



## Secure Wireless Networking Solutions for Sensor and Smart Munitions Systems

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# Overview

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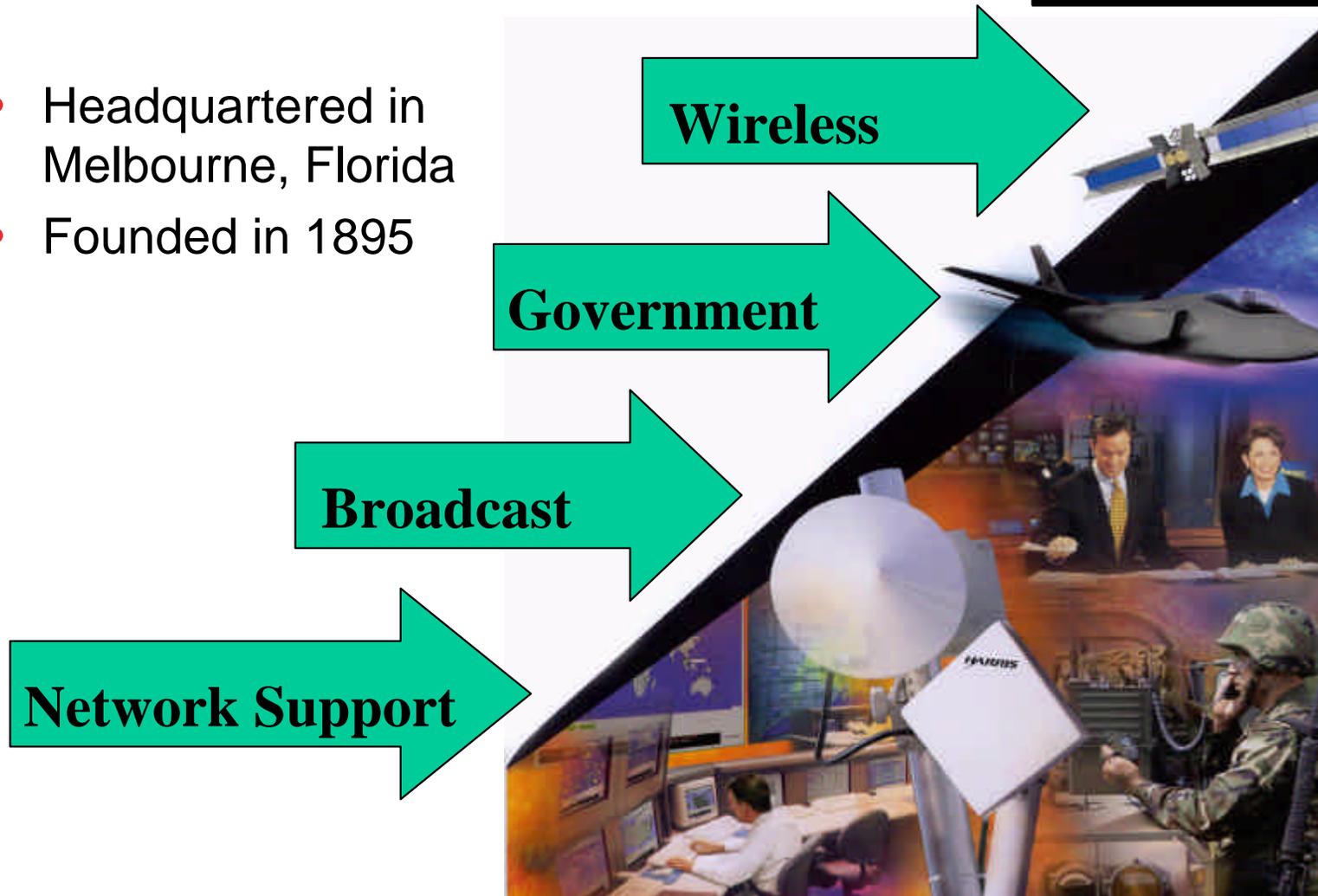
- Harris Overview
- Sensor/Munitions Comm Evolution
- Sensor/System Requirements
- Analogous Communications System Solutions
- Future Sensor System Solutions
- Summary



