FCS (BCT) System-of-Systems Schedule

- SoSCE Update
- Network Update
- Battle Command
  - WMI
  - Mission Planning
  - Sustainment Tools
- SoSCE Update
- Battle Command
- Sensor Mgmt
- Embedded Training
- UGV Family

Spin Out 4

Spin Out 3

Spin Out 2

Spin Out 1

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FCS Brigade Combat Team...
18 Integrated Systems + 1 Network + 1 Soldier

Unmanned Aerial Vehicles
- Class I
- Class II (National)
- Class III (National)
- Class IV

Unmanned Ground Vehicles
- Armed Robotic Vehicle (ARV)
- ARV RSTA
- ARV A (L)
- MULE (Countermine)
- MULE (Transport)
- Small (Manpackable) UGV

Unattended Munitions
- Int式 Munitions Systems

Full Brigade Combat Team... 2014
FCS Layered, Networked Architecture

Command FCS (BCT) system elements are commonly developed to integrate FCS platforms into an integrated system that is geographically dispersed

Battle Command incorporates C2, Intelligence, Surveillance, and Reconnaissance (ISR), Embedded Training, and Sustainment

Net ready information management element of service based architecture

Heterogeneous transport layer enables robustness

Networked battle command, embedded training, and supportability developed Technical View (TV-1) integrated into SoS level TV-1 standards supporting integration

Integrated Architecture Provides Design-Phase Flexibility and Tactical Adaptability For The Networked FCS (BCT)
Recent Significant Events

Class I Flight Test

Autonomous Nav System

MULE

Fire Scout Flight Test

Demonstrations and Technologies On Track
Recent Significant Events

- Integrated Mission Test 0
- JEFX-06
- NLOS-LS Transport
- SUGV
- Stryker Leader / Follower
- 120 MM Cannon

Demonstrations and Technologies On Track
Recent Significant Events

- Active Protection Systems
- SoSIL
- NLOS-C Fabrication
- Unattended Ground Sensor
- NLOS Cannon
- Experiment 1.1 Vehicles

Demonstrations and Technologies On Track
Look Ahead Through 2008

- **Joint Requirements Oversight Council (JROC)**
- **DAB Review**
- **DAB Review (T)**
- **System-of-Systems Preliminary Design Review (SoSPDR)**
- **Spin Out (SO) 1 MS C**

- **Integration Verification (IV) 0 / Integrated Mission Test (IMT)**
- **JEFX 06**
- **Exp 1.1**
- **Lab / Field / Demo**
- **Network Test and Verification**
- **Network Lab Integration and Testing**
- **SO 1 & Current Systems Integration**
- **Container Launch Unit (CLU) Qual Test**
- **PAM Missile Qual Test**
- **EBCT Stand-up**
- **EBCT**

- **EBCT Stand-up**
- **EBCT**

- **IMT**
- **Dry Runs**

- **IMT**
- **LD**
- **LUT**
- **FDTE/PT**
- **SO 1**

- **IMS, NLOS-LS, UGS IQT**
- **Bradley, Abrams, HMMWV Developmental test with A/B kits**
- **Container Launch Unit (CLU) Qual Test**

- **2**
- **2**
- **3**
- **CLU Deliverables**

- **PAM Missile Qual Test**

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How to Get Involved with FCS

FCS External Website

The Future Combat System (FCS) program is an Army transformation initiative designed to link soldiers to a wide range of weapons, sensors, and information systems by means of a mobile ad hoc network architecture that will enable unprecedented levels of joint interoperability, shared situational awareness and the ability to execute highly synchronized mission operations.

The FCS program, considered the core building block of the Army's future force, consists of the following elements:
- The network (information and communications)
- 18 individual combat systems including manned and unmanned systems
- The soldier

Because all of the constituent parts of the FCS program are viewed as systems in themselves -- including the 18 sub-systems, the network itself, and even the individual soldier -- it is commonly referred to as the "18+1+1" system or a "system of systems."

www.boeing.com/fcs
www.army.mil/fcs

Quick Links:
- Partners
- Unsolicited Proposals
- Request for Information Proposal
- FCS Business Opportunities
- Register with FCS

Partner Lists and Website Links

Submission Of Proposals Not Covered By an RFP

Partner Posted Solicitations for Requests for Information

Partners Opportunities, Contacts, Submittal Form, and LSI Technology Areas of Interest

