



Airborne, Maritime/Fixed Station Joint Tactical Radio System

NPS 6th Annual Research Symposium:
*Networked Warfighter
'A Revolution in Military Affairs'
May 2009*

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Report Documentation Page

*Form Approved
OMB No. 0704-0188*

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1. REPORT DATE MAY 2009	2. REPORT TYPE	3. DATES COVERED 00-00-2009 to 00-00-2009			
4. TITLE AND SUBTITLE Airborne, Maritime/Fixed Station Joint Tactical Radio System		5a. CONTRACT NUMBER			
		5b. GRANT NUMBER			
		5c. PROGRAM ELEMENT NUMBER			
6. AUTHOR(S)		5d. PROJECT NUMBER			
		5e. TASK NUMBER			
		5f. WORK UNIT NUMBER			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School, Airborne, Maritime and Fixed Station Joint Tactical Radio System (AMF JTRS), Monterey, CA, 93943		8. PERFORMING ORGANIZATION REPORT NUMBER			
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSOR/MONITOR'S ACRONYM(S)			
		11. SPONSOR/MONITOR'S REPORT NUMBER(S)			
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES NPS's 6th Annual Acquisition Research Symposium, Monterey CA, 13-14 May 2009					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 18	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			



Agenda



- AMF JTRS: Revolution in Military Affairs
- Making the JTRS RMA a Reality
- Total Systems Integration Realities



Revolution in Military Affairs

‘...a major change in the nature of warfare brought about by the innovative application of new technologies which, combined with dramatic changes in military doctrine and operational and organizational concepts, fundamentally alters the character and conduct of military operations’.

Dr Andrew Marshall
Director of the Office of Net
Assessment



Historical Examples

- Crossbow
- Gunpowder
- Cannon
- Air Power
- Radio
- Networks...

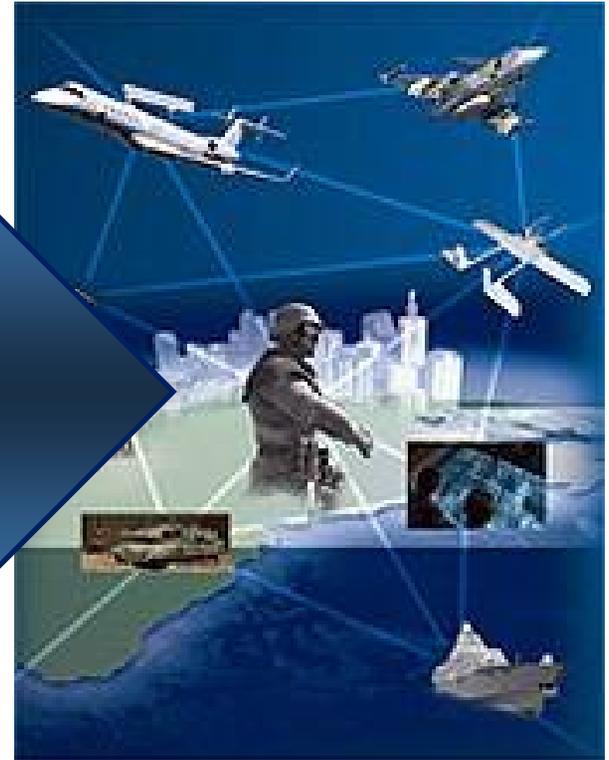
Worst-case scenario is an "RMA breakout" by an adversary!



Revolution in Battlespace Awareness



From This to....



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"It's no use the signal's too weak."



The Revolution in Battlespace Awareness begins with the network-centric enabler (JTRS); NOT another Radio!



