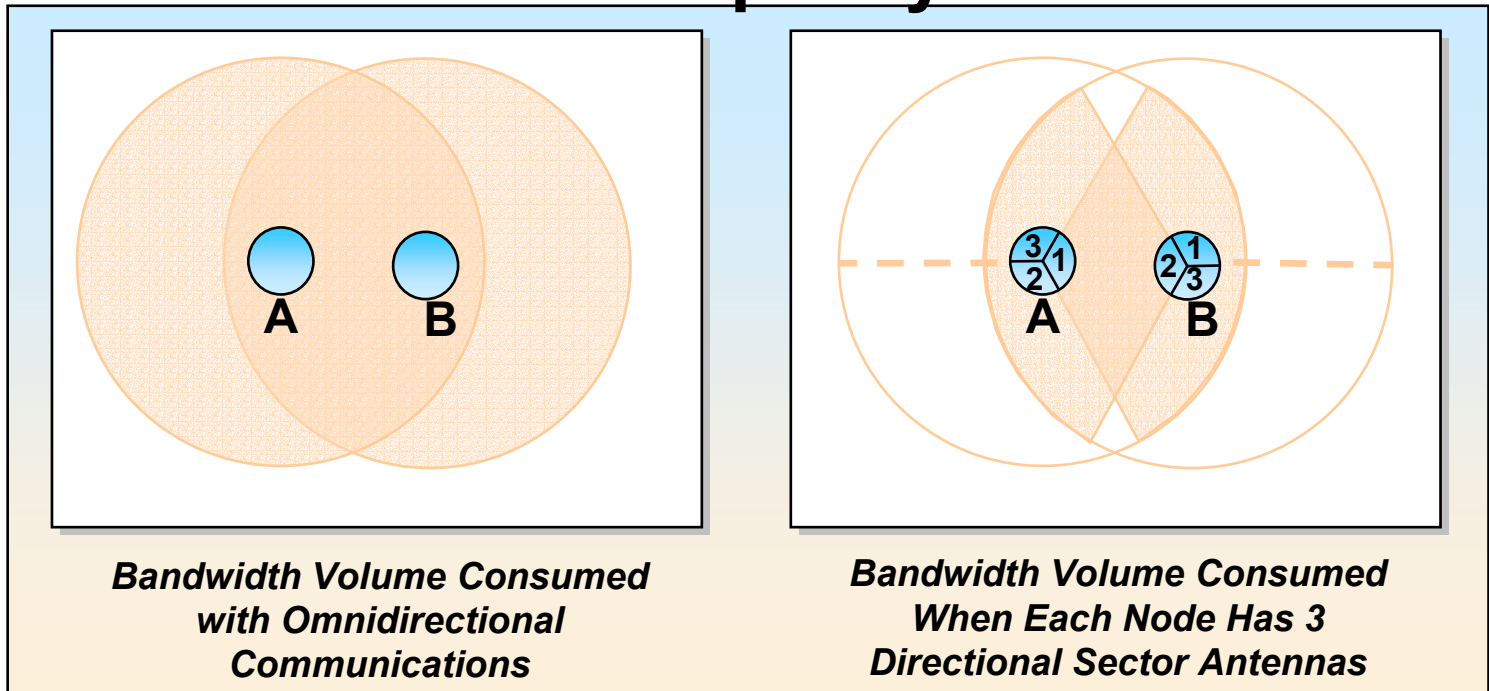
 MITRE
Technology
Program

Problem

- **Army transformation simultaneously requires dramatically higher data rates, low probability of detection, and resistance to jamming for highly mobile networks. These requirements strongly suggest the use of highly directional communication mechanisms. Current mobile ad hoc networking techniques neither embrace directionality nor accommodate the qualities of service necessary to support the C4ISR collaborative applications needed.**

Background

- **Directional communications consume smaller bandwidth volumes and enable increased spatial reuse of spectrum resulting in increased network capacity**



- **But existing contention based access schemes rely upon omnidirectional communications...**