Supplier Registration Form

Supplier Diversity Information and Contacts

Overview of FCS

Illustrates FCS Functionality
Panel Speakers

- COL Michael Williamson
  - Project Manager, FCS Networks Systems Integration

- COL Charles Coutteau
  - Project Manager, FCS Manned Systems Integration

- COL Chris DeLuca
  - Project Director, Spin Outs
NETWORK SYSTEMS INTEGRATION

COL Michael Williamson

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25 October 2006
**FCS Layered Network Architecture**

**Platforms & Sensors**
Suite of ground/air, manned/unmanned platforms, with a diverse set of sensors tailored to the warfighters needs

**Applications**
Battle Command and Control, Intelligence, Surveillance, and Reconnaissance (ISR), Embedded Training, and Sustainment

**Services**
Common toolset of infrastructure services, (i.e. information assurance, interoperability, etc.)

**Transport**
Multi-Tiered (Ground, Air, Space), Dynamic, On the Move Communications Network

**Standards**
Common set of standard to enable interoperability and end-to-end performance metrics
Manned Systems Include Software & Radios

Common – MGV includes:
- SOSCOE
- SU, PPS, BCME, WMIS, L1F, SDM
- Ground Sensors
- NMS
- PS-MRS, LDSS, IETM
- Embedded Training, including ETESS
- MGV Common: Crew Stations, VMS, Core Vetronics, Powertrain, Traction/Suspension, Chassis Aux System, NBC, ECS, Active Protection, Countermeasures, Defensive Armament, Signature Management
- ANS,
- JTRS, MC4

Note: WIN-T = WIN-T PoP (w/HNW)
Unmanned Ground Systems
Include Software & Radios

- Common - UGV includes:
  - SOSCOE
  - BCME, SDM
  - Ground Sensors
  - ETESS
  - NMS
  - JTRS

Note: WIN-T = WIN-T PoP (w/HNW)
Unmanned Air Systems Include Software & Radios

Class IV Mission
- SOSCOE
- NMS
- Air Sensors
- BCME, PPS, SDM, L1F
- PS-MRS
- ETESS
- Class IV Mission
- JTRS
- HNW

Class III (Notional)
- SOSCOE
- NMS
- Air Sensors
- BCME, L1F, PPS, SDM
- PS-MRS
- ETESS
- Class III Mission
- JTRS
- HNW

Class II (Notional)
- SOSCOE
- NMS
- Air Sensors
- BCME, PPS, SDM
- PS-MRS
- ETESS
- Class II Mission
- JTRS

Class I
- SOSCOE
- NMS
- Air Sensors
- BCME, SDM
- PS-MRS
- ETESS
- Class I Mission
- JTRS

Note: WIN-T = WIN-T PoP (w/HNW)
Unattended Munitions Systems
Include Software & Radios

Note: WIN-T = WIN-T PoP (w/HNW)
Warfighter Systems Include Software & Radios

Note: WIN-T = WIN-T PoP (w/HNW)
ISR Key Capabilities and Requirements

- Functional/Operational Capabilities
  - Situation Awareness/Situation Understanding
    - Wide area search of enemy combat systems, personnel and communication signals
    - Air and ground surveillance with aided target detection and distributed fusion
    - Wide sensing coverage through manned, unmanned and unattended sensors
  - Lethality / Support of networked fires
    - Tracking, designation, combat ID and BDA during target engagements
  - Platform/soldier survivability
    - Detection of enemy fires, munitions and sensors
    - Detection and alerts for CBRN threats
  - Assured Mobility
    - Detection of mines, minefields and obstacles
    - Development of terrain features and trafficability measurements

- Key Requirements
  - Detection ranges of key ISR sensors
  - Probability of detection and false alarm rates for AiTR
  - Surveillance Timelines
  - Target Location Errors
  - IED detection
  - Concurrent operational loading of multi-function sensors
  - Operation in hostile environments
  - MTBEFF
  - AUPC
Battle Command
Key Requirements

- Common Look and Feel Warfighter Machine Interface
- Full Control and Autonomy of Organic Sensors and Unmanned Systems
- Automated Deconfliction of Blue Forces, Air/Ground Space, and Fires/Munitions
- Automated Planning and Rehearsal Decision Making Process
- Collaboration Toolset (email, chat, and whiteboard, etc.)
- Multi-Levels of Fusion for Situation Refinement at the Platform
- Distributed Fusion Management

- Decision Aiding Supporting C2 of Multiple Unmanned Airborne, Unattended Sensor and Munitions, and Ground Systems by a WF
- Dynamic Sensor Planning, Tasking and Collection Visualization To Support CCIR
- Rapid Battlefield Damage Assessment Tied to Networked Fires
- Execution Monitoring and Dynamic Plan Adjustment Based on Changes in the Current Situation
- Real-time Assessment and Sharing of Combat Power
SOSCOE Key Requirements

