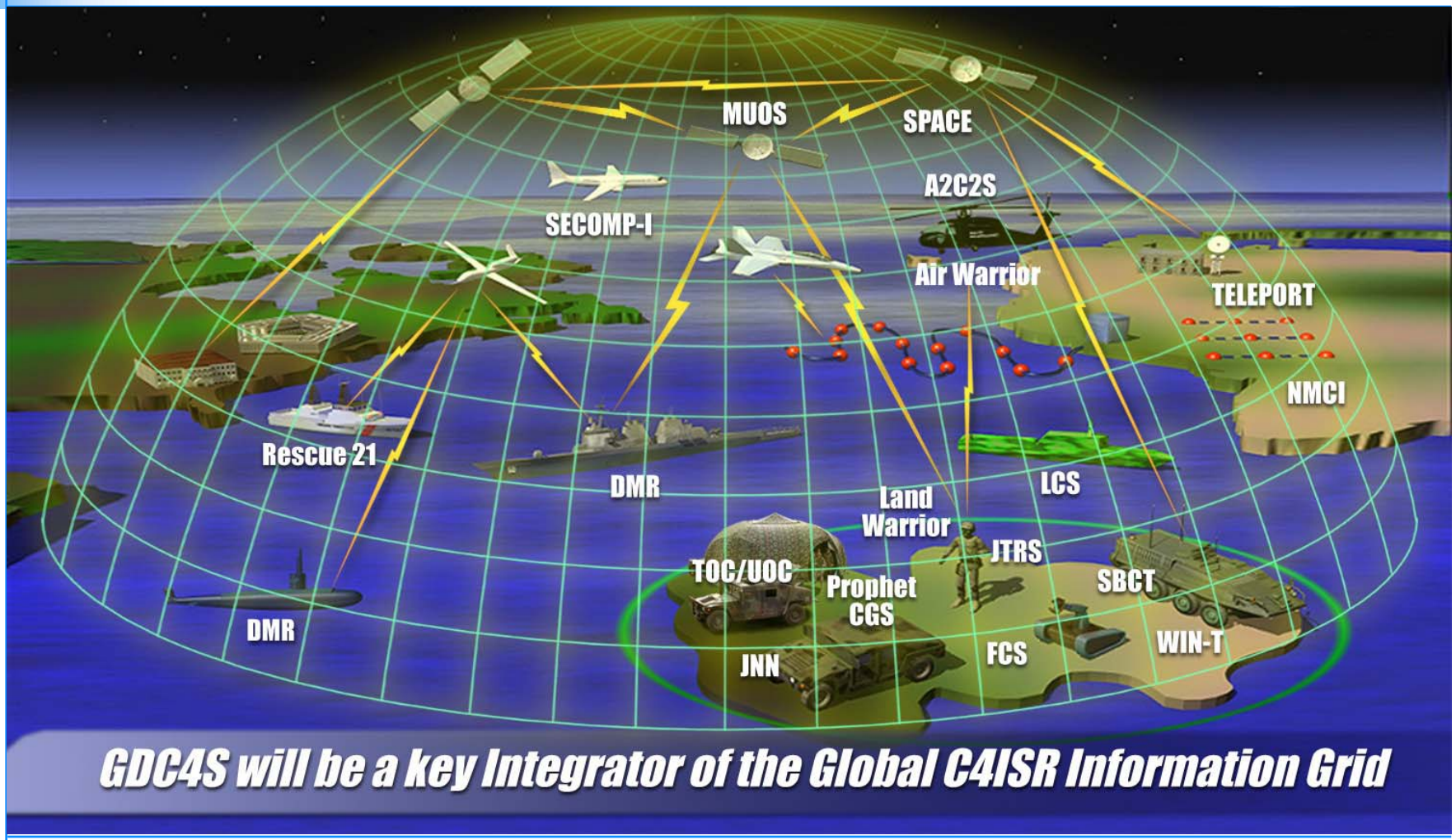
GENERAL DYNAMICS
C4 Systems

Analysis and approach for Army Interoperability

Patrick A. Vessels
Director, Strategic Technologies
General Dynamics C4 Systems
Battle Management Systems Division

