



Battle Command Requirements and Technical Challenges

Presented by

Gary P. Martin

Technical Director

Communications Electronics Research, Development and Engineering Center (CERDEC)

Research Development and Engineering Command (RDECOM)

gary.martin2@us.army.mil

19 Apr 2006





Outline

- Battle Command
- Network considerations
- Implications of the Future Network
- Challenges
- Summary



Definition of Battle Command

- Battle Command is the ability to envision the tactical military objectives, translate the vision into an intent, formulate courses of action, and provide the force of will to concentrate overwhelming combat power at the right time and place to win decisively with minimal casualties
- Battle Command competencies:
 - Seeing the enemy
 - Seeing yourself
 - Seeing the Terrain
 - Visualizing the battle
 - Seeing into the future

Commanders must not be prisoners of a static command post.

They must go where they can assess the risks and make adjustments by seeing, hearing, and understanding what is occurring.



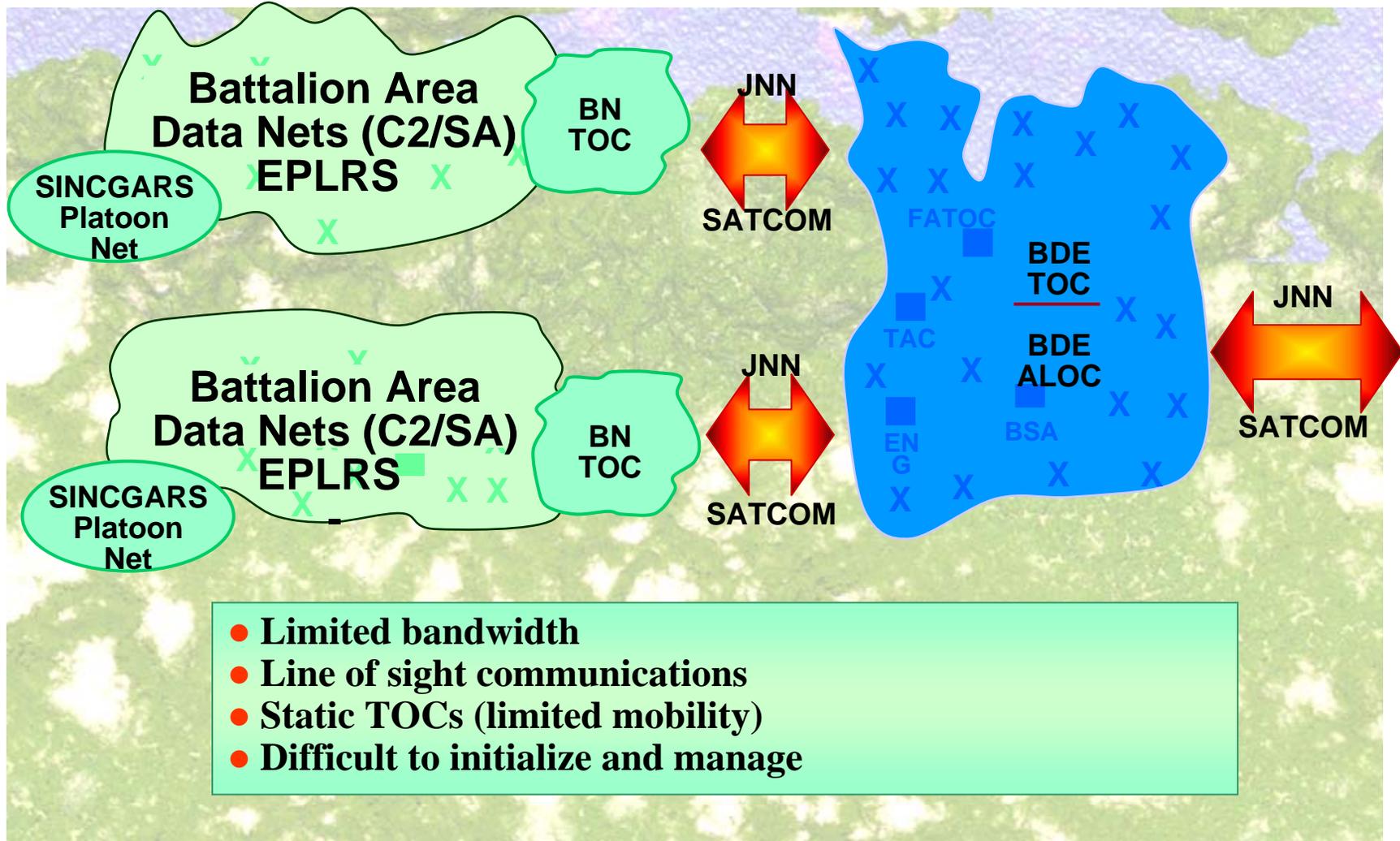
C4ISR Missions



C4ISR

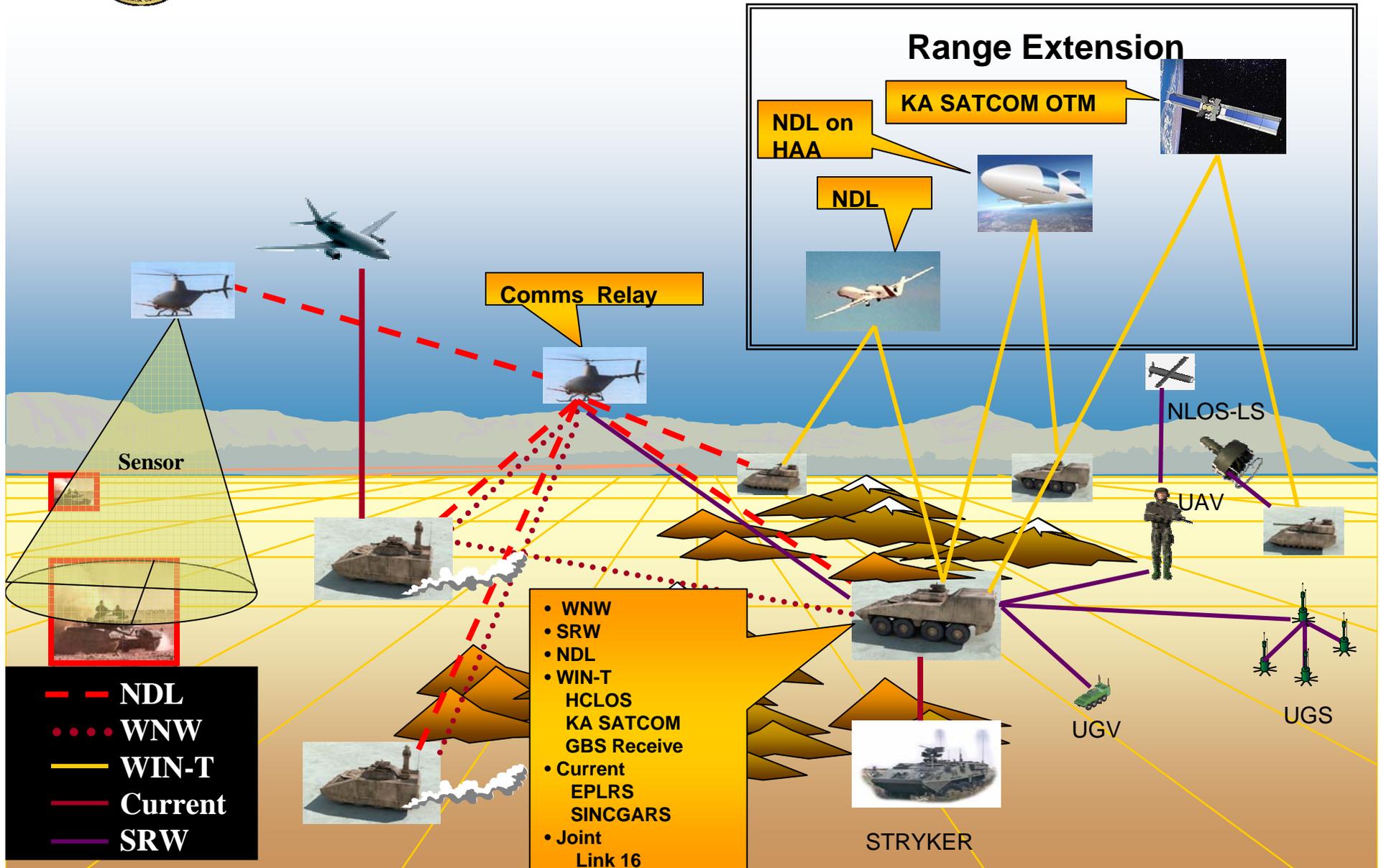


Network Challenges – Today's Network





The Future Army Network





Technology Needs and Enablers

- Mobile Ad-HOC Networking Systems
- Affordable on-the-move satellite solutions
- Broad-band, multi-port, omni directional antennas