• **SoSCOE Major Integration Capability Requirements**
  – *Transparent* to the user
  – Common software components to integrate FCS Platforms and across FCS System of Systems
  – Enable net-centric integration within the tactical enclave (wireless, adhoc, dynamic network environment)
  – Work with self forming JTRS network transport to allow for “plug and play” battle command integration

• **SOSCOE Feature Requirements**
  – Isolate Battle Command Software from the Details of Interaction of the Ad Hoc, Bandwidth Constrained Network
  – Transform data and messages for Interoperability with Current, Future, and JIM Forces
  – Provides collaboration tools for Battle Command and NCES/GIG Interoperability
  – Build Information Assurance to include DoD PKI into the fabric of applications

Multiple editions allow SOSCOE to meet performance, scalability, portability, composeability, and interoperability requirements
Transport Layer Key Requirements

- Transport Technical Requirements
  - Utilize JTRS and WIN-T
  - Provide secure communications
  - Connectivity over a 150kmx150km Area of Operations
  - Connect individual soldiers, manned ground vehicles, unmanned ground and air vehicles into the network
  - Operate in an ad-hoc, on the move environment
  - Connect the BCT to higher echelons and the GiG
Applying Lessons Learned Across All Layers

- Counter IED Systems Integration
  - All FCS MGVs will have the Latest in Counter-IED (Jammer) Technology

- Customizable presentation of data through CPOF
  - FCS Warfighter machine interface extending the flexibility of the CPOF presentation for the commander

- Collaboration – a killer “app” from OIF
  - FCS will push capability further down in echelons (i.e. soldiers outside the command post)
  - SOSCOE services will help enable this capability

- Commander’s OTM Transport
  - FCS will extend mobility to the individual platform across the Brigade
  - Also introducing high data rate at the quick halt capabilities to enhance performance across the full spectrum of operations
  - Everything over IP (EoIP)
  - FCS will converge to a pure IP based architecture conforming to DoD standards
Important “Take-Aways”

• FCS will move the Army towards a Network-Centric environment that provides information on demand to:
  • Warfighters
  • Decision Makers
  • Supporting Establishment
• FCS is being developed as an integrated Network capability at all layers
  • The network must be viewed as more than the “Transport”
• FCS Spinouts will provide early introduction of technology to the Current Force

FCS is building the future force while enhancing the current force
MANNED SYSTEMS INTEGRATION

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MGV Platform Overview

**Mounted Combat System**
- Provides LOS & BLOS offensive fire capability
- 120mm LW XM360 Cannon

**Infantry Carrier Vehicle**
- Carries 2 Common Crew + 9 member Infantry Squad
- Provides Infantry Direct Fires Support with Mk44 30mm and M240C 7.62mm Coax

**Non Line of Sight – Mortar**
- Close support of tactical maneuver
- 120mm breech-loaded mortar

**Reconnaissance Surveillance Vehicle**
- Primary manned scout platform
- 5m Masted sensor suite
- 2 Common Crew plus 4 Scouts with two Mission Workstations
- Mk44 Weapon System with M240C Secondary

MGVs Represent 322 Nodes on the FCS Network

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MGV Platform Overview Cont’d

**Command & Control Vehicle**
- Provides command & control to the FCS BCT
- Two-Man Crew and Four-Man Mission

**Medical Vehicle - Evacuation**
- Evacuates up to 4 litters or 6 ambulatory casualties
- On board medical equipment and space for medics to perform En Route Care and advanced trauma

**Medical Vehicle - Treatment**
- Provides Advance Trauma Medicine and Advanced Trauma Life Support
- Full body access treatment table, quick erect shelter, blood refrigeration, 3D Ultrasound

**Non Line of Sight – Cannon**
- Provides mid-to-long range indirect fires support to the FCS BCT
- 155 mm Caliber 38 Cannon

**FCS Recovery & Maintenance Vehicle**
- Primary recovery and maintenance vehicle
- Up-righting, Winching and Towing
- Recovery of disabled vehicle crew
Common MGV Subsystems

- Hybrid Electric Drive (HED)
  - Propulsion Engine
  - Li Ion Batteries Traction Drive System

- Hit Avoidance System (HAS)
- Active Protection System (APS) / Countermeasures (CM)

- Core Vetronics / Crew Stations

- Auxiliary Systems-Fuel / Automatic Fire Extinguisher System (AFES)