Objective

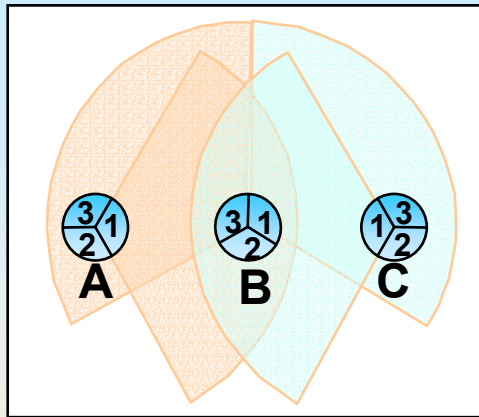
- **What channel access mechanisms are most appropriate for ad hoc networks that combine directional and omnidirectional elements (aka directional ad hoc networks)?**
- **How should one initiate and maintain a network topology in directional ad hoc network environments?**
- **What routing algorithms are necessary to achieve standard (unicast), high-assurance, and multipoint data delivery services in directional ad hoc networks?**

Activities

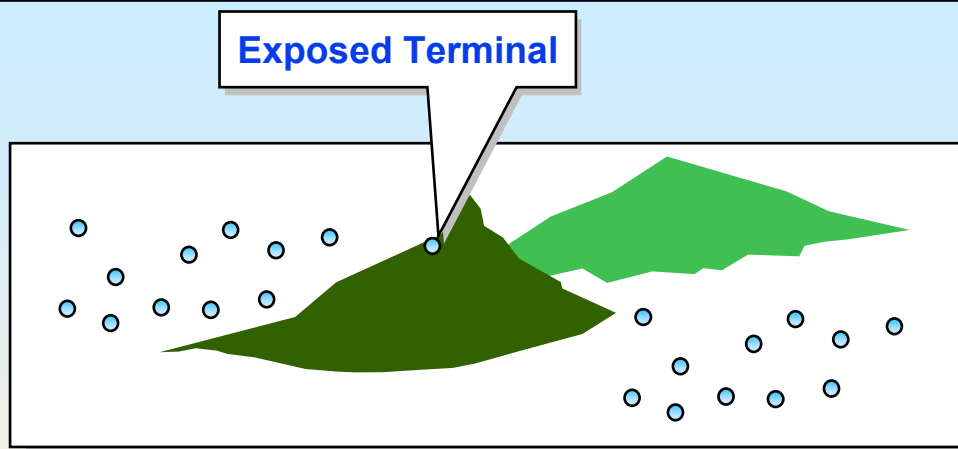
- We have recently developed simulation models of the Mobile Mesh protocols and have made them available to the Army's Future Combat System – Communications (FCS-C) program.
- We are actively developing channel access mechanisms for modestly directional ad hoc networks. We are engaged in simulation efforts that are identifying values for key design parameters of our Synchronous Collision Resolution (SCR) media access protocol. These results are being utilized in our development of a proof-of-concept prototype directional radio system.

Highlight

- We have developed channel access techniques that exploit the classic “hidden terminal” problem and avoid the “exposed terminal” problem



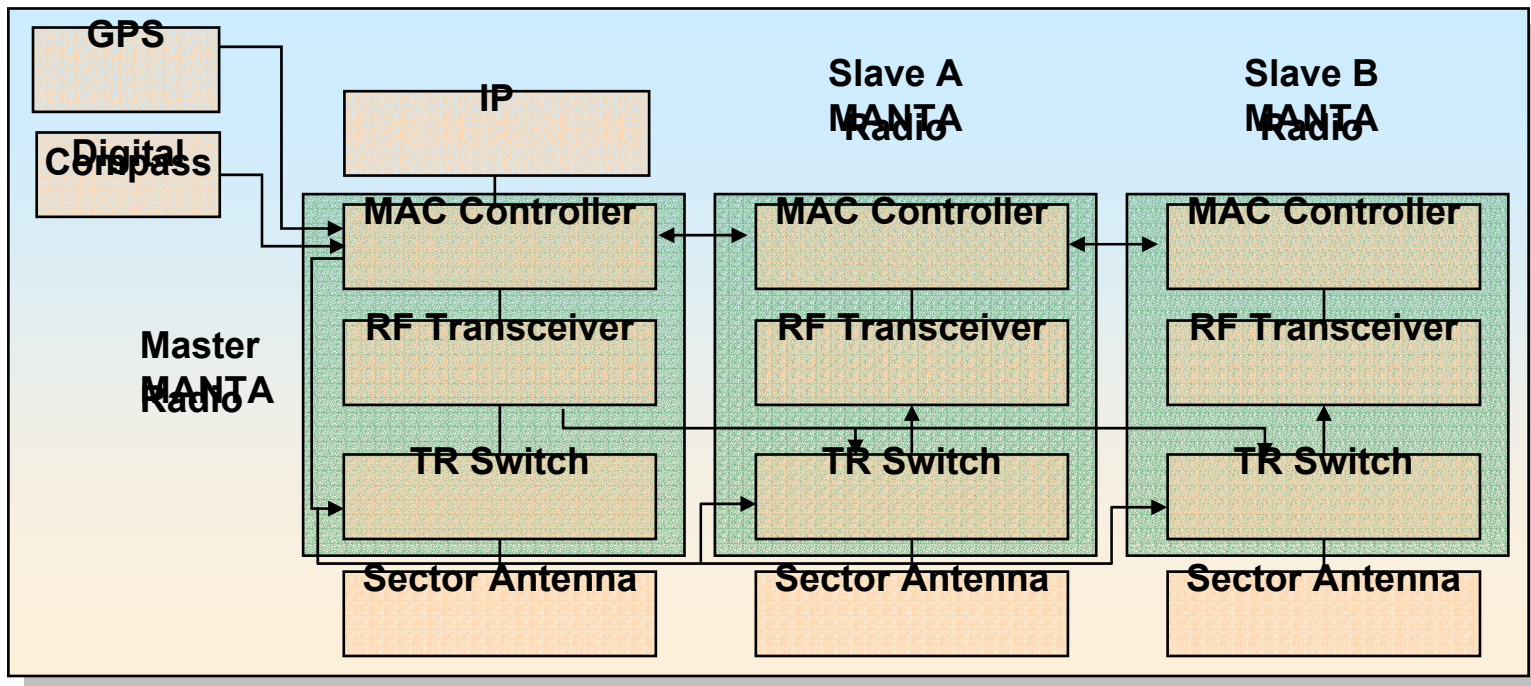
A and C are hidden from each other. Separate receivers allow A and C to successfully transmit simultaneously to B.



