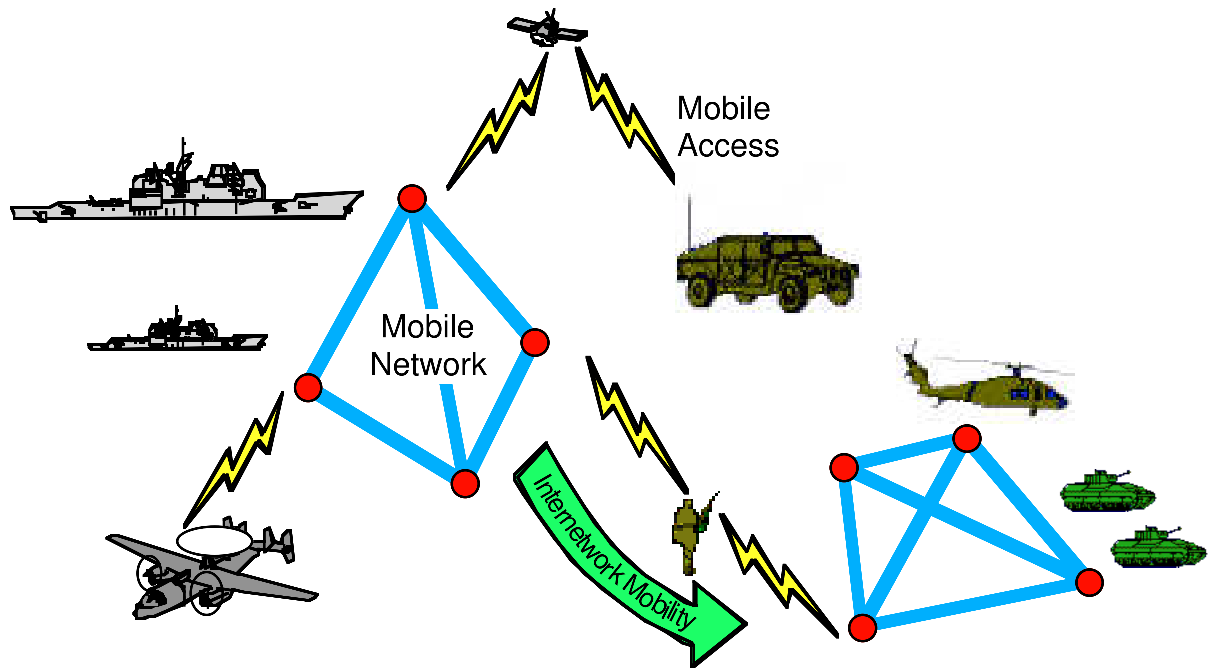
Mobile Mesh Networking: Military Internet Issues

Joe Macker
Information Technology Division
Naval Research Laboratory

4 December 1995

Joe Macker
(202) 767-2001
macker@itd.nrl.navy.mil
http://tang.itd.nrl.navy.mil/macker.html