## *Focused on Communications*



- Headquartered in Melbourne, Florida
- Founded in 1895



# RF Communications Division Business Areas

**HARRIS**



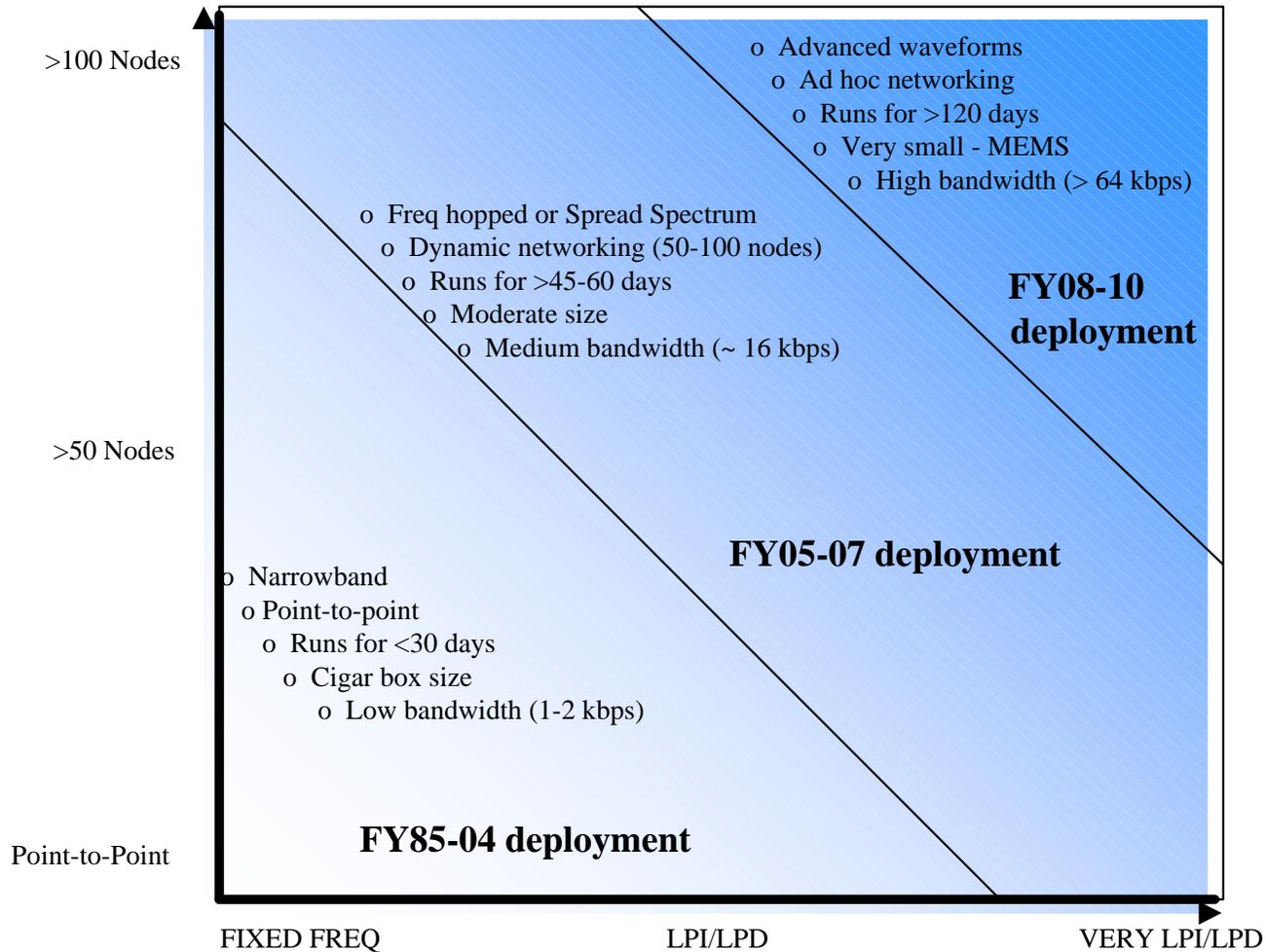
- **Tactical/Strategic**

- Falcon & Falcon II Radios
- Vehicular Tactical Systems
- Shipboard Systems / Radios
- Wireless Gateway
- IP Networking Solutions

