

# Overcoming NLoS: Connecting TDL Networks with SATCOM

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# HAVELSAN

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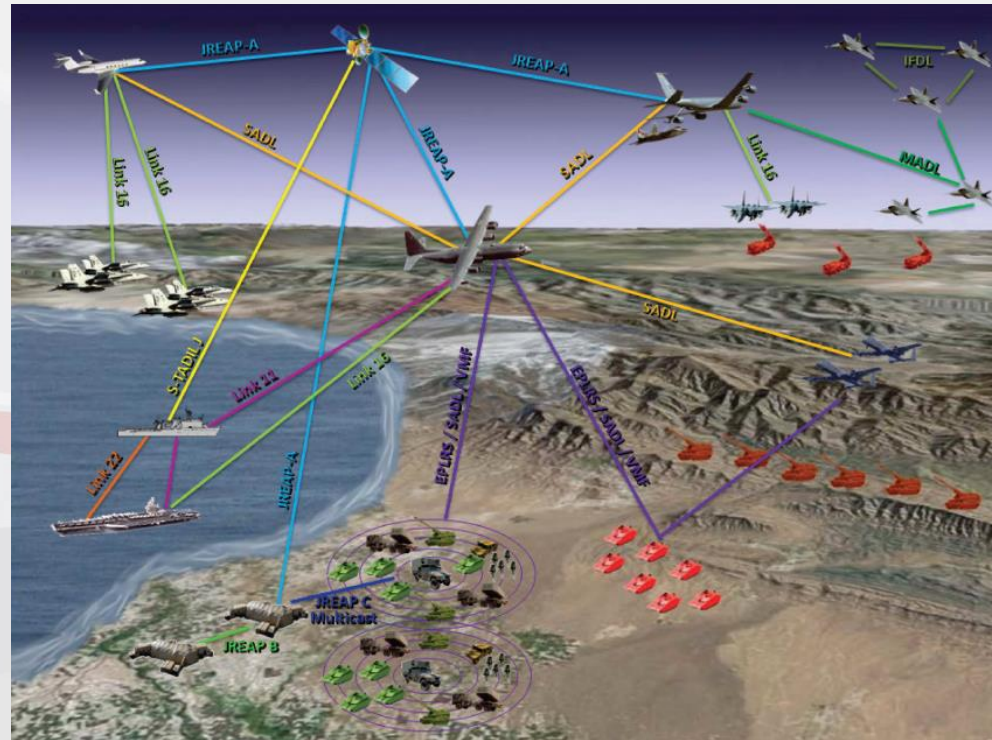


# Introduction

- Advances of military technology and the evolving threats necessitate the development and deployment of C4ISR systems that enable commanders and decision makers to have real-time access on battlefield tactical information in an accurate and precise manner
- The response time for decision making and information forwarding to other Command and Control centers or the fighting units in the theater of operations is essential
- Advanced communication systems that support the rapid exchange of Situational Awareness and Command and Control information within the mission elements are critical

# Introduction

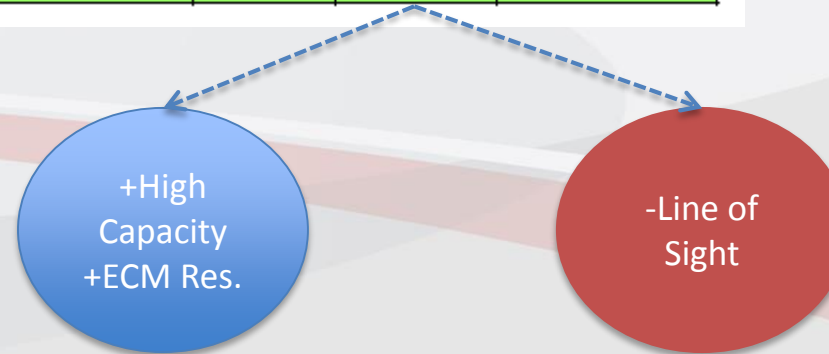
- Data Link network technology provides interoperability of diverse services and platforms by providing a common medium for the exchange of surveillance, command and control, and intelligence information