Time synchronized transmissions (ala SCR) avoid the exposed terminal problem seen in asynchronous protocols like 802.11b

Highlight

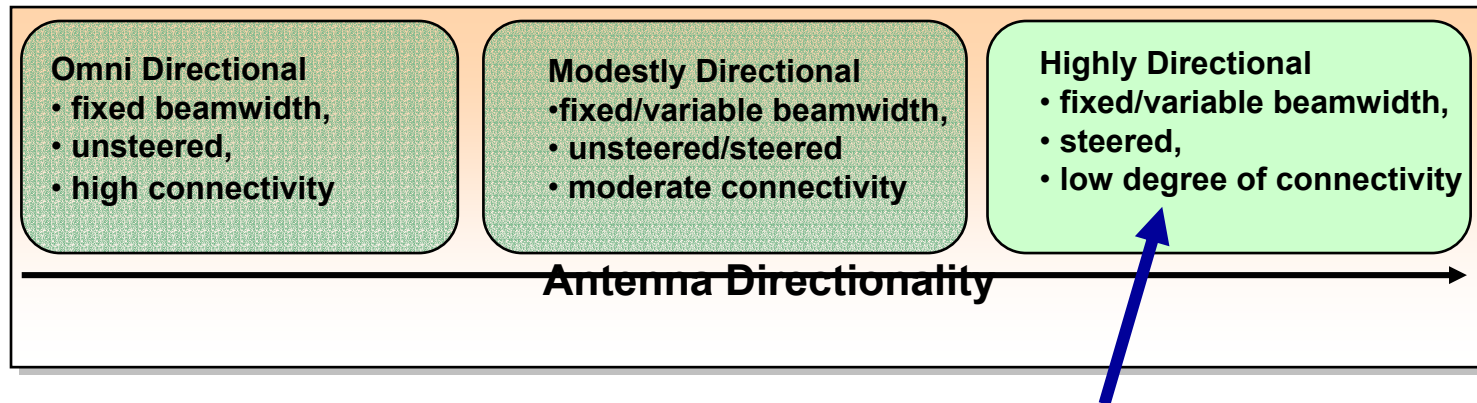
- We are developing a modestly directional communication system prototype to better understand “the problem” and to demonstrate our research



Impacts

- **Presented Channel Access Insights For Moderately Directional Comms at the FCS-C System Integrator Kickoff Meeting**
- **Provided OPNET model of MobileMesh to FCS-C players. Also provided enhancements and fixes for the 802.11 MAC which may benefit other DARPA programs**
- **MILCOM 2001 Paper/Presentation**

Future Plans



■ Pursue highly directional comms

- Mechanisms for establishing and maintaining highly directional links
- Mechanisms to keep track of available and committed resources
- Policies to decide where in the network to create highly directional links