Seamless C4ISR - Core to Edge



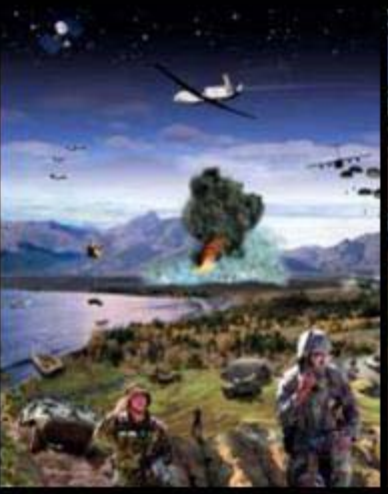
Communications and Networking

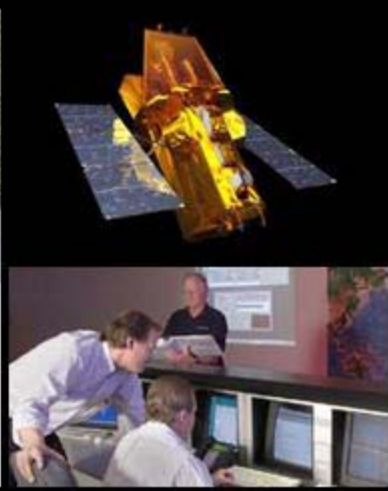
Information Assurance

Command and Control

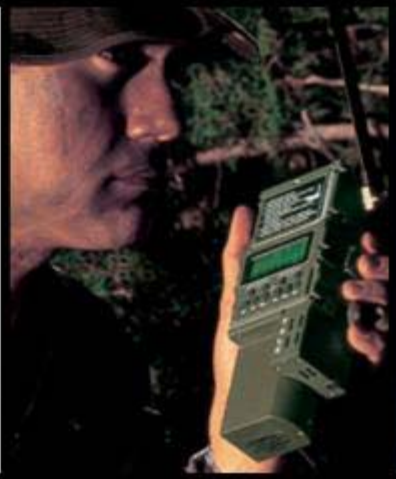
Intelligence, Surveillance, Reconnaissance (ISR)

Space Systems and Services





GENERAL DYNAMICS
C4 Systems



Ruggedized Computing and Displays

Platform Integration

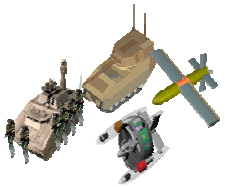
Ground-Based Satellite and Wireless Communication Products

RF Networking

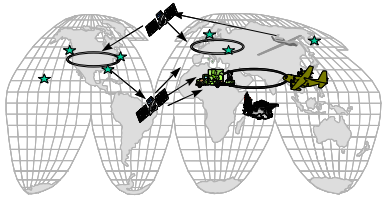
Homeland Security

Key Architectures in the Army

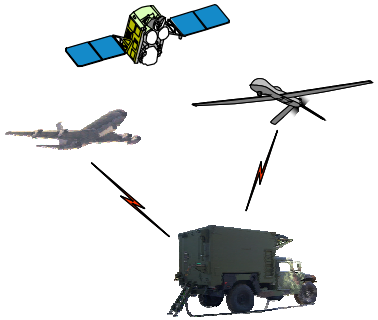
- System of Systems Common Operating Environment (SoSCOE)
- Army Battle Command Systems 6.4
- Distributed Common Ground System – Army
- Network Centric Enterprise Services
- Land Warrior/Future Force Warrior