- Nuclear Biological Chemical (NBC) / Environmental Control System (ECS)

- Defensive Armament System (DAS)

- Armored/A + B

- Structures Upper / Lower Hull

- Suspension-Hydro-pneumatic Suspension Unit (HSU) Band Track

- Externally Mounted Close Combat Armament System

- 5L Common Engine

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Platform Collected Data Shared by All via the Network

M1 Abrams Solder-Machine Interface

FCS Warfighter-Machine Interface (C2V Example)

Current Force Platform Sensor Data is available to the Local Commander and Crew

FCS Sensor Data from all MGV (and other) platforms is available to the Entire BCT
Distributed Approach to Collaboration

Joint Collaboration Services
- Email
- Shared Whiteboard
- Shared Application Collaboration System
- Audio and Video
- Streaming Information Sharing
- Web
- Instant Messaging

FCS BCT Collaboration
- Sharing of Planning Products
- Text-based Chat
- Presentation Sharing
- Whiteboard
- File Transfer
- Session Archival
- Map-based Collaboration
- Voice and Data Communication

Applications
- Warfighter Machine Interface to Chat, Email, and Whiteboard services
- Real-time Application Sharing
- File Transfer
- Session Archival
- Map-Based Collaboration

Services
- Chat, Email, Whiteboard services
- Infrastructure for collaboration in a mobile ad-hoc wireless environment
- FCS – NCES/GIG Interoperability

Transport
- Network Management
- Voice, Data, and Video

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Platform Sustainment Enablers

- Networked sustainment enablers integrated into each MGV platform

- Platform Soldier-Mission Readiness System (PS-MRS)
  - Integrate logistics into the network centric battlefield model: functional availability, physical availability, mission readiness
  - Enable 2 level maintenance concept

- Logistics Decision Support System (LDSS)
  - Logistics Planning and Management
  - Decision Support for Sustainment/Combat Replenishment Operations
  - In-Transit Visibility of Supplies
  - Enables Automated Resupply and Maintenance Planning

Embedded Platform-Level Supportability Functions
Platform Embedded Training

- MGV Platforms will embed training enablers
  - Training is a platform ‘mode’ that is part of our architecture
  - Platform workstations and “network” access enable individual, crew, and distributed collective training
  - Support live, virtual and constructive training
  - Reach-back connectivity to “knowledge repositories”

- Training Support Packages
  - Level V interactive electronic technical manuals
  - Simulation-based training support packages
  - Interactive multimedia instruction

- Enablers include
  - Environmental representations (i.e. terrain, weather)
  - Computer generated forces provide external entities necessary to training tasks (i.e. targets, dismounted soldiers)
  - Transport layer components
Summary

- Each MGV platform is a node on the network

- Common Network architecture and components embedded in all FCS Manned Ground Vehicles

- Common look and feel Warfighter Machine Interface
SPIN OUTS

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FCS Brigade Combat Team...
18 Integrated Systems + 1 Network + 1 Soldier

Unmanned Aerial Vehicles

Unmanned Ground Vehicles

Full Brigade Combat Team... 2014
Spin Out 1 Operational Architecture

- Abrams, Bradley, and HMMWV with FCS Network B-Kit have same capabilities and all three systems can control U-UGS, T-UGS and IMS.
- The FCS Network B-Kit is installed on Abrams, Bradley and HMMWV brigade, battalion, company commander and platoon leader vehicles.

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Operational Capabilities

- Enhanced tactical bandwidth
- Initial Network Lethality via NLOS LS and IMS
- Local Surveillance/Target Cueing via UGS
- Enhanced Red & Blue SA exchanged with FBCB2
- UGS/IMS C2 & Level 1 Sensor Data Fusion
- Initial Network Protection
- Initial Foundation for Networked Fires & SA Interoperability
- Improved Force Protection via IMS

Technical Capabilities

- U-UGS
  - B-kitted Vehicles: M2A3, M1A2 SEP, HMMWV
- T-UGS
- NLOS-LS
- IMS

- FCS BC B1F with Basic Control for UGS, IMS
- FCS BC B1F with Basic Network Planning for UGS, IMS
- Integration and Fusion of UGS/IMS Data (L1F/BSO)
- NLOS-LS controlled via AFATDS

Applications

- XWindows Display on FBCB2

- SOSCOE Build 1.8 (3 Editions, Real Time, Std. Edition, Micro)
  - Interop Services
  - Identification and Authentication, Event Logging, Basic Role Based Access Control
  - Services: 13 for Std. Edition, 7 for Real Time, 6 for Micro