- Broadband, power efficient amplifiers
- Network aware Adaptive applications
- Sensor Management/tasking
 - Data Compression (especially for Sensor data)
 - Onboard Processing at the Sensor
- Automated decision aids



Operational Considerations

- Robotic and unmanned Systems
 - Management and tasking
 - Autonomous operation
 - Synchronization
- Sensor fidelity and adjustability to mission needs
- Fusion/Knowledge Management
- Tailorable COP
- Intelligent use of all communications systems



Future Considerations

- Better use of Available Frequency Spectrum
 - Move to more spectrally efficient technologies
 - Processing of data prior to transmission
- Connectivity
 - Network design Matters
 - Increased use of SATCOM or aerial relays for extending the range of terrestrial network
- Enhanced Interoperability
 - Gateways versus backward compatibility
- Simplification of Network Operation
 - Use of interoperable routing, network management, Information assurance, quality of service, and mobility protocols



Information Assurance

- Role Based Access & Control
- Identification, Authentication, Authorization, Accounting (IAAA)
 - PKI Certificate Services
 - Biometrics
- Database / Data Encryption
- Information Authentication
- Automated Intrusion Detection and Response
 - Antivirus sensor
 - Malicious code detection and intrusion correlation
 - Attack response
- Information Warfare Survivability

