



# Electronic Proving Ground

The Army's C4I Developmental Tester

## ATEC Industry Days

24 Jun 03

Jim Cole

Over 49 years of C4I  
testing



### Mission Core Competencies

- √ Distributed systems of systems
- √ Network-centric systems
- √ Command & control
- √ Communications & computers
- √ GPS/Navigation
- √ E3
- √ IEW
- √ Info assurance
- √ MANPRINT/RAM
- √ Sensors

Readiness  
Through  
Testing

**MISSION:** Our mission is to support the acquisition process through testing C4ISR systems.

**VISION:** A customer-focused organization that leverages emerging technologies, focusing on adding value, quality, flexibility, and responsiveness in support of DoD C4ISR programs.



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## Topics

FCS networked systems of systems

Required Test Capabilities

Test Planning, Command & Control

Electronic Warfare

Simulation and Stimulation

Digital Data collection, reduction, validation, analysis, and AAR

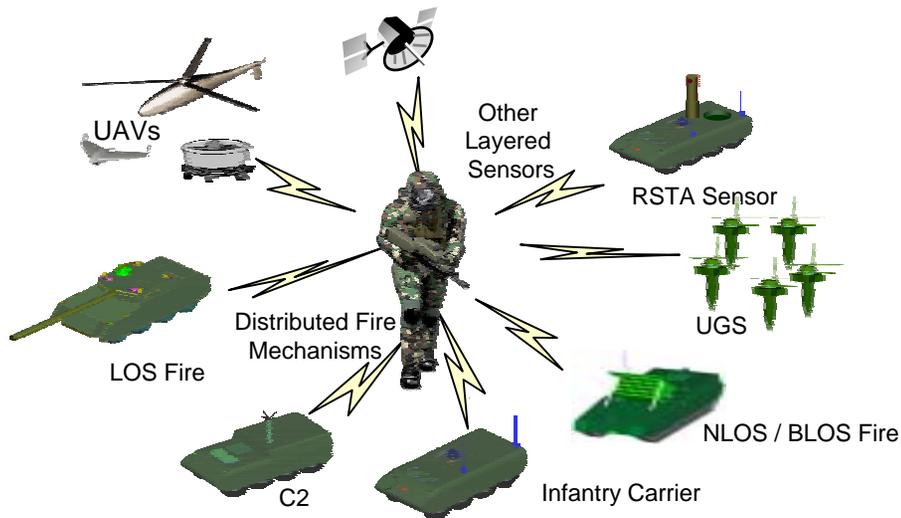
Summary



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## ■ FCS Networked System of Systems (SoS)



### <sup>1</sup> Considerations for Technology

- Command, control, communications
- Continuous situational awareness
- High speed voice and data nodes
- Mission-centric, embedded info system
- Network-centric architecture
- Info-based decision tools
- Top-to-bottom collaborative planning
- Common Operational Picture (COP) tailored to unit task, purpose, and situation
- Flexible/scalable networks
- Mobile & seamless networks
- Advanced waveforms [e.g., Wideband Networking Waveform (WNW)]
- ...

#### Notes

<sup>1</sup>From *Statement of Required Capabilities, Future Combat System of Systems (FCS)*, dtd 02 November 01, & other FCS documents



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## Required Test Capabilities

### Test Planning, Command & Control

- Test planning & control for distributed SoS testing
- System of systems IA approach
- Collect real-time SA of the test battlespace: awareness of the distributed SUT and instrumentation

### Electronic Warfare

- Analysis of intra-vehicular & battlespace electromagnetic environments
- Live and synthetic electronic warfare

### Simulation and Stimulation

- Tactical C4ISR environment for flexible/scalable/seamless networked SoS
- Battlefield stimulation of a wireless, networked, OTM system of systems.
- New FCS message formats, threads, and battlefield scenarios.