- ABCS 6.4 Software Block 2 Services

- Pre – EDM GMR: EPLRS, SINCGARS (voice) SLICE 2.1, WNW 2.0
- Pre- EDM HMS SFF-H, EDM HMS SFF-A: SLICE 2.1(UHF)
- MSRT: SLICE 2.1 (UHF Band)
- SCRS: SLICE 2.1 (L-Band)
- Zigbee
- ICS Type VI

Standards

- VMF - Variable Message Format
- IPV4 - Internet Protocol version 4
- XML - Extensible Markup Language
Spin Out 1 Systems/Products for FY 08 Testing

Abrams
SINCGARS
SLICE 2.1

Bradley
SINCGARS
SLICE 2.1

HMMWV
SINCGARS
SLICE 2.1

Control Cell
NLOS-LS control cell W/SCRS/SINCGARS, AFATDS, EPLRS, FBCB2, SKL, DAGR

ISR node x 8
Gateway x 2

Zigbee

EO node x 2
RN node x 1

Tactical-UGS
6 for Test/4 Spares

Urban-UGS
12 for Test/4 Spares

Urban-UGS
12 for Test/4 Spares

Dispensing module
Intelligent Munitions System (IMS)
7 for Test/3 Spares

Urban-UGS
12 for Test/4 Spares

Zigbee

15 Missile Trainers and 1 container/launch Unit per system

Non Line Of Sight – Launch System (NLOS-LS)
6 for Test/1 Spares

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Spin Out 1 Systems and Capabilities

**JTRS GMR Radio Hosting FCS Software (SINCGARS/EPLRS/SRW/WNW)**
- RF amplifiers and antennas for CF vehicles incl. co-site mitigation for FCS network components
- Interoperate in Current Force EPLRS and SINCGARS network
- Manage Red/Black side of JTRS (SRW, WNW)

**Integrated Computer System (ICS) – Type VI**
- Networked thru JTRS CL1
- EPLRS Form Factor w/integrated platform LAN router
- Remote & local zeroization of stored data
- Provide firewall between future network and current network
- Leverages Existing FBCB2 monitor for display of FCS BC Applications (IMS and UGS Control)
- Software:
  - SOSCOE v1.8
  - Level 1 interoperability services to: FBCB2 & AFATDS
  - Battle Command Software
  - SDM, L1F & C2 for U-UGS, T-UGS & IMS
  - SOSCOE interoperability services send Fused Sensor data to FBCB2 application for Situational Understanding/COP Display
  - Network Management System - Manage FCS computer/network
  - Partial identification of Battle Space Objects
  - Controls IMS arming, disarming & exchange of control with IMS controller

**NLOS-LS**
- CLU and PAMs
- Transported on FMTV
- JTRS HMS
- Ground launched or fired from FMTV
- Managed/networked via AFATDS between FDC & NLOS-LS CLU
- Secondary control via PDA
- Software Description: SOSCOE 1.8
Spin Out 1 Systems and Capabilities

IMS w/JTRS HMS
- Hand emplacement of dispenser
- Dismounted control of IMS in addition to platform control of IMS
- Anti-personnel & anti-vehicle lethality
- Operate in an unattended, unclassified environment for 30 days
- IMS Components have capability to self map, self destruct/deactivate

U-UGS
- Hand emplaced
- Intrusion Detection and Imaging Nodes
- Tamper detection
- Software:
  - Gateways include SOSCOE Micro Edition

T-UGS
- Hand emplaced
- Acoustic/Magnetic/Seismic sensing, EO Sensor, Radiation/Nuclear sensing
- Tamper detection
- Software:
  - Gateways include SOSCOE Micro Edition

JTRS HMS
- Various Small Form Fit (SFF) configurations
- Using Soldier Radio Waveform (SRW) as the primary transport waveform
- Effort on-going to accelerate hardware deliveries to support SO-1 for UGS, IMS and NLOS-LS
- Gateway to GMR radios at the vehicular platforms
Current Force Platform Integration

Bradley

HMMWV

Abrams

ICS Type VI

Processor Modules

Security Components

Data Storage Modules

Switch Modules

OS & OS-E

Control IMS/UGS

ABCS Interoperability

EPLRS/ SINCgars/ WNW/SRW

FBCB2

Leveraging FBCB2 Keyboard & Display

Interface to the Tactical Internet

JTRS GMRS

Power Amps

Power Amps

Local Control Display Device

COSITE Group

Antennas

Diplexers (Filter Assembly)

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We Look Forward to Your Questions

25 October 2006