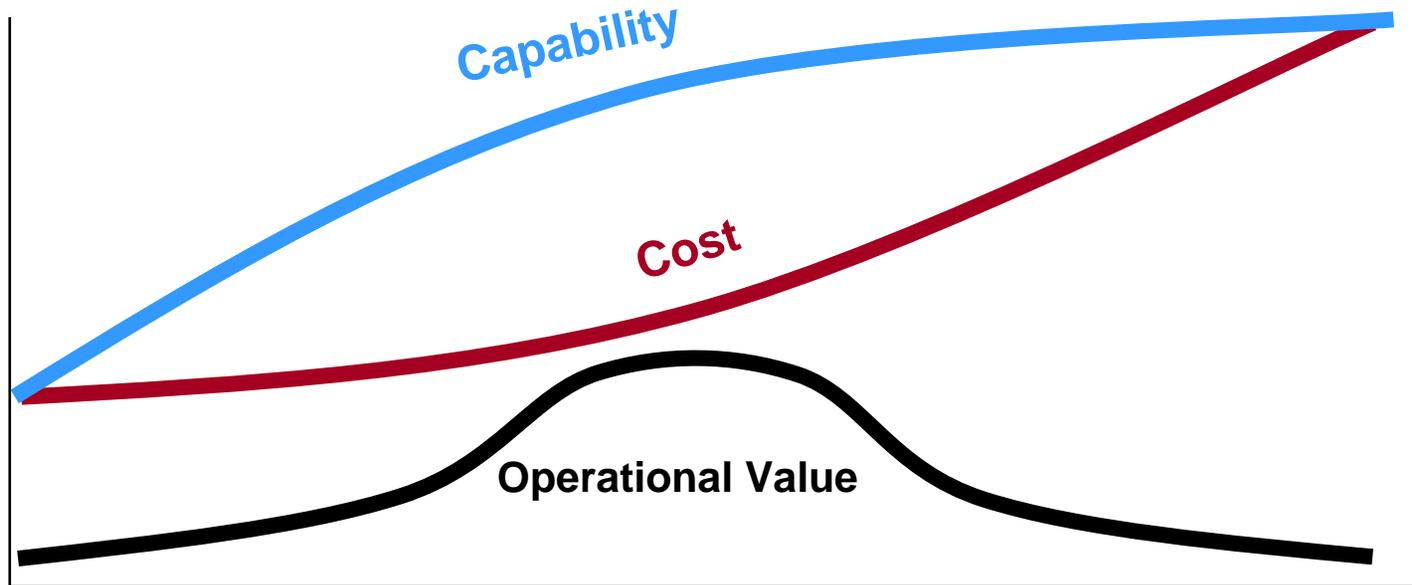


A Few Realities

- Network designs need to optimize across dimensions of connectivity, robustness, and bandwidth
 - Trades required – we cannot maximize all three
 - Ad-hoc networking waveforms are required but insufficient to enable network centric operations
- There is significant trade space along dimensions of technical features, development costs, procurement costs, operating costs, and performance
- If the network is to provide protection equal to 20 tons of cold, hard, rolled steel, then the network must be “hard as steel”
- There is a dimension of “Art” in effective battle command. Technology alone will not achieve the objectives of Future Force Battle Command



Cost Versus Capability



Legacy Networks
(NTDR, EPLRS,
SINGARS, ...)

Appropriate mix of
terrestrial, aerial and
satcom networks
(multi-tiered)

Large Terrestrial Nets with Ad-
Hoc Networked Waveforms
(WNW, SRW, ...)

As the system becomes more complex, it reaches a point beyond which small increases in capability require very large increases in cost (development, procurement and operational).

Where is the maximum Value, which equals Capability / Cost?



The Urban Operations Challenge





Situational Understanding

File Map Tools Help
Knox-311 Scale: 1:10,000

Map Display

Sensor Controls

<input type="checkbox"/> On <input type="checkbox"/> Off <input type="checkbox"/> Deactivate	<input type="checkbox"/> Reset Tripped <input type="checkbox"/> Detonate <input type="checkbox"/> Detonate Tripped
--	--

Sensor Video

Entity	Location	Status
▼ Minefield 1		
▼ Mines		
Current Task or Target List		
US M16A2		Command Activate

Sensor Coverage Analysis



Tomorrow's Warfighter





Definition of Battle Command

- Battle Command is the ability to **envision** the tactical military objectives, **translate the vision into an intent**, formulate **courses of action**, and provide the force of will to concentrate overwhelming combat power at the right time and place to win decisively with minimal casualties
- Battle Command competencies:
 - Seeing the enemy
 - Seeing yourself
 - Seeing the Terrain
 - Visualizing the battle
 - Seeing into the future

This is Hard to do and it takes a seasoned Leader to do well!!



Summary

- Network Centricity is complex but essential to supporting mobile battle command.
- There are many dimension to solving the Battle Command Challenge (technical and operational)
- I contend that Network connectivity and Information security are the most critical challenges
- Trades are needed to ensure the right balance is achieved between technology, capability and “art”