AMF JTRS Networked Device: 'Everything is in the Box'

Overview
The Network

a's Largest and wireless
files

AMF
JTRS



Information Capability





AMF JTRS Warfighting Advantage



Opportunity

- The opportunity now exists for our Military to make enormous gains in its ability to share information (extend reach)

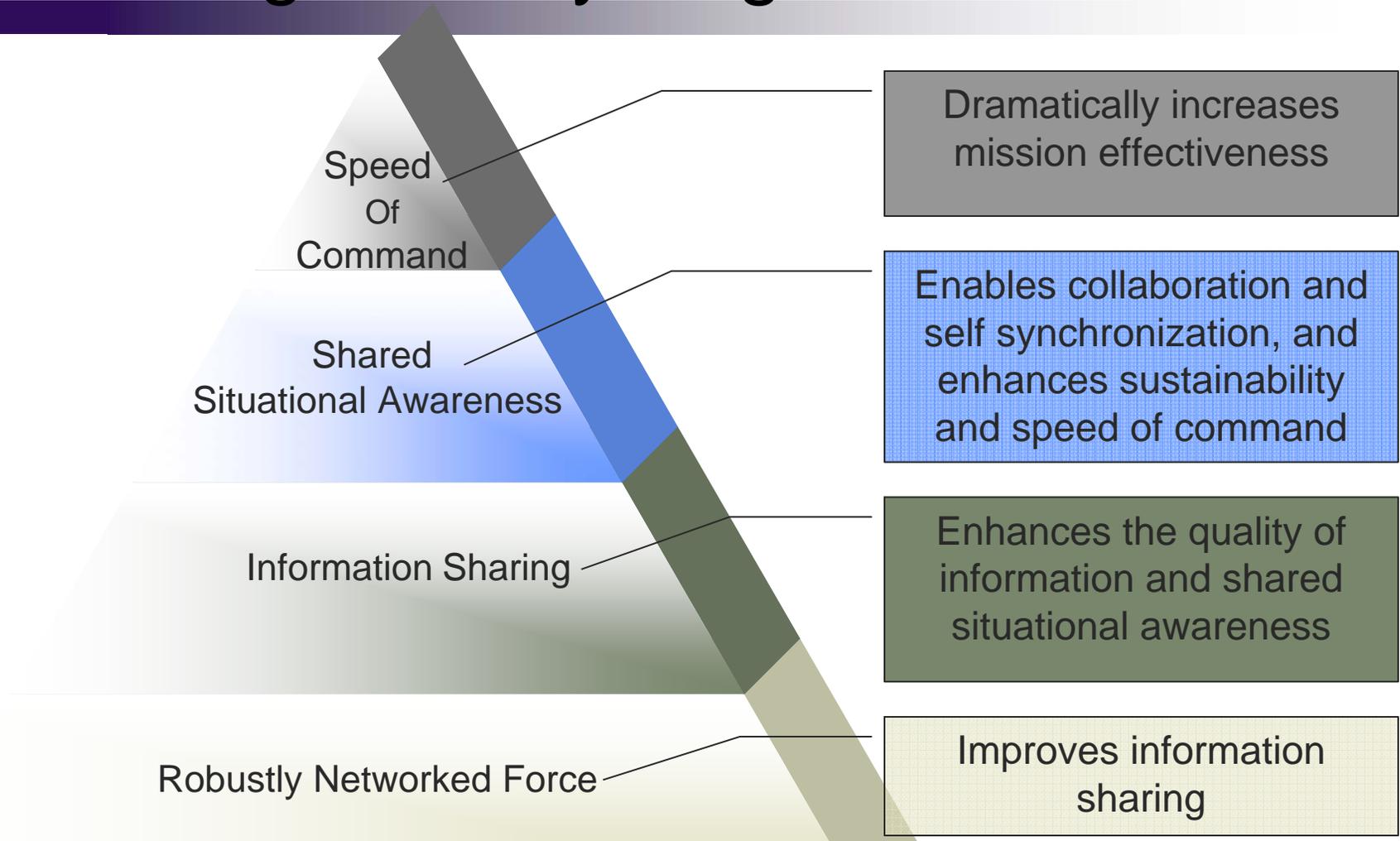


Change

- Changes in the flow of information could be dysfunctional if these changes were not also accompanied by changes to concepts of operation, doctrine, organization, command concepts, training, and other elements of a mission capability package