- **Communications Security Products**

- Cryptographic ICs/Modules
- Citadel
- Sierra Reprogrammable Type I COMSEC

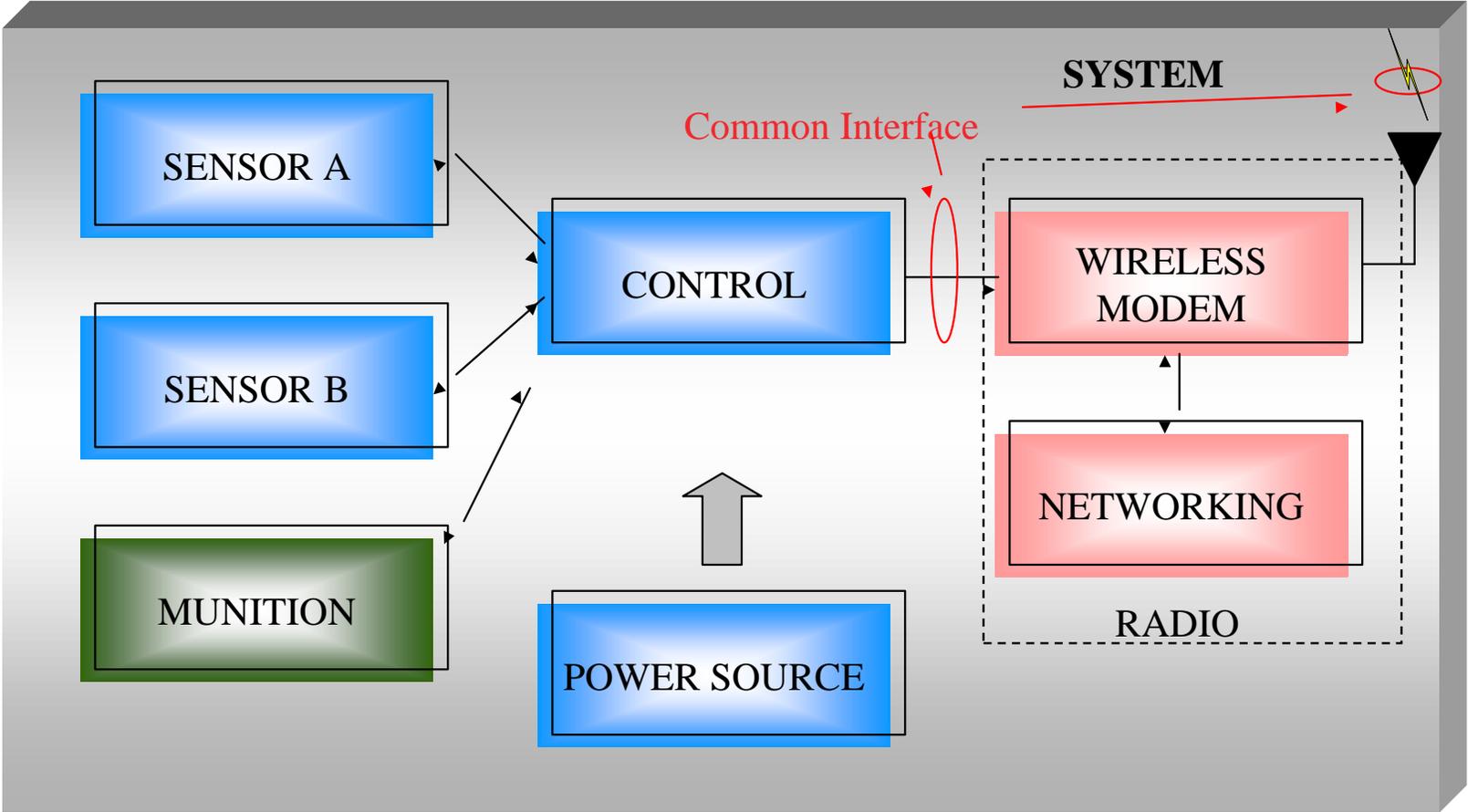
# Evolution of Sensor Communications



- Self-organizing/Self-healing
- LPI/LPD
- Variety of deployment modes
- Battery consumption, and wake-up time constraints are major factors
- Propagation (range)
- Data rate
- Software Defined Radio - JTRS
- Collaboration among sensors
- Command and response latency
- Security
  - Traffic analysis, spoofing, authentication
  - Level of security