### Digital Data collection, reduction, validation, analysis, and AAR

- Information capture over distributed networks
- High bandwidth, wireless data collection
- Data/info analysis: sophisticated, robust data analysis & synthesis; provide real-time reports
- Data concentrators

### System Design Enablers

- Embedded video in instrumentation
- Autonomous agents
- Micro-miniaturization
- Minimally intrusive, low power instrumentation
- High impedance interface to the SUT
- Mass storage devices w/ timing (cigarette-pack size); solid state
- Smart, adaptive antennas



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		FY03	FY04	FY05
<b>SYSTEMS</b>		FBCB2, JTRS Prophet, ABCS JNTC?	FBCB2, JTRS Prophet, ABCS WIN-T SoS S/W Blocking U of A, FCS	WIN-T SoS OPEVAL S/W Blocking FCS, U of A, U of E
<b>C A P A B I L I T Y</b>	<b>D E V E L O P M E N T</b>			
	<u>Instrument</u>			
	<u>Labs &amp; Fac</u>			
	<u>Business Tools</u>			
<b>STRATEGY</b>		C4I Tool Kit TRCS TB GPS TB	C4I TB	Fully Integrated C4I TB



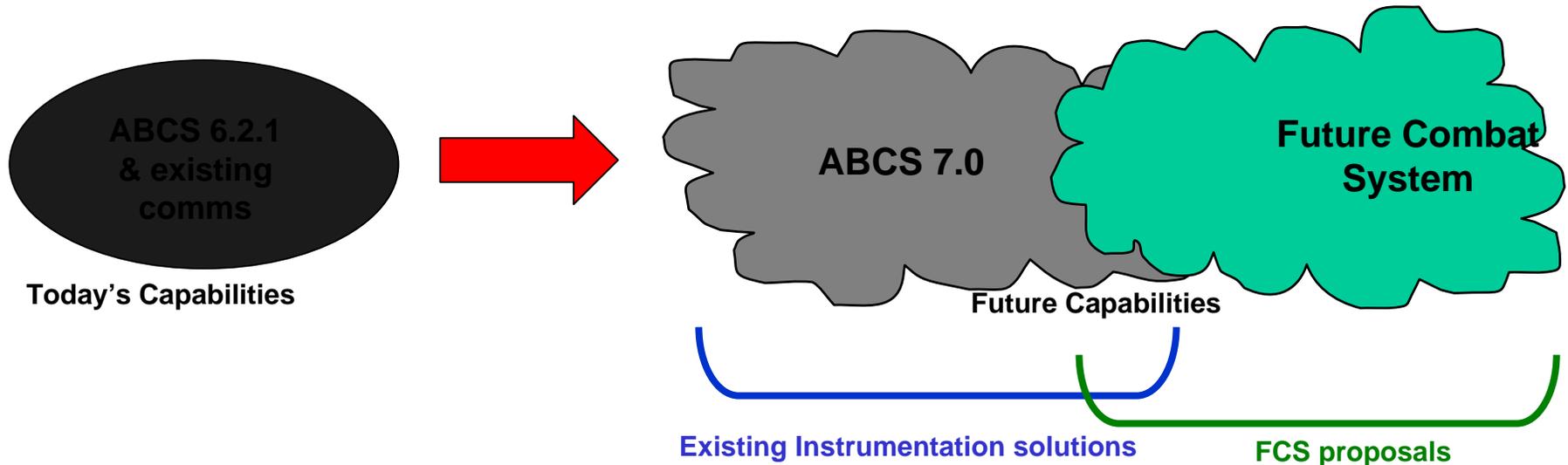
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- Difference between existing instrumentation and future requirements.