FCS/SoSCOE



NCES/JC2

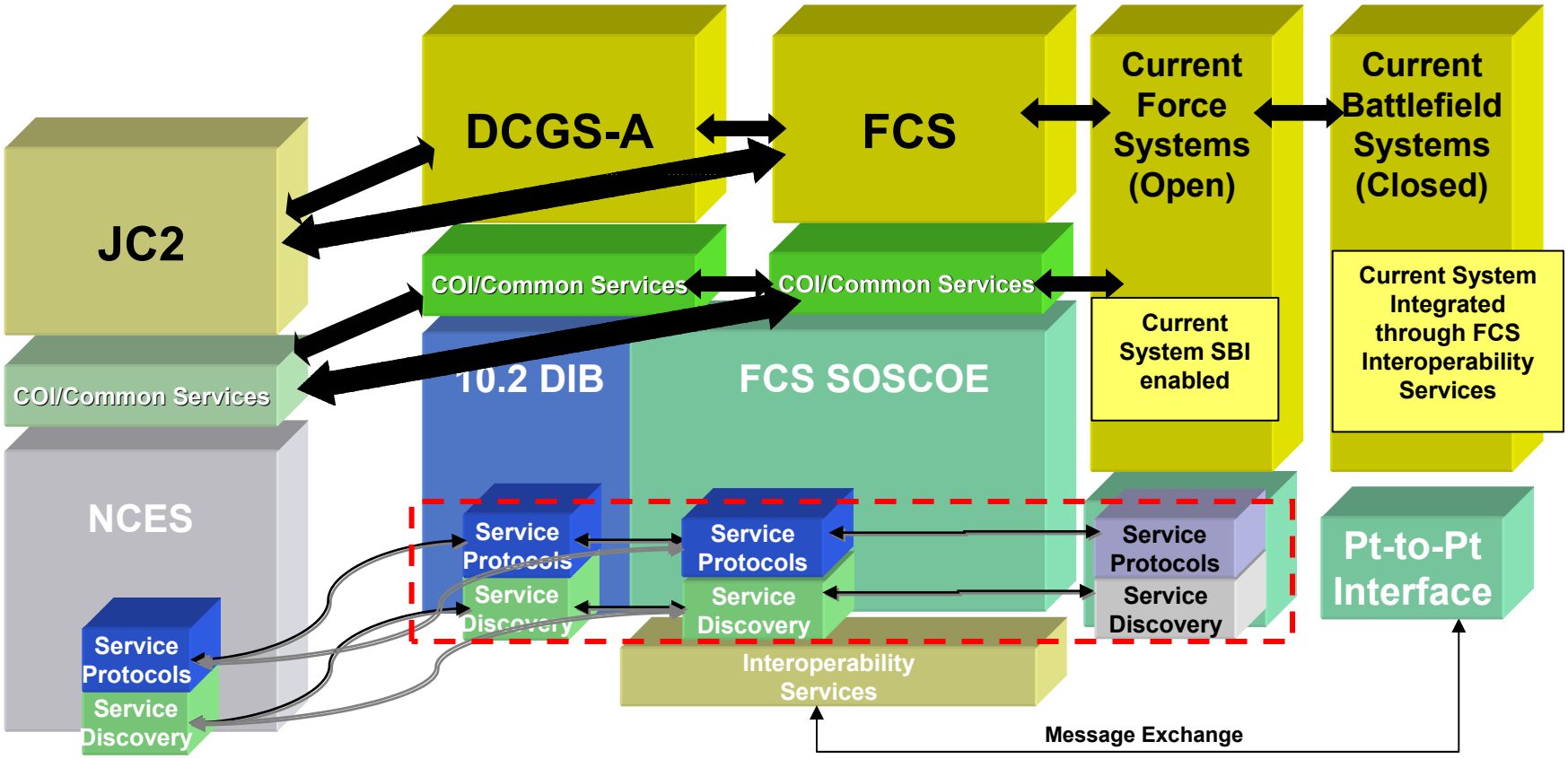


DCGS-Army

Land Warrior/
Future Force Warrior

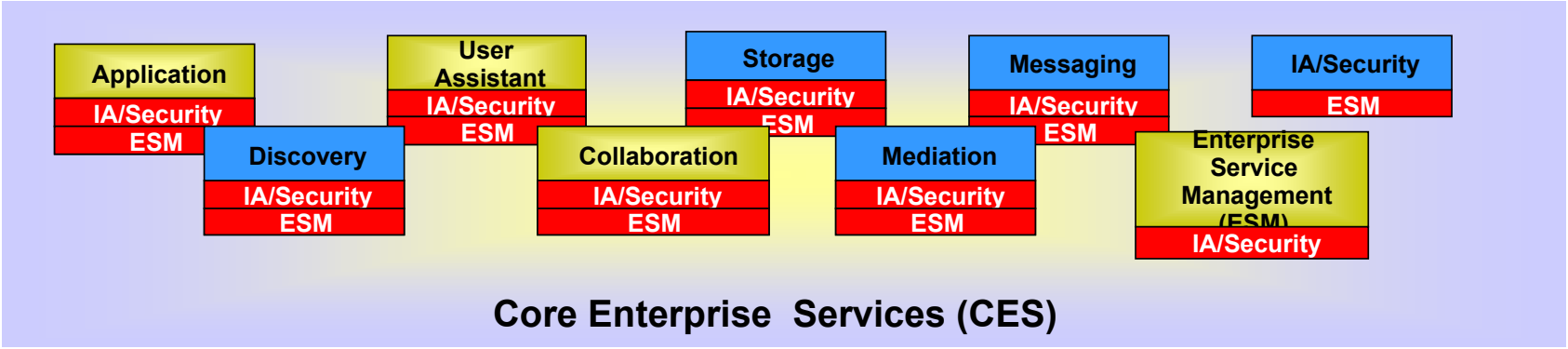
ABCS 6.4+

FCS Interoperability Approach



Analysis: SoSCOE & NCES Interop

- Key communications and protocol level interoperability provided by Interoperability Service of SOSCOE
- Mission Performance and QoS drives interactions with all CES but the key drivers are highlighted in blue



= required interoperability with SoSCOE

Interoperability Focus Areas

- **Presentation**
  - Integration into presentation layers
- **Workflows**
  - Workflow Model
- **Services**
  - Service Model
- **Data**
  - Models
  - Storage
- **Communications**
  - Connectivity
  - Discovery
  - Communications
  - Security
  - Network Impacts

Our primary focus is here.

What are each supporting?

Aspect	NCES	SoSCOE
Focus	DoD Enterprise	Army Tactical C2
C2ISR	Yes	Yes
Security	Primarily Intra Enclave Security	Primarily Intra Enclave Security
Real Time, Safety Critical Weapons	No	Yes
Portability	Important. Very Java centric	Primarily C++, Difficult portability Environment
Scalability / Availability	Designed to provide highly available services to many users	Decentralized, autonomous operations in many vehicles. Scale by adding vehicles
Performance/QOS	Focused on QoS at a location (i.e. guaranteed video)	Focused on sending most relevant data over limited bandwidth
SBA Focus	Open/COTS Based SBA – Web Enabled, Web Service Enabled, Published Metadata	Custom Developed SBA – Custom discovery, transport, dissemination, workflows, etc.