# Tactical Data Links

Tactical Data Link Comparison

TDL	Link 1	Link 11A	Link 11B	IJMS	Link 16	Link 22
Bearer	Landline	HF / UHF	Multi-Media	UHF	UHF	HF / UHF
Speed (BPS)	1,200	1,800	1,200	28,800	53,760+	HF 1,200 UHF 12,667
ECM Resistance	N/A	None	N/A	High	High	Medium
Encrypted	No	Yes	Yes	Yes	Yes	Yes



## Link 16 Message- Functional Areas

- Precise Participant Location and Identification (PPLI)
- Platform Status Information
- Surveillance
- Information Man.
- Network Man.
- Weapon Coord. & Man.
- Aircraft Control
- Electronic Warfare
- Free Text

# Link 16 Terminal (MIDS)

- Jam-resistant radio that operates in the 960-1215MHz
- Employs Time Division Multiple Access (TDMA) Architecture
- Line of Sight (LoS)
- Three MIDS families



MIDS LVT(1)

	Voice	TACAN	1553	Ethernet	Output Power	Example Platforms
MIDS LVT(1)	X	X	X	Platform D	200W, 1000W*	F/A-18, E-2D
MIDS LVT(4)	X		X	Platform D	200W, 1000W*	JAS-39, Ground
MIDS LVT(5)	X		X	Platform D	200W, 1000W*	Maritime C2
MIDS LVT(6)		X	X	Platform D	200W	AC-130, F-16
MIDS LVT(7)			X	Platform D	200W	B-2

\* requires additional hardware

## MIDS LVT(1) family

	Voice	TACAN	X.25	Ethernet	Output Power	Example Platforms
MIDS LVT(2)			X	Platform J	200W	Army Ground
MIDS LVT(11)	X		X	Platform J	200W	Patriot Air Force Ground
						TACP

## MIDS LVT(2) family

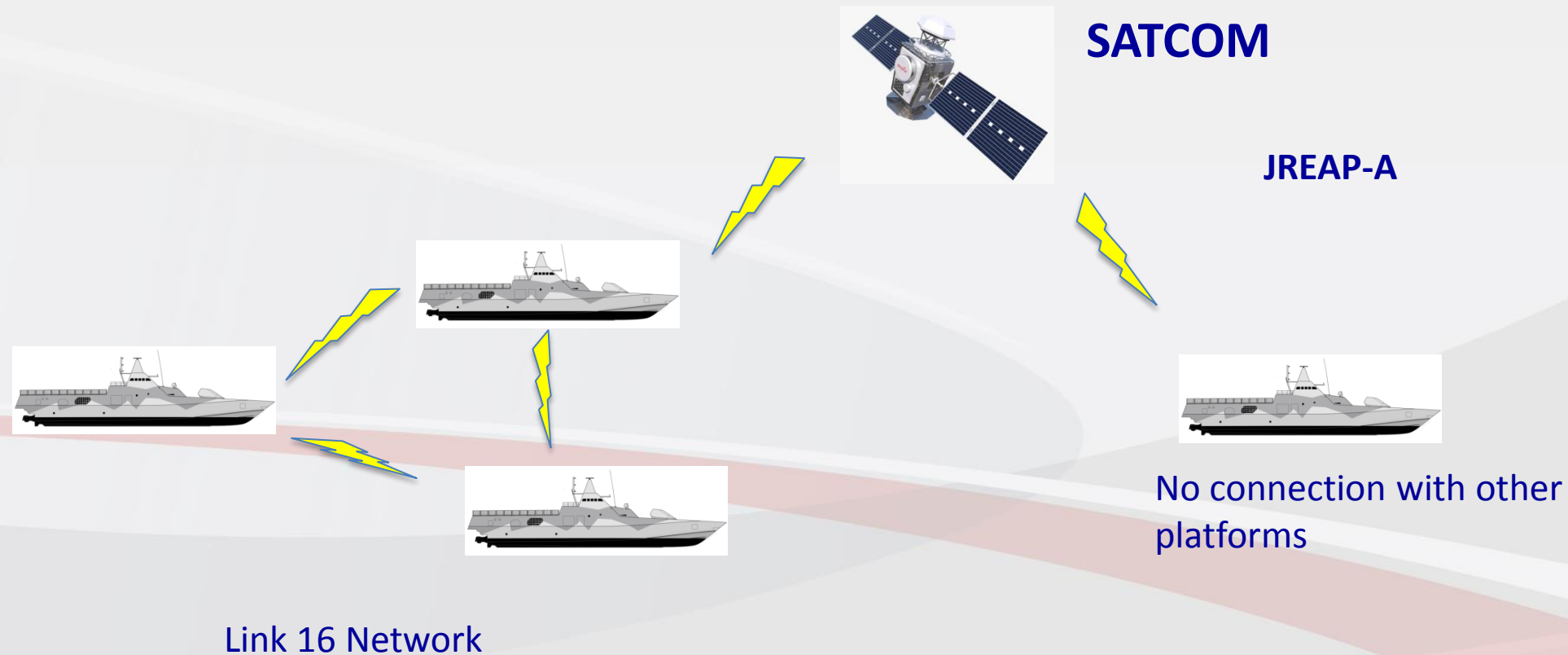
	Voice	TACAN	1553	Ethernet	Output Power	Platform
MIDS LVT(3)			X		50W	F-15