Networked Warfighting: Changes Everything



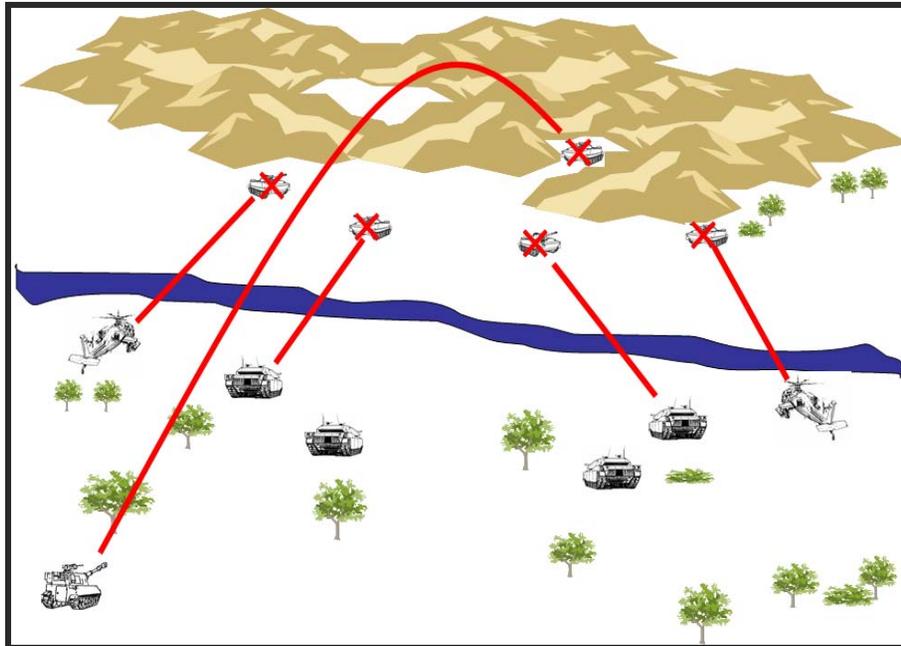
Warfighters will be able to dominate any situation; and day-to-day operations will be optimized with accurate, timely, and secure information



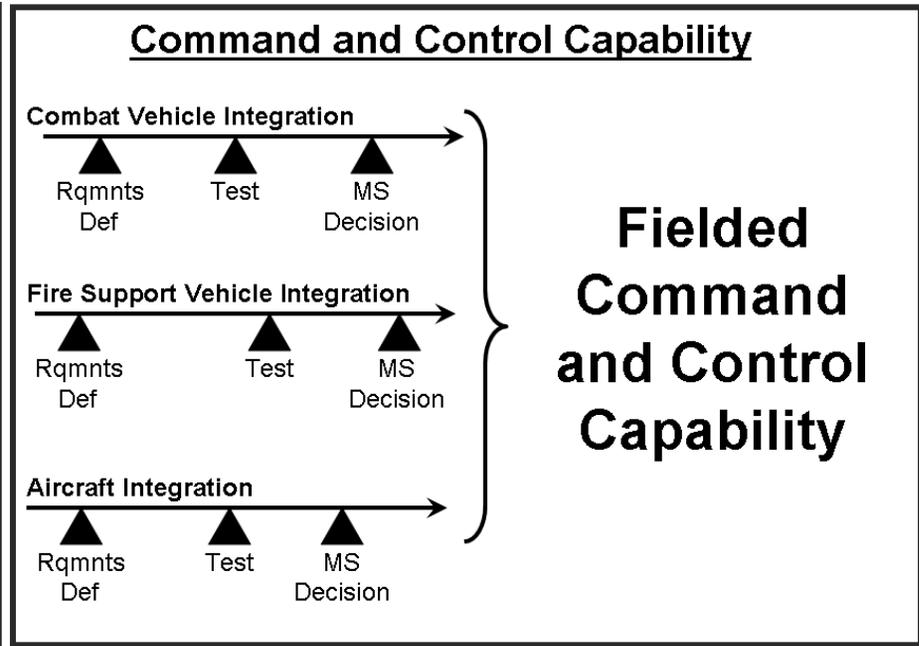
'A Systems of Systems Solution'