**Existing instrumentation** are intended for testing SoS such as Joint Tactical Radio System (JTRS), Warfighter Information Network (WIN), Army Battle Command System (ABCS) version 7.0 systems, and the technology behind those systems

**Future requirements** are for instrumentation enhancements/developments to meet shortfalls not addressed by existing IDAPs and to address new technologies & capabilities within the FCS networked systems of systems. [e.g., ABCS 7.0 will not be part of FCS. It will be replaced by an Army battle command SoS capability more sophisticated and robust than ABCS 7.0]





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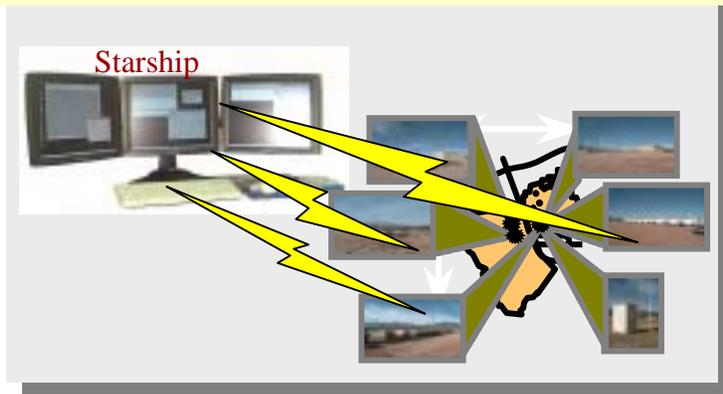
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## Test Planning, Command & Control

### *Graphical test planning for distributed testing*



### *Situational awareness for the tester*



## STARSHIP/STARGEN

**Existing Instrumentation.** An integrated suite of C4I test tools for command and control to support testing of the Objective Force in distributed tests, experiments and demonstrations, and training exercises. This capability must be flexible and robust to support tests either on-site or interactively from a remote site connected by a communications link.

## STARSHIP Objective Force

**Future Capability.** Central node in a flexible/seamless/scalable networked system of systems. Test planning, command, control, and real-time reporting for a wide variety of SUTs and instrumentation. Provide real-time SA of the battlespace for both SoS SUTs and instrumentation. Easily tailorable GUIs per specific test missions. Easily integratable with evolving FCS systems and supporting models and simulations.

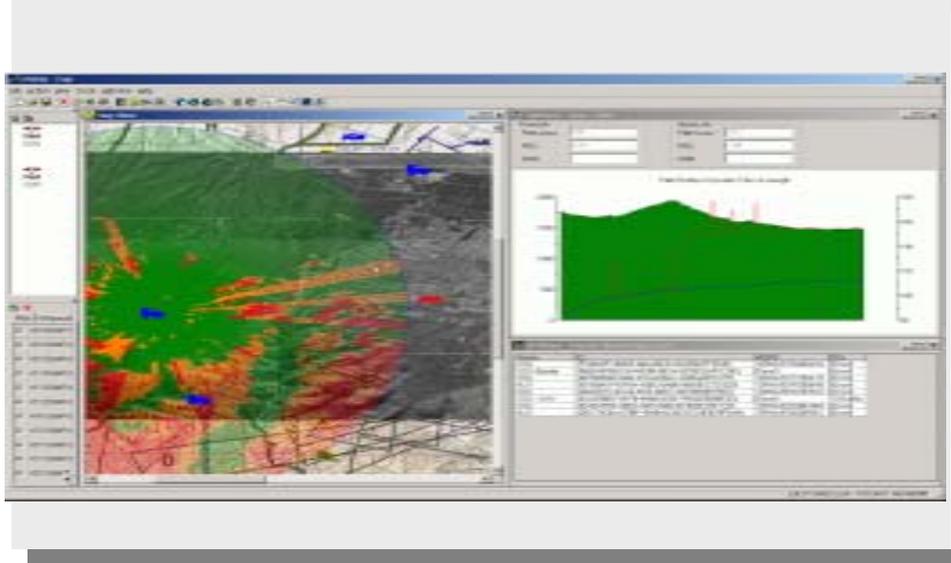


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## Test Planning, Command & Control

### *Suite of electromagnetic engineering tools*



### Orion Objective Force

**Future Capability.** Central node in a flexible/seamless/scalable networked system of systems. Test planning, command, control, and real-time reporting for a wide variety of SUTs and instrumentation. Provide real-time SA of the battlespace for both SoS SUTs and instrumentation. Easily tailorable GUIs per specific test missions. Easily integratable with evolving FCS systems and supporting models and simulations.

