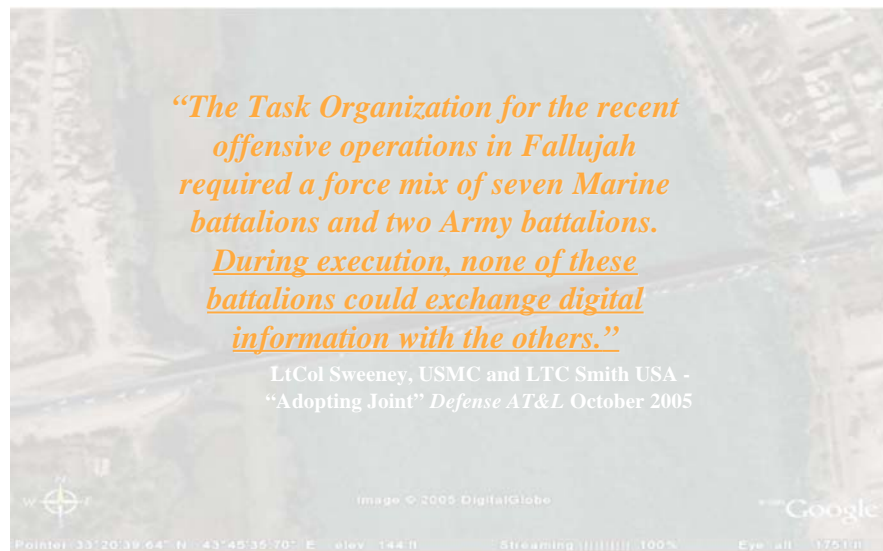


Challenges in Knowledge-based Mobile Ad Hoc Networking

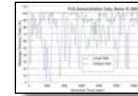
Robert C. Durst

There's lots of room for improvement



Status

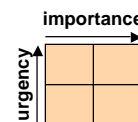
- Today's military networks are mobile, but they're not *ad hoc*
 - Planning takes a long time
 - Systems don't reconfigure themselves in the field
 - The answer to "why" has a direct bearing on the use of knowledge-based systems
- Why? [Barriers to true mobile ad hoc networking]
 - Today's military networks are over-subscribed
 - "Comm sucks" is a phrase in frequent use
 - Congestion loss is significant
 - Today's military networks are built by the individual services
 - Services are modeling their inter- (and sometimes intra-) service interface and interaction models from the commercial telecommunication industry – static points of interconnection, negotiated flows, nothing "unexpected"
 - Services have hierarchically-assigned responsibilities
 - Today's services pull their best practices from industry
 - But there *are no* commercial mobile ad hoc networks
 - Best practices are from static, wired networks – mismatch?



3

What is the Trade Space for Optimization?

- Resources to allocate
 - Radio Frequency spectrum
 - Power (operating and radiated)
 - Over-the-air capacity
 - Delay/Jitter
 - Loss
 - Storage
 - Trust?
- Classes of traffic
 - Real-time jitter-sensitive (voice, video)
 - Near-real-time (chat)
 - Non-real-time, loss-sensitive (files, email)
 - Coarsely time-sensitive (position)



4



What should knowledge-based systems do to address the existing barriers?

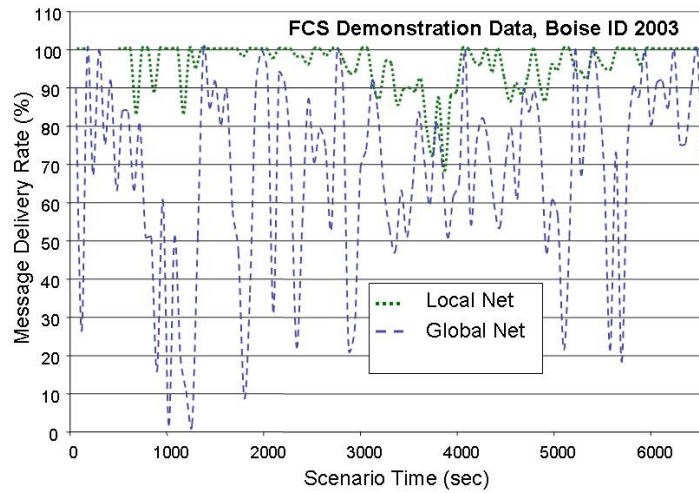
- **Reduce oversubscription**
 - Reduce traffic through
 - In-network aggregation
 - Intelligent caching
 - In-network data reduction
 - Manage resources to avoid bottlenecks
 - Enhance connectivity – make a fabric, not a string
 - Create and use multiple parallel paths through the routing fabric
 - Use *storage* to spread traffic in time
 - Identify and exploit correlation
 - **Accommodate service-unique components**
 - Identify, adapt, and *mutually* configure for interoperation
 - **Emulate industry-derived best practices**
 - Provide stable, reliable, effective, “hands-off” solutions
 - Build for the “-ilities”
-

5



Thanks!

Losses are significant in military mobile ad hoc networks



Brown et al, "Future Combat System - Scalable Mobile Network Demonstration Performance and Validation Results," Proceedings of MILCOM 2003, October 2003, Boston, MA.



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