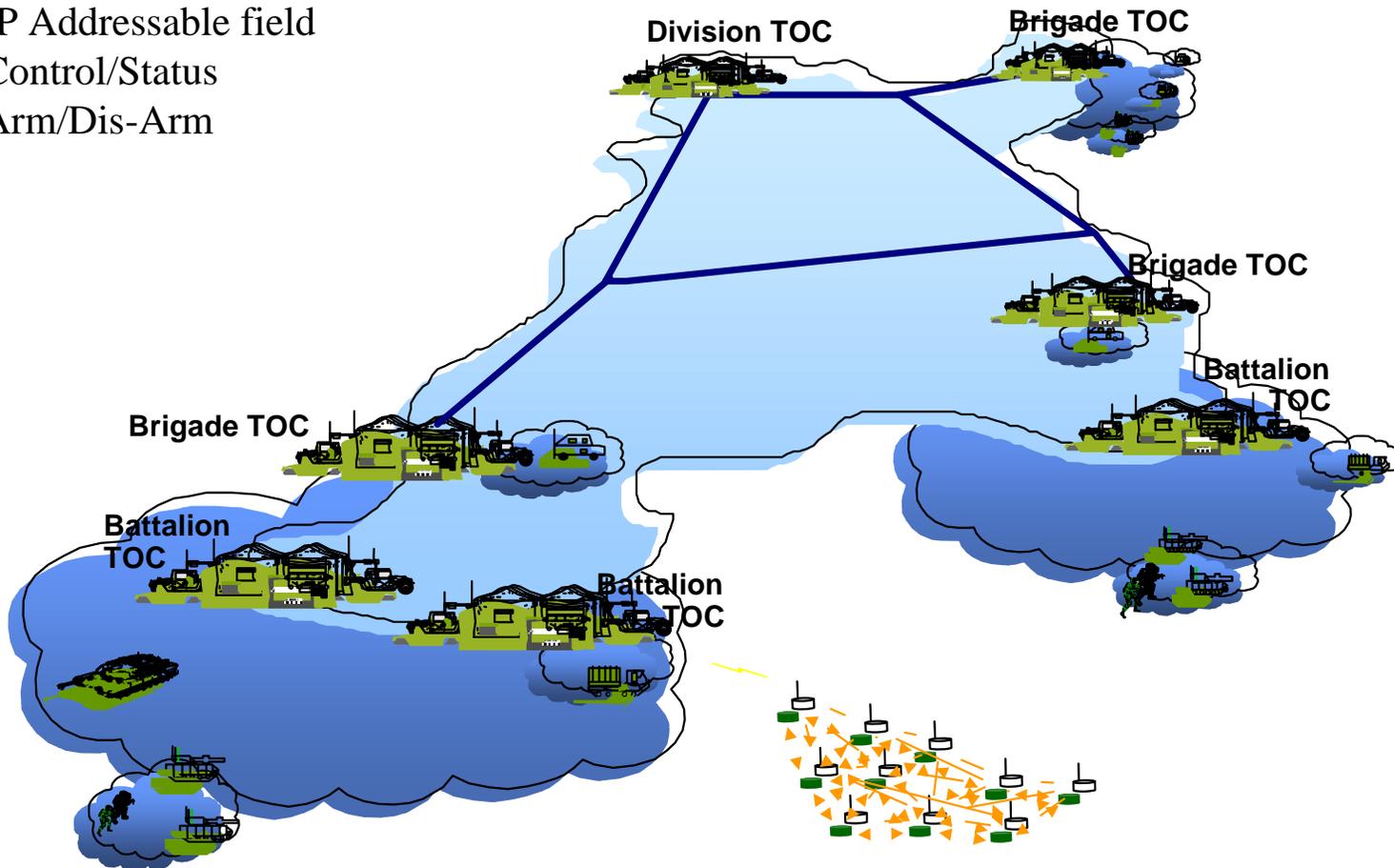
# Integrated Sensor/Munition System



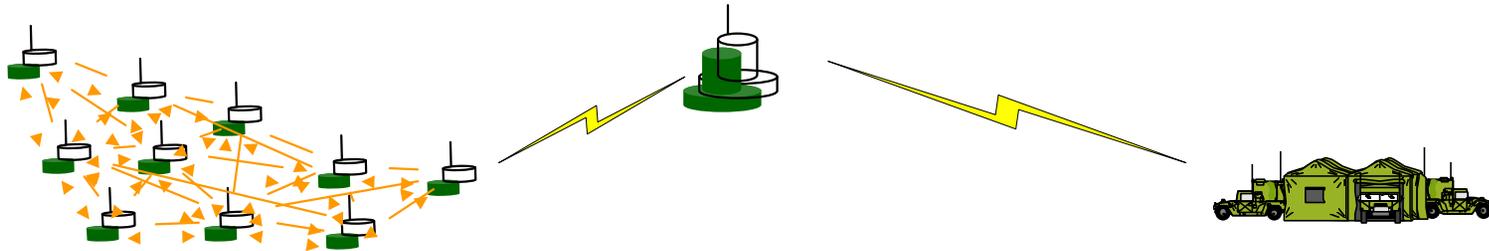
# Integration Through TI



- IP Addressable field
- Control/Status
- Arm/Dis-Arm



# System vs. Sensor Communications



<b>SENSOR</b>	<b>C2/RELAY NODE</b>
<ul style="list-style-type: none"><li>• Short range</li><li>• Maximum battery life</li><li>• Self-forming network</li><li>• Low cost</li><li>• High data rate</li></ul>	<ul style="list-style-type: none"><li>• Long Range (<math>\leq 300</math> km)</li><li>• Limited network</li><li>• Data Fusion</li><li>• Moderate Uplink Bandwidth</li></ul>

# Encryption Alternatives

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- Very high grade **Non-Type I** encryption (Citadel)
  - 64 - 128 bit key length
  - Requires brute-force decipher techniques
  - Compatible with coalition forces
- Programmable customized algorithms
  - Unique algorithm per customer
- Built-in black key functions
  
- All encryption levels: (Sierra)
  - commercial standards, proprietary, Government **Type 1** and Type 2, AES
- Advanced key management capabilities: Public key cryptography, ECC



- Modeling and Simulation
  - Network loading will be verified through modeling and simulation efforts.
  - Joint model development
    - MITRE Developing Physical Model
    - Harris Developing CSRT/MRT Network Model
    - ACS Developing Control Station and Munition Model
  - Statistics collected at physical and network layers correlated with data collected during live tests
  - Physical modeling includes terrain and environmental characteristics
  - Correlation testing accomplished at component, and system levels

- Migration of handheld/manpack radio technology to networked radio modules
- Sophisticated channel access methods to ensure timely distribution of data
- Dynamic routing optimized for performance implemented inside the radio
- Advanced Power Management and Error Correction Technology
- All data is encrypted over the air



# FALCON™ II *Product Family*



World class family of software defined radios which support virtually all tactical communication requirements for Brigade level operations and below.

Over 15,000 radios fielded from 2 - 512 MHz.