### Orion

**Existing Instrumentation.** Orion is a software suite used to assess the ability of Army systems and equipment to operate in their intended electromagnetic environment, including threat forces, and to assess the influence of these electromagnetic environments.

- RF Link Analysis
- Area mode analysis
- Antenna Modeling
- 3D viewing
- Interfaces to external simulations, live players
- Supports DIS and HLA protocols



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## Test Planning, Command & Control

### Future GPS Tracker - Patented

- Will provide economical, real-time visibility of unit & personnel locations for police, firefighters, EMTs, & special forces
- Miniature GPS tracker unit for mounting on vehicle or manpack
  - Self-contained & battery operated
  - Contains GPS receiver & wireless radio for transmitting to base station
- Master controller on the base station displays the position & status of each tracker on a raster graphics map
  - GPS trackers configure automatically on the display when turned on
  - Up to 999 units tracked simultaneously
- GPS tracker technology and base station software are Government owned; the miniaturized version will be Government owned





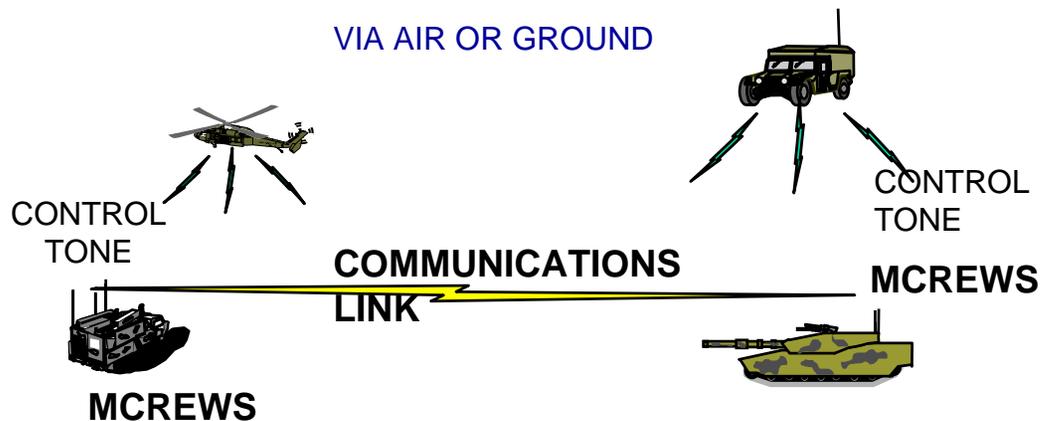
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## Electronic Warfare

### Synthetic Jamming

VIA AIR OR GROUND



### MCREWS

#### Existing Instrumentation.

Capability to provide an electronic attack test environment as required for distributed systems testing, with the systems distributed over a large geographical area. Electronic Attack (EA) emissions must not interfere with electronic transmissions of systems other than those that are intended to be jammed. Augment existing systems (targeting up to 4 victims per EA box) by providing low-cost EA systems to target a single SUT, thereby requiring less components.

### Micro-MCREWS

**Future Capability.** Provide capability for EW scenarios involving an adaptable number of victim SUTs. Incorporate FCS-specific threat waveforms. Capability to provide an adaptable EA suite of tools to support a Multifunctional On-The-Move Secure Adaptive Integrated Communication (MOSAIC) test environment. Employ latest technologies for EA events involving smart, adaptive victim antennas. Employ micro-miniaturization technology to reduce the footprint of the EA systems. Low power consumption. Provide EA scenarios for a wide spectrum of SUT frequencies, including those of GPS/navigation systems.