Synchronize Acquisition with Warfighter



On the battlefield all components have to function as a cohesive force in order to achieve success



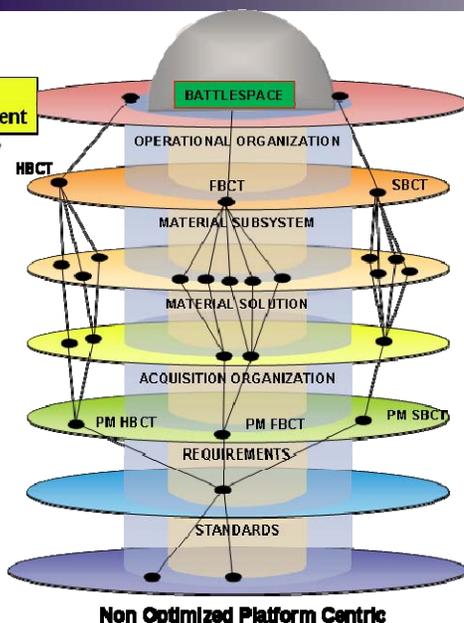
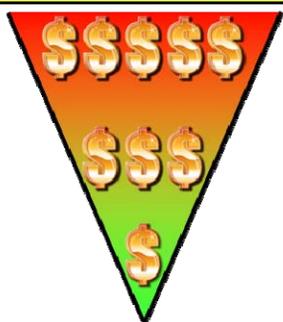
Same is true for the acquisition of a capability. Multiple organizations need to be synchronized in order to achieve success



Capabilities Management Challenge



Increase Cost Due to Multiple Solutions for the Same Requirement

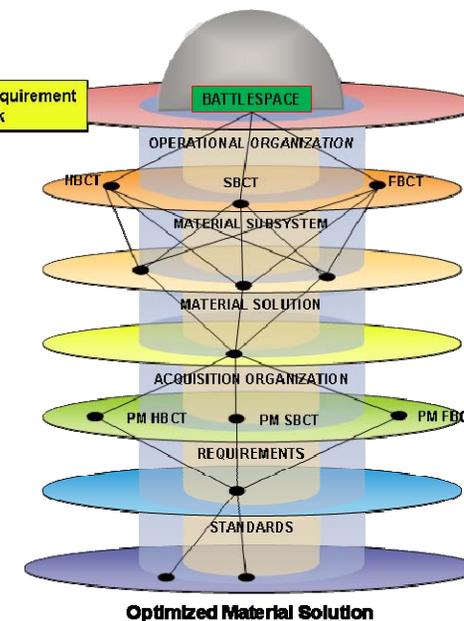


Multiple, independent solutions increasing burden on the unit and impacting overall capability