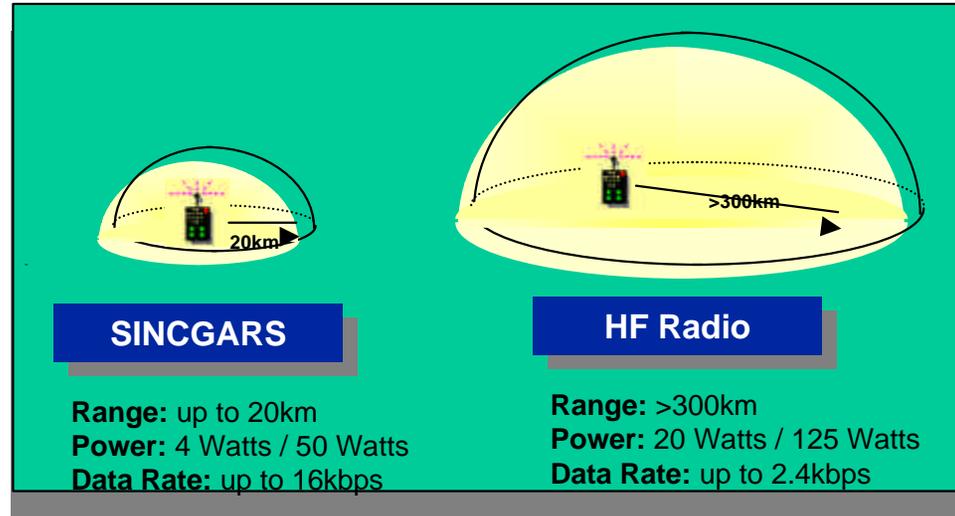
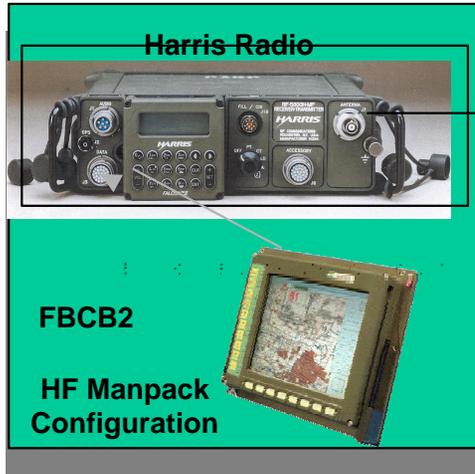
## *Harris Falcon II Networking Programs*

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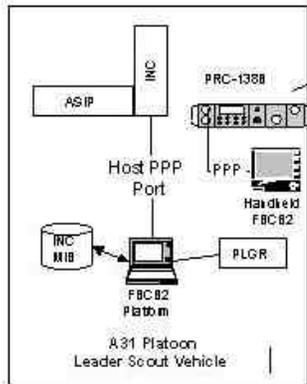


- Successful, proven networking technology demonstrated across the Falcon II product line
- **PRC-150(C)** – Tactical Internet Range Extension
  - Precursor to selection for IBCT program
  - FBCB2 Comms over **HF**
- **PRC-117F** – **SATCOM** backlink for aircraft, allowed database replication & IP data transfer.

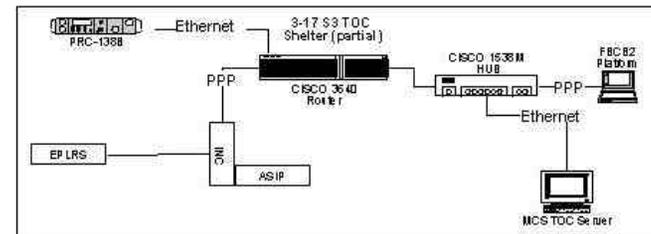
# HF Tactical Internet Range Extension



FBCB2-Equipped:  
CDR Vehicles,  
Staff Vehicles, etc.