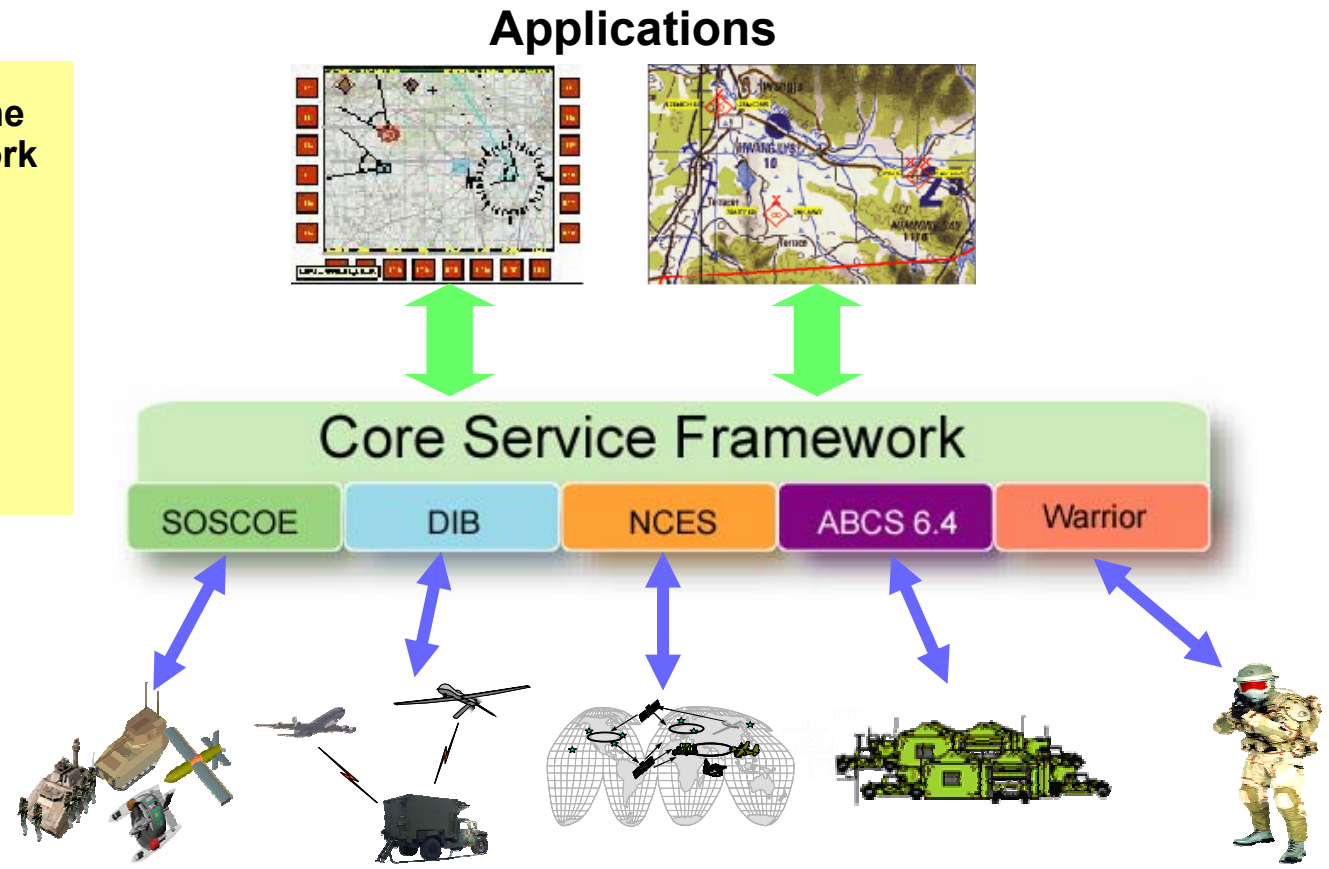
NCES/SOSCOE Interoperability Issues

#	Area	Issues
1	Discovery	Different discovery metadata and mechanisms prevent service discovery.
2	Encryption	Different encryption prevents service interoperability.
3	Identity / RBAC	Different identity and RBAC schemes prevent authentication / authorization.
4	Workflow	Different workflow models prevent workflows of services from NCES and SOSCOE.
5	Transport	Different transport mechanisms prevent service interoperability.
6	Interface Lang	Different service interface languages prevent service communication.
7	Metadata	Different languages for data and lack of SOSCOE metadata prevents data interoperability.
8	Data Models	Different data models require translators for interoperability.
9	Network Protocols	Non-standard SOSCOE network protocols prevent email, chat, and collaboration interoperability.
10	QoS	Compliance to the WIN-T / JTRS QoS scheme by FCS and non-FCS systems is required for effective bandwidth utilization.