Optimized Solution for Same Requirement Reduces Cost and Risk

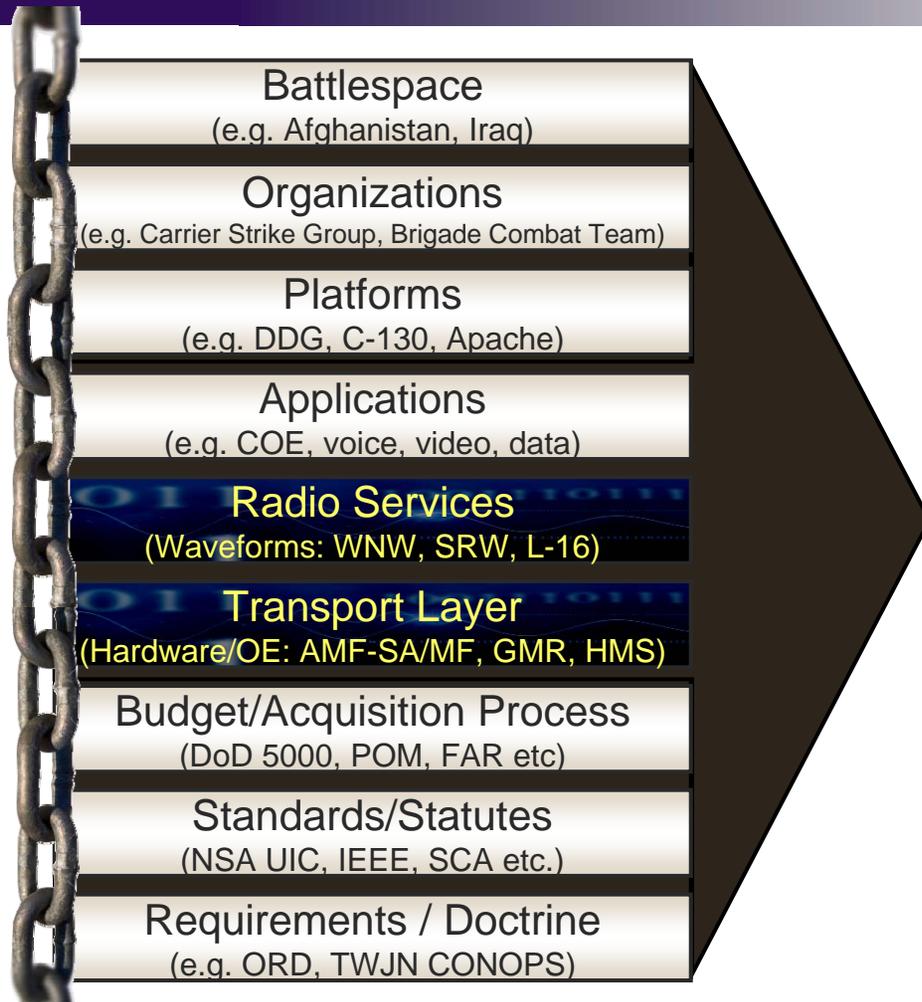


Fewer, well coordinated materiel solutions that are employed consistently across all systems & optimizing overall capability