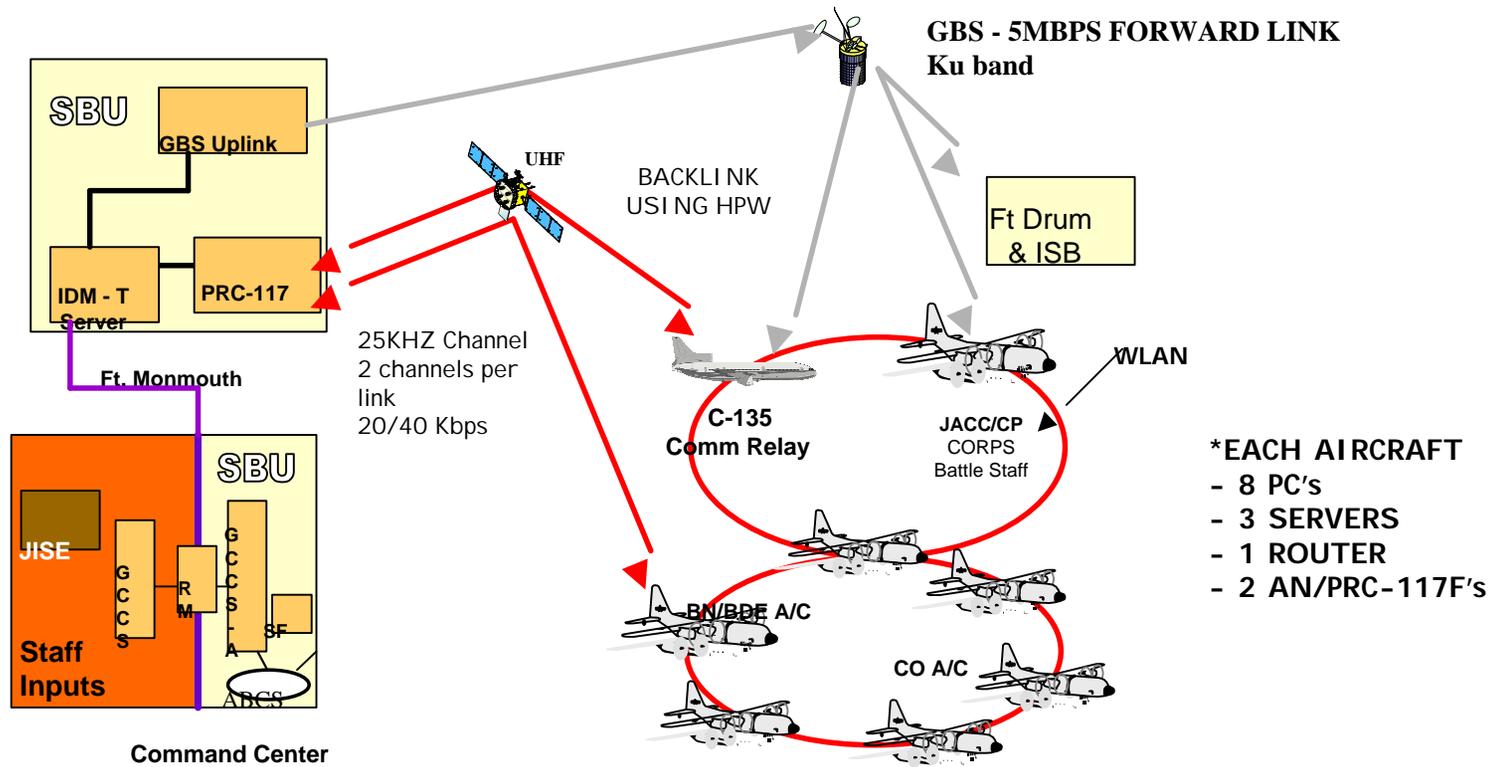


HF provides Long range TI  
Connectivity

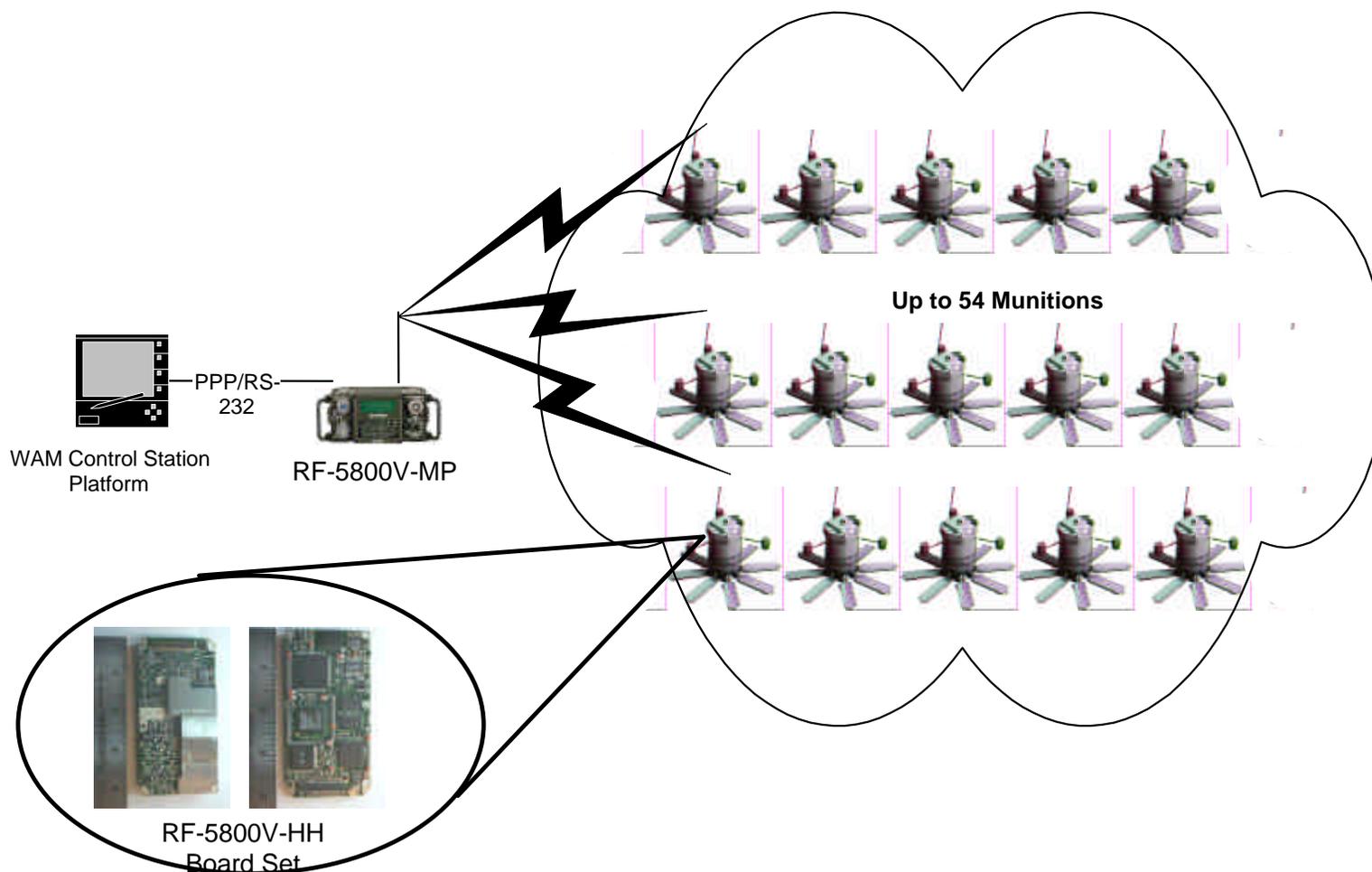


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# Experimental Architecture for Enroute Mission Planning



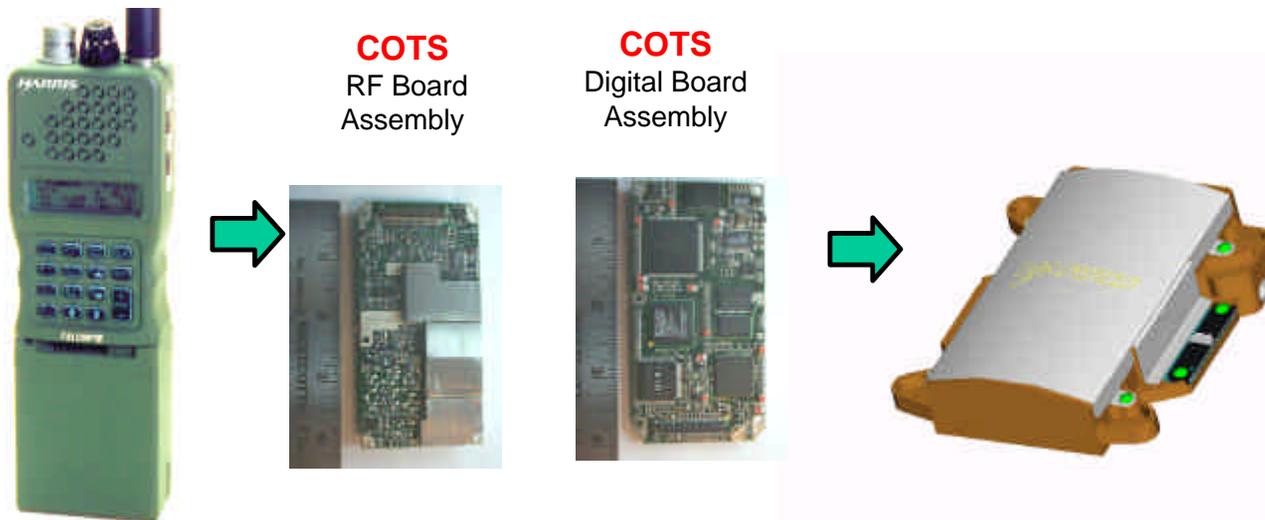
# Advanced Hornet System



## Evolution of the RF-5800V-NM



- A repackaging of existing COTS VHF Handheld radio.
  - Same RF Board Assembly
  - Same Digital Board Assembly
- New mechanical enclosure to fit within smaller space.
- Software changes to compensate for LCD and keypad removal
- Software change to add dynamic networking.
- Power Management software upgrade.