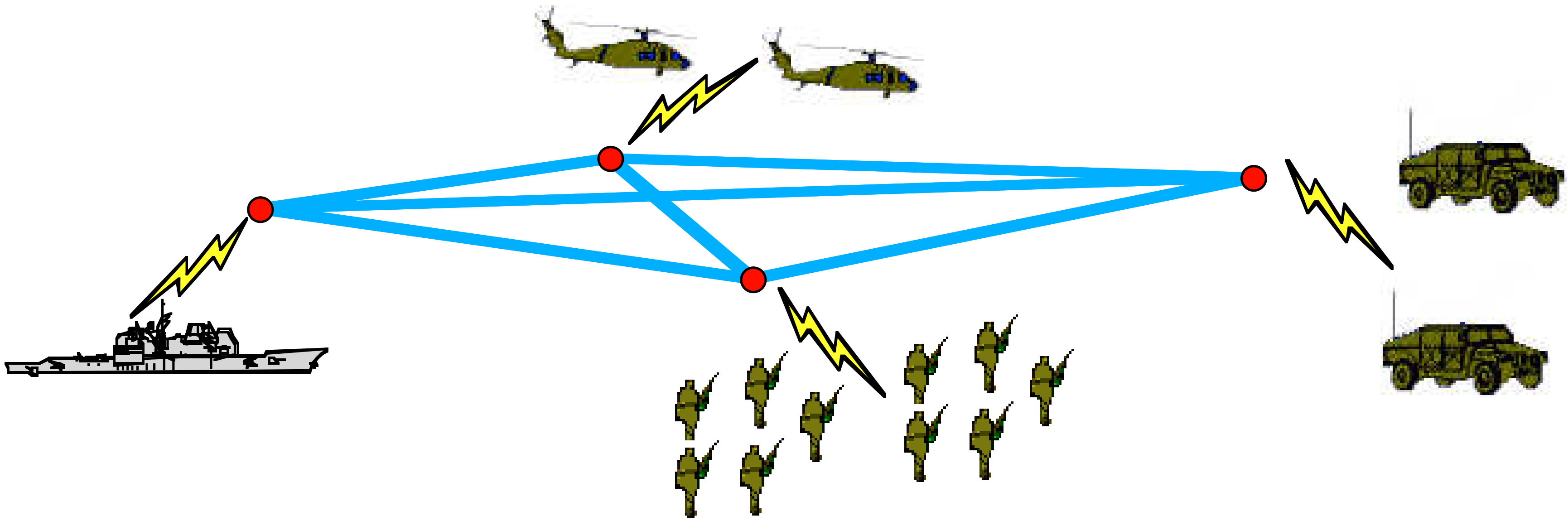
Mobility Issues



- Users remain attached to their Information Environment via wireless network communications
- Diverse data requirements (e.g., short time-sensitive data packets, voice, imagery)
- The military wireless environment is highly dynamic and hostile!

- Limited Communication Resources
- Highly dynamic topologies with multi-hop, sporadic connectivity
- Heterogeneous communication media
- Robustness
  - Survivability
  - Recovery
- Security Concerns

Navy Mobile Networking Efforts



- Open Systems Network Architecture
- Near Term Investments
  - IP-based Wireless Internetworking technology
  - Multicast Routing Support
  - Combat Network Radio IP Interface
- Future Potential
  - Improved, Mobile Routing Protocols
  - Integrated Services Support

Some Navy Wireless IP R&D Efforts

- **CSS Architecture**
  - **OSPF, M-OSPF Wireless Segment demo in 95′**
- **Data and Voice Integration ATD**
  - **Highly mobile subnet routing protocol (MCA)**
  - **Integrated Services Support (e.g., low rate voice)**
  - **Support for M-OSPF and RSVP in 1996**
- **CSNI**
  - **International NATO Wireless OSI/IP Networking Interoperability Experiments**
- **Military Internet Multicast (MIM)**
  - **Wireless Multicasting Experiments (M-OSPF)**
- **HF E-Mail**

Present Design Limitations

- Limited Wireless Bandwidth means "Congestion is the rule not the exception"
  - Present Navy solution has applied OSPF/M-OSPF routing approaches to achieve load balancing and QoS routing within wireless AS
- Scaled domain boundaries and hierarchies are imposed to minimize traffic overhead (link state ads)
  - Results in a narrowing of possible topological dynamics
  - Wireless battlefield would like larger domains supporting highly mobile intradomain activity
  - Need less topological constraints while maintaining performance

DoD Mobile Routing Summary

- IP technology provides the best heterogeneous networking solution
- An effective, multi-vendor mobile mesh routing solution requires a focused IP standardization effort
- Develop mobile mesh routing solution with required features:
  - Bandwidth Efficiency
  - Highly Dynamic Mobility
  - Network Load Balancing
  - Multipath Routing
  - Robustness
  - QoS Support