Networked Dependencies

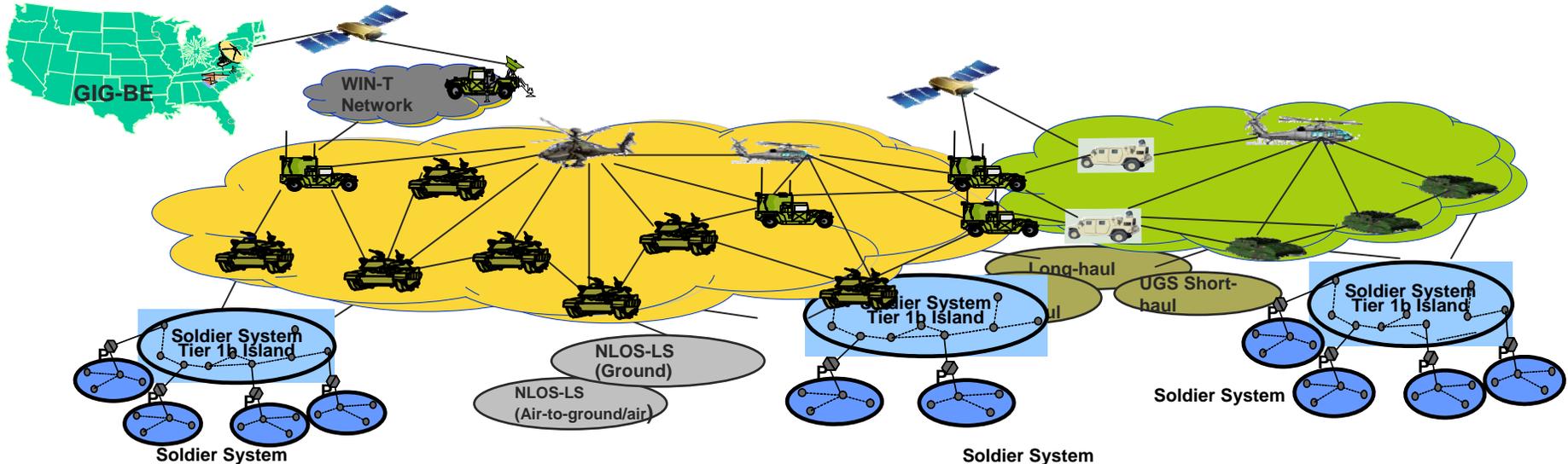


It's not just a radio; it's a synchronized networked capability!

To provide Battlespace networked communications, all layers are interlinked and dependent