## RF-5800V VHF Manpack

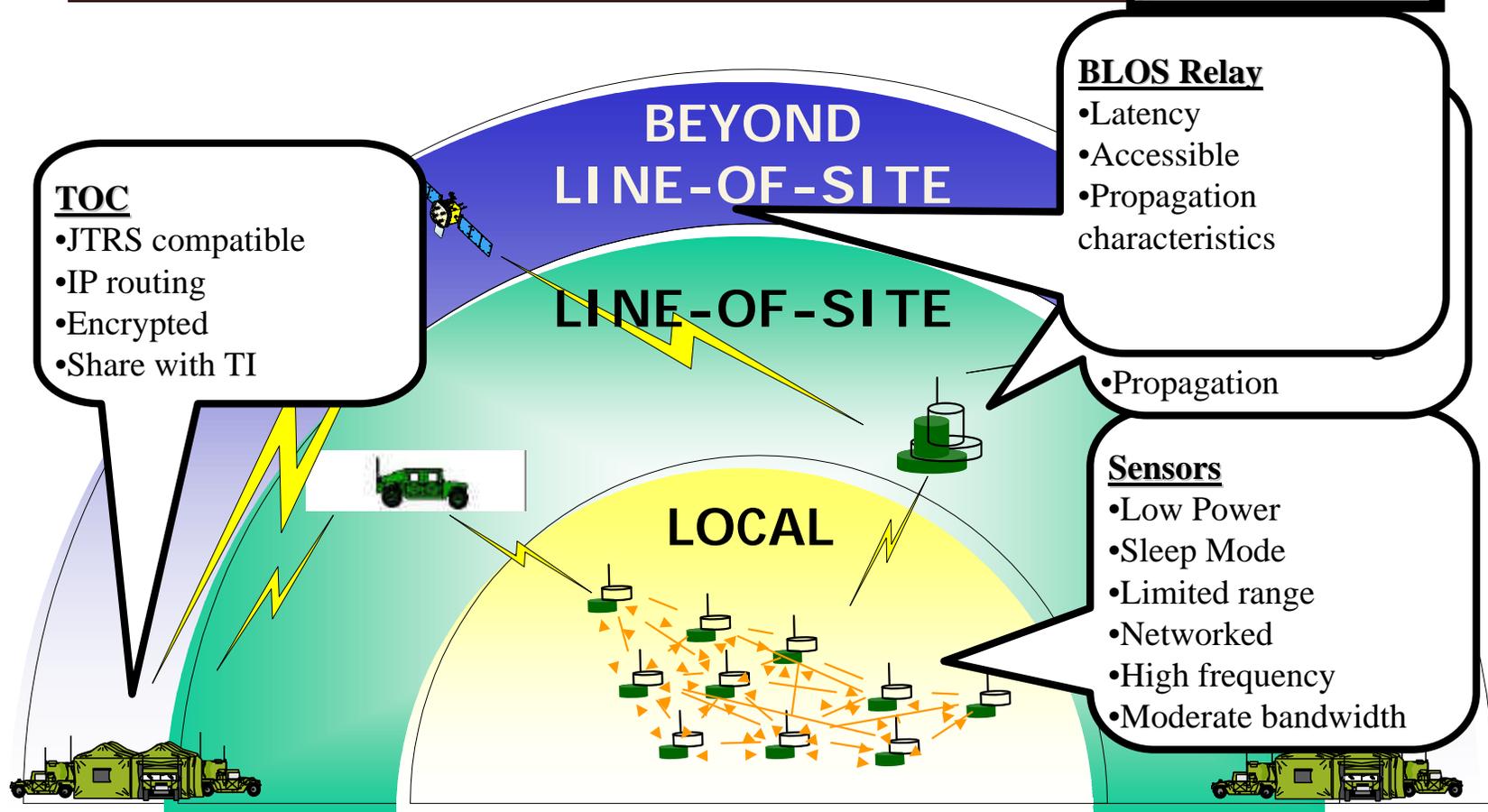


**Faster,  
Farther,  
Smaller  
And Totally Secure**

### ADVANCED FEATURES:

- 300 hops-per-second ECCM
- UTM grid format for GPS
- Extended Frequency Range (30 to 108 MHz)
- 64 kbps modem
- Digital encryption (Citadel)
- Customer unique encryption (Citadel)
- Internal GPS
- Software upgrade capability
- GPS position reporting
- Wireless Cloning
- Networking

# Multimode Communications



# Communications Tradeoffs



Factor	Characteristic	HF	VHF UHF	SATC OM
<b>Latency/Access</b>	<ul style="list-style-type: none"> <li>•Error correcting</li> <li>•Interleaving</li> <li>•Channel access</li> </ul>	1-9 sec	1-2 sec	2-3 sec
<b>Data Rate</b>	<ul style="list-style-type: none"> <li>•1.6 - 200 kbps</li> <li>•Channel quality</li> </ul>	2.4-64 kbps	16-64 kbps	64 kbps
<b>Antenna</b>	<ul style="list-style-type: none"> <li>•Size</li> <li>•Complexity</li> <li>•Deployment</li> </ul>	16 ft	12 in	Direct Or Omni
<b>Encryption</b>	<ul style="list-style-type: none"> <li>•Type I</li> <li>•Non-type I - unattended</li> </ul>			
<b>Power</b>	<ul style="list-style-type: none"> <li>•Transmission efficiency</li> </ul>			
<b>Range</b>	<ul style="list-style-type: none"> <li>•BLOS</li> <li>•Reliability</li> </ul>	NVIS >300 km	20 km	>300 km
<b>Size</b>	<ul style="list-style-type: none"> <li>•Frequency elements</li> <li>•Processing complexity</li> </ul>			

## Summary

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- Sprinkle sensors/munitions like *glitter*
- Will require multimode solutions - HF, VHF, and UHF/SATCOM tactical networks
- Routing algorithms for 100s of nodes
- Reduced size/power
- Software defined digital radio platforms (JTRS)