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## Simulation and Stimulation

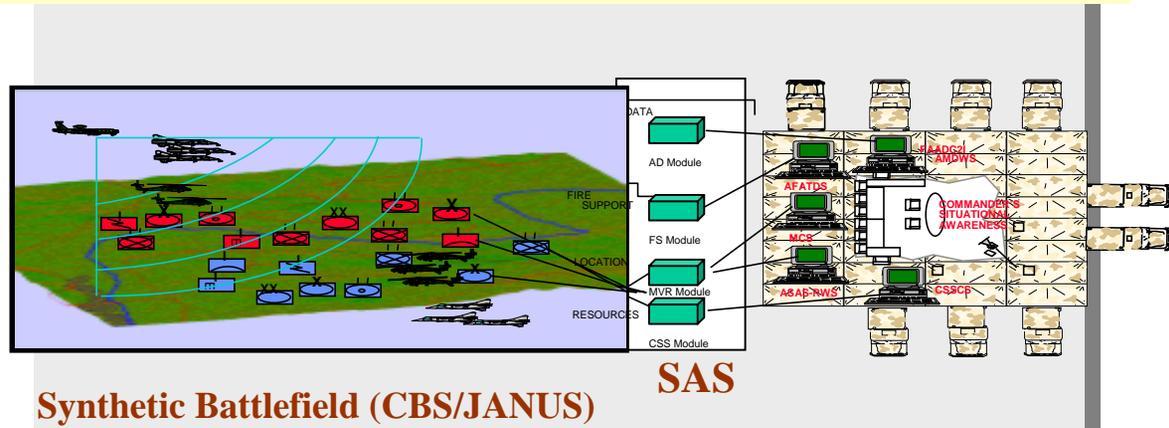
### Simulation Application Suite

**Existing Instrumentation.** Capability to stimulate tactical C4ISR systems for testing by enhancing and expanding an existing technology, the Simulation Application Suite (SAS). SAS translates command and control information generated in the Corps Battle Simulation (CBS) to tactical C4ISR systems. Improvements in SAS are required to affect ease of loading and increase data integrity for simulation and C4ISR tactical systems (Army Battle Command System (ABCS)) databases, expand C4ISR message generation, generate more robust radio communication representations and incorporate the ability to translate information regarding Unmanned Air Vehicle (UAV) tracks from combat simulations representing this other than CBS.

### Future Capability.

Provide a tactical C4ISR environment for a flexible/scalable/seamless networked system of systems. Ability to determine and apply appropriate battlefield stimulation requirements for a wireless, networked, OTM system of systems. Incorporate new FCS message formats, threads, and battlefield scenarios.

### *Simulation driver for C4I systems and operators*





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## ■ Simulation and Stimulation

### Simulation Test Operations

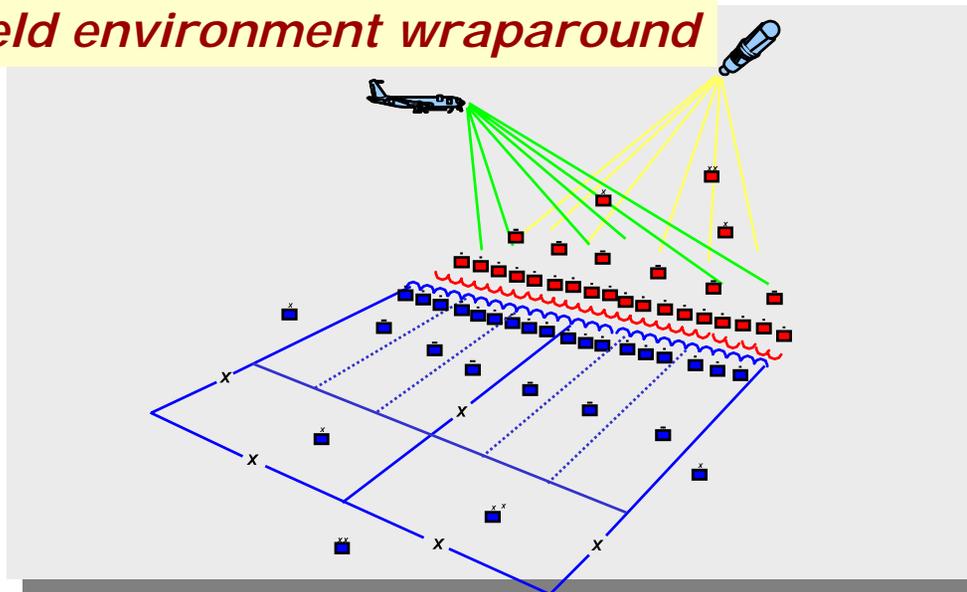
#### Rehearsal Model (STORM)