WNW and SRW: Components of a Layered Tactical Network

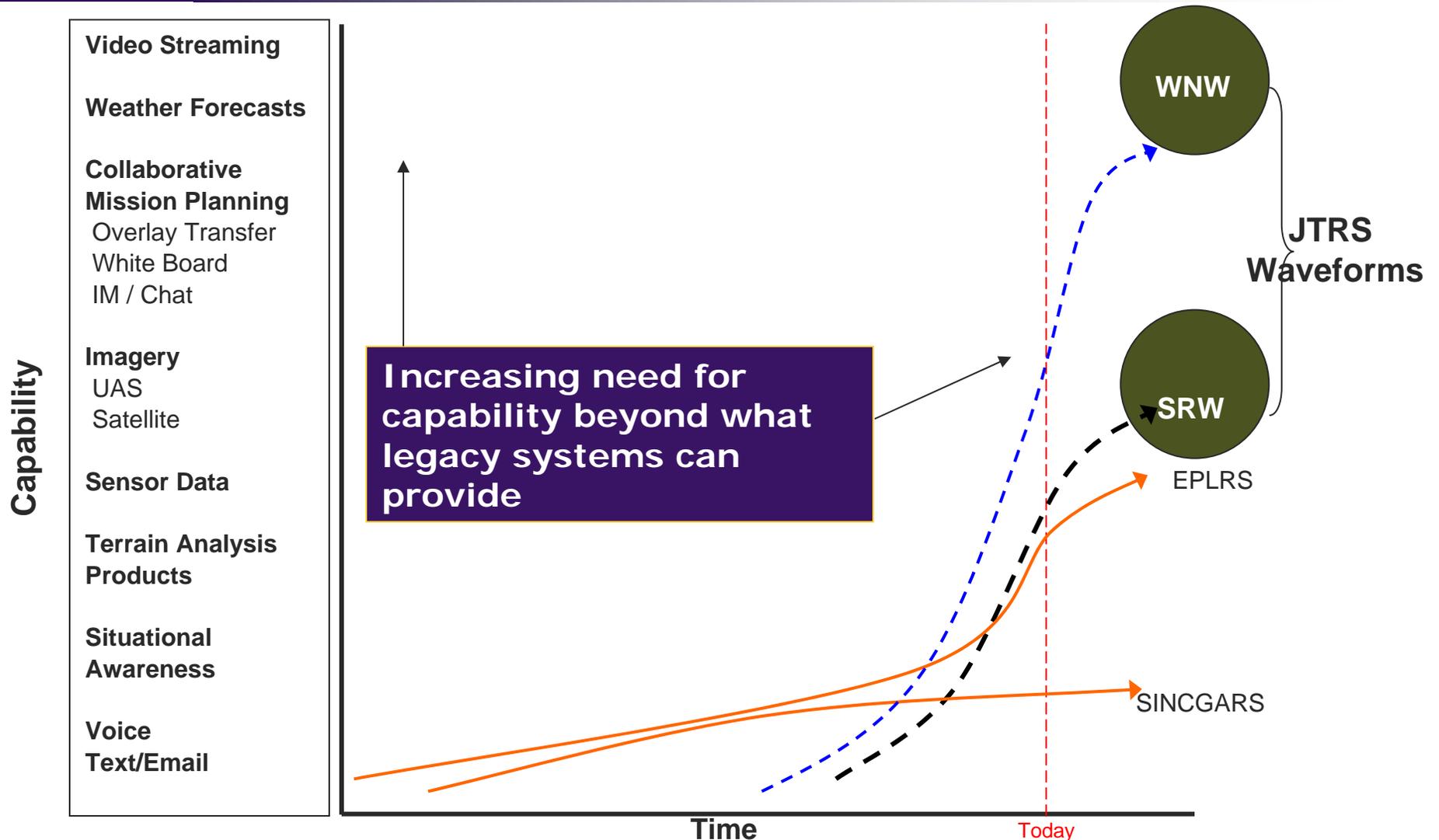


■ **Integrated WNW and SRW Ground Domain network provides the dynamic, scalable, mobile network architecture for tactical network communications**

- **WNW** provides necessary large scale, highly mobile wide area backbone
 - Interconnects SRW stub networks to form integrated ground domain network
 - Dynamic IP routing, IP encryption, IP QoS for GIG interoperability
 - Leverages advantaged nodes to enhance network extensibility and performance
- **SRW** provides critical tactical edge connectivity for the dismounted operator and sensor networks where battery conservation is at a premium
- **JTRS Enterprise Network Manager** provides a single, user-friendly system to plan, monitor and "over-the-air" reconfigure the integrated WNW/SRW



Required Capabilities in an Integrated Net-Centric Environment



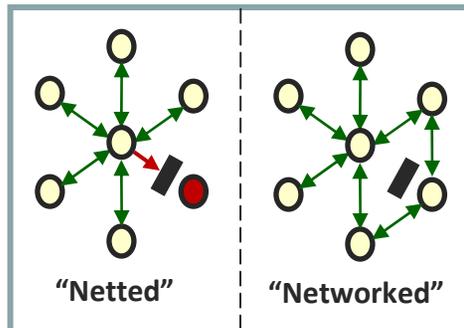


Current vs. JTRS Capabilities

Current	Future
Legacy  "Fixed" Waveform	AMF  "Selectable" Waveforms

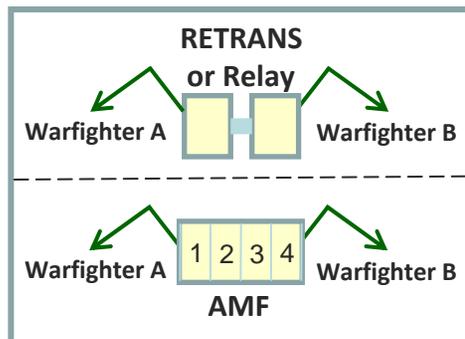
Current radio systems are designed to operate in a specific or "fixed" spectrum / waveform. **Future advancements limited and costly**

AMF can individually "select" the specific spectrum/waveform for each channel → **provides operational flexibility as technology advances**



Communications between current "netted" radio systems are dependent upon line of sight with all stations in a net. **Single point of failure**

In a JTRS "networked" sub-net all stations can communicate as long as there is line of sight to any other station that has line of sight with the source / originating station. → **Information Assurance of delivery**



For current radio systems – two retransmission (RETRANS) or Relay radios are required to connect stations – or - other nets not within line of sight of the originating radio. **Communications are vulnerable to failure**