## MIDS LVT(3) family



# Weakness of Link 16: LoS Operation

Example Scenario I: Connecting a platform to L16 network

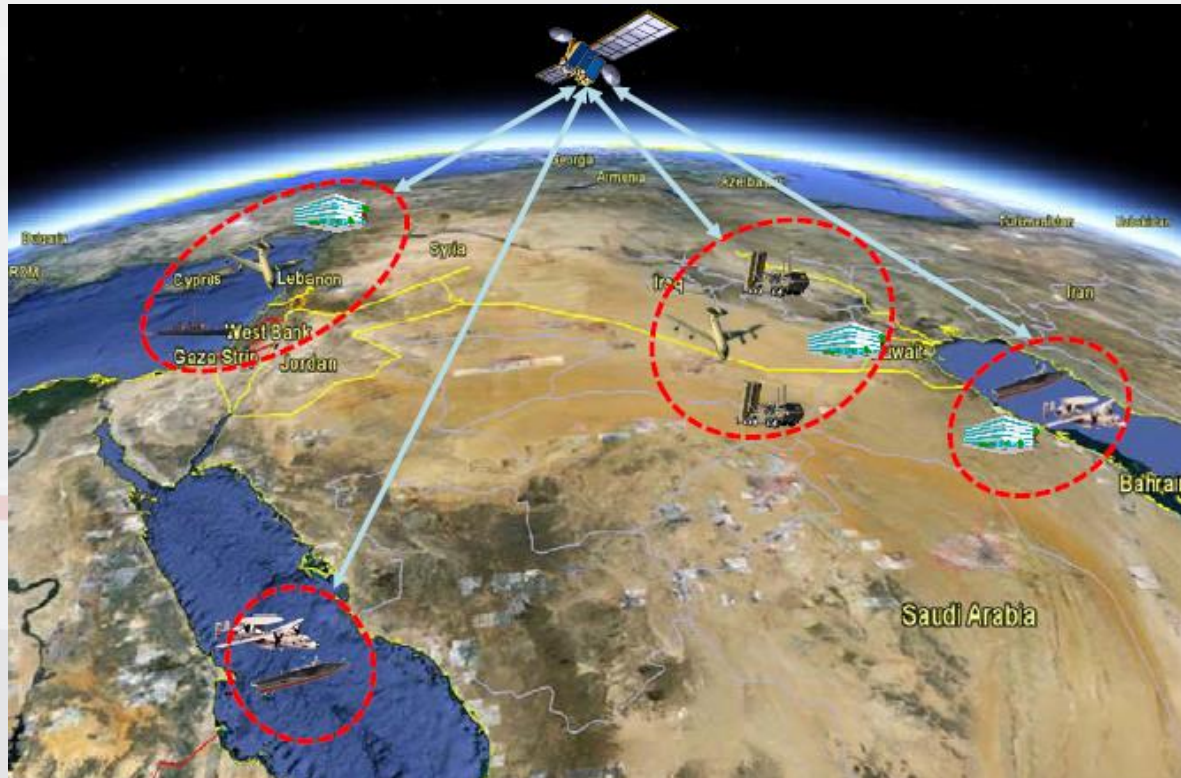


Link 16 Network

No connection with other platforms

# Weakness of Link 16: LoS Operation

Example Scenario II: Connecting networks via satellite



## JREAP (Joint Range Ext. App. Protocol)

Enables tactical data to be transmitted over digital media and networks not originally designed for tactical data exchange

### JREAP Capabilities:

- Extend the range-limited network to beyond LoS
- Reduce the loading on stressed networks
- Provide back-up communication in the event of the loss of a normal link

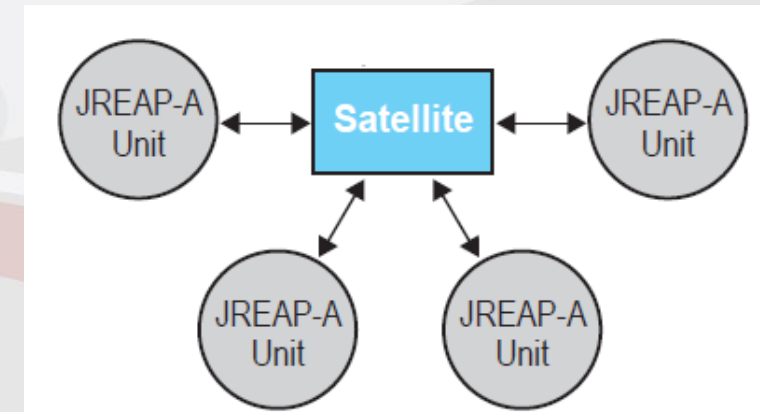
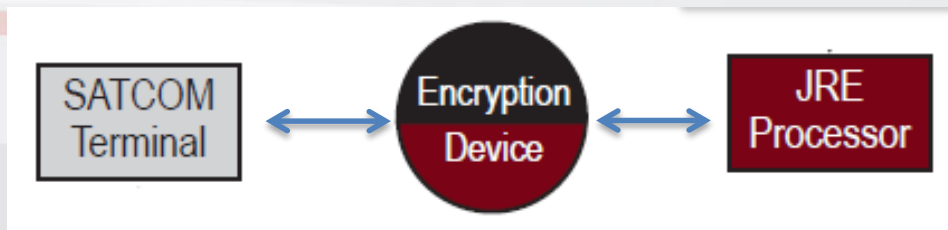


# Range Extension Application Protocol (JREAP)

- Implementation is based on STANAG 5518
- The main body of the document describes
  - Common message structures, message elements and protocols primarily at the application level that are independent of the media
  - Appendices are provided for specific communication modes to describe necessary JREAP message and protocol modifications
- The standard addresses 3 communication modes
  - **Appendix A: Half-duplex Announced Token Passing (Satellite)**
  - Appendix B: Full-duplex Synchronous and Asynchronous Point-to-Point
  - Appendix C: Internet Protocol

# JREAP-A

- JREAP-A implements the full-stack header and uses a token passing protocol, where one unit is allocated a particular period of time to transmit while all other units listen and receive data
- JREAP-A is commonly used over 25 KHz Ultra High Frequency (UHF) Demand Assigned Multiple Access (DAMA)/Time Division Multiple Access (TDMA), Extremely High Frequency (EHF) Low-Data Rate (LDR), and 5/25 KHz UHF Non-DAMA SATCOM Systems. These are multi participant satellite comm. networks



# Summary

- Data Link Networks technology has become the tool that support the rapid, secure and effective exchange of critical information among the mission elements
- The exchange of information leads to the creation of a Common Operational Picture thus significantly improve Situational Awareness, a significant Force Multiplier in modern warfare operations
- Satellite communication overcome the limitations of the existing links and support the capability of joint operations
- As SATCOM network capacity improves and costs reduce, the use of SATCOM in military domain will increase.

# THANK YOU

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