**Existing Instrumentation.** Simulates FBCB2, ABCS and related systems with JVMF and USMTF message traffic via standard tactical internet radios. Creates situational awareness messaging automatically according to FBCB2 rules. Receives live unit situational awareness messages and processes into simulation display. Uses realistic communications models for pathloss, tactical internet, and GPS. Role Player Work Station (RPWS) - emulates different roles (commander, etc).

#### Future Capability.

Provide instrumentation enhancements/developments to address new messaging traffic within the FCS networked systems of systems. It will be replaced by an Army battle command SoS capability more sophisticated and robust than ABCS 7.0.

### *Battlefield environment wraparound*





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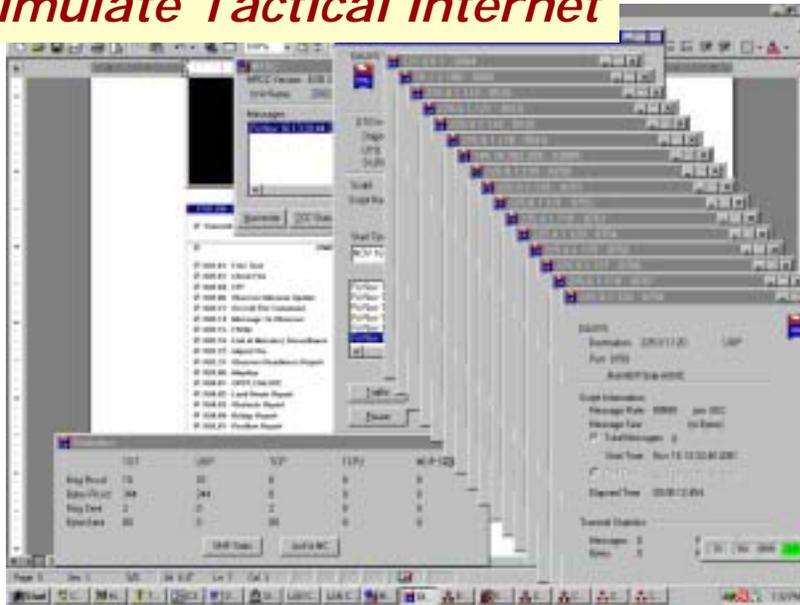
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## ■ Simulation and Stimulation

### Digitized Army USMTF/VMF Stimulator (DAUVS)

**Existing Instrumentation.** Transmit and Receive C2 and SA messages. Send via Unicast (point to point) and Multicast (one to many). Vary Message Rate, Message Type.

### *Stimulate Tactical Internet*



### Future Capability.

Provide instrumentation enhancements/developments to address new messaging traffic within the FCS networked systems of systems. It will be replaced by an Army battle command SoS capability more sophisticated and robust than ABCS 7.0.



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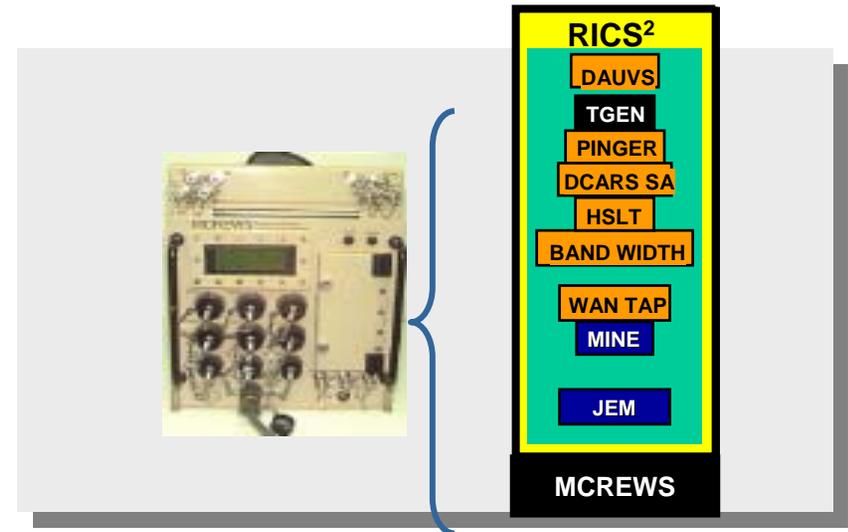
## Digital Data Collection, Reduction, Validation, Analysis & AAR