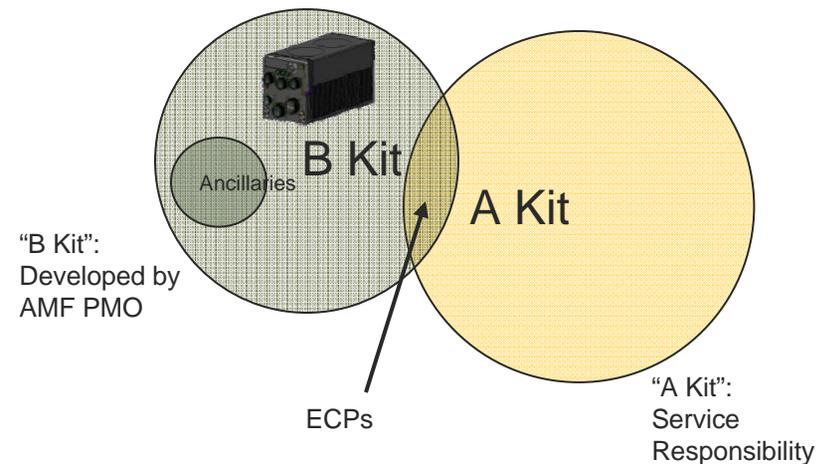
JTRS provides this connectivity between channels internal to the radio system --- connecting different sub-nets or access to higher level networks → **Built in capability**



Composition of Integration Cost (Longbow Apache Example)



TOTAL INTEGRATION COST (Installed Capability Cost)	
Design	Production
<ul style="list-style-type: none">• B-Kit NRE• B-Kit EDM• A-Kit NRE• Platform Integration NRE• Platform Quals & Certs	<ul style="list-style-type: none">• B-Kit Production• A-Kit Production• A & B Kit Installation
<p>Design Integration Costs (R&D) are one-time (per platform type) while "production" integration costs are recurring but typically decrease with time (learning curve)</p>	





Design Integration Costing Methodology



Determining Design Integration Costs (ACTUAL)

$$DTIC_{R\&D} = BKitNRE + \sum_1^n BKitEDM + \sum_1^n AKitNRE + \sum_1^n PlatformIntegrationNRE + \sum_1^n Qual$$

AMF SDD Contract Cost For Each Platform Class (n) EDM cost For Each Platform Class (n) A Kit material cost For Each Platform Class (n) Platform Integration labor cost For Each Platform Class (n) Qual/Cert cost

Data Source **AMF PMO** **AMF PMO/Services** **Services** **Services** **Services**
Funding Source **AMF PMO** **Services** **Services** **Services** **Services**
Cost Category **Design** **Material** **Design** **Design** **Test**

Determining Design Integration Costs (ROM)

$$eDTIC_{R\&D} \approx BKitNRE + \sum_1^n BKitEDM + \sum_1^n (BKitNRE * x_n) + \sum_1^n (BKitNRE * y_n) + \sum_1^n (BKitNRE * z_n)$$

AMF SDD Contract Cost For Each Platform Class (n) EDM cost For Each Platform Class (n) A Kit material cost based upon a historical percentage of the BkitNRE cost For Each Platform Class (n) Platform Integration labor cost based upon a historical percentage of the BkitNRE cost For Each Platform Class (n) Qual/Cert cost based upon a historical percentage of the BkitNRE cost

Data Value **AMF SDD Contract Cost** **AMF SDD Option CLIN And Quantities** **"A Kit" Historical ROM** **"Platform Integration" Historical ROM** **"Qualification" Historical ROM**

$$(x \approx HistoricalAkitNRE \div HistoricalBkitNRE)$$

$$(y \approx HistoricalIntegrationNRE \div HistoricalBkitNRE)$$

$$(z \approx HistoricalQualNRE \div HistoricalBkitNRE)$$

ROM Methodology - Estimate costs as percentage of radio development effort (i.e. BKitNRE)