### Remote Reconfigurable Intelligent Instrumentation to Control, Collect, Simulate and Stimulate [(RICS)2]

#### Existing Instrumentation.

- In-Line Monitoring System [ILMS]
- Pinger
- Digitized Army USMTF/VMF Stimulator [DAUVS]
- Traffic Generator [TGEN]
- Internet Controller (INC) Sniffer
- High Speed LAN Tap [HSLT]
- Bandwidth monitor
- Multiple Inline Network Extractor

### *Integrated suite of test tools*



**Future Capability.** FCS/Objective Force doctrine will yield new message threads and message formats. Instrumentation must be capable of supporting: advanced waveforms, increased WAN traffic, increased data volumes resulting from FCS continuous SA, high speed voice/data/video nodes, adaptable/flexible/seamless networks. Autonomous agents. Where possible, embedded instrumentation.

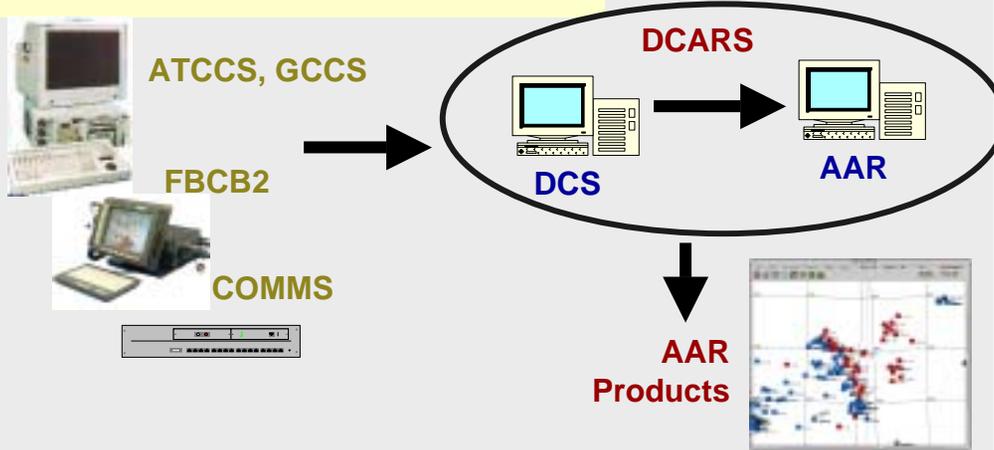


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## Digital Data Collection, Reduction, Validation, Analysis & AAR

### Embedded Instrumentation



## Digital Collection, Analysis & Review System (DCARS)

### Existing Instrumentation.

- Message capture
- Database collection
- Web browsing
- Geographic Information System (GIS)
- Screen capture
- AAR products
- Supports DIS and HLA protocols
- DII COE Compliant

**Future Capability.** FCS/Objective Force doctrine will yield new message threads and message formats. Instrumentation must be capable of supporting: advanced waveforms, increased WAN traffic, increased data volumes resulting from FCS continuous SA, high speed voice/data/video nodes, adaptable/flexible/seamless networks. Autonomous agents. Where possible, embedded instrumentation.



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## Summary

- Over 49 years of C4I testing
- Tools, experience, and knowledge to perform testing in a mobile, networked system of systems environment
- Capabilities uniquely suited to test FCS concepts, development, and SoS events

### Point of Contact

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