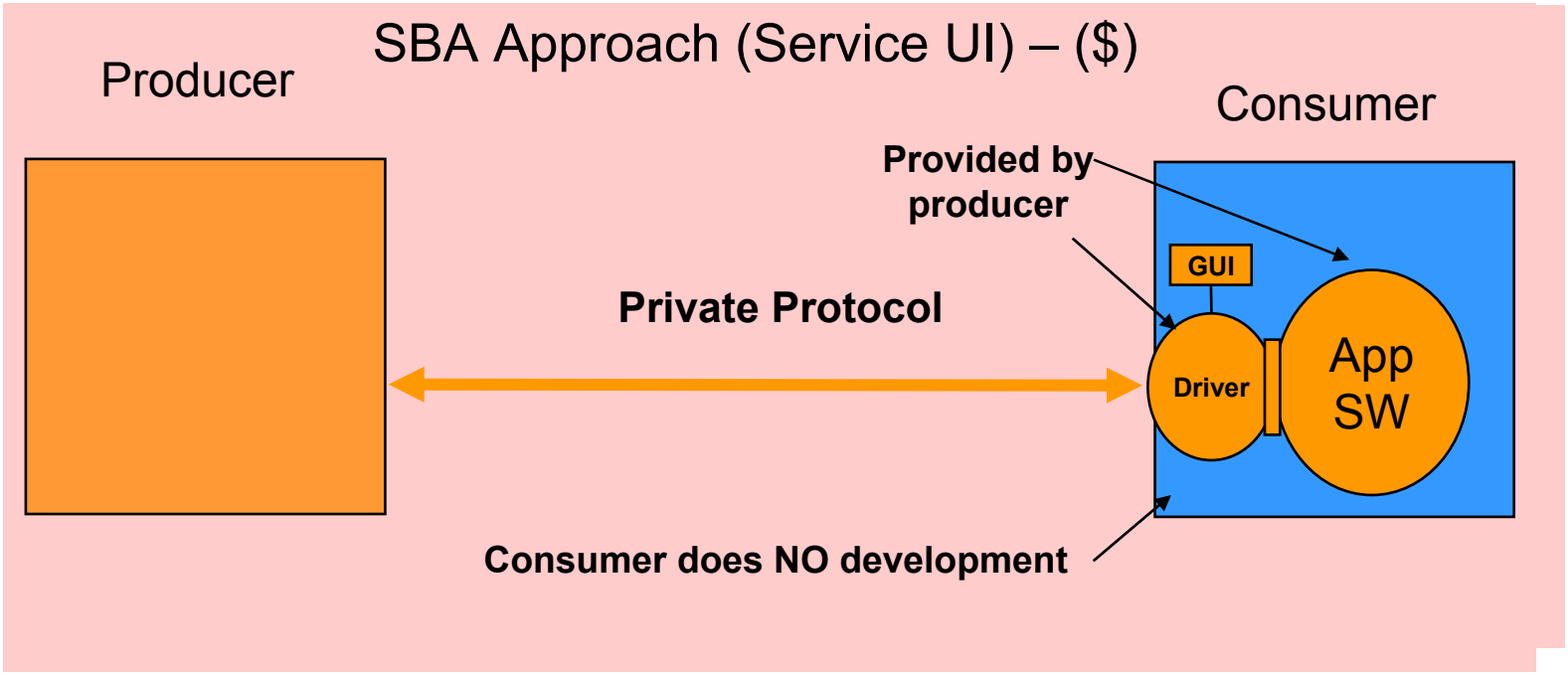
Designing for Interoperability

Services addressed in the Core Service Framework

- Security
- Discovery
- Data Storage & Mediation
- Visualization
- Messaging
- Workflow
- Alerts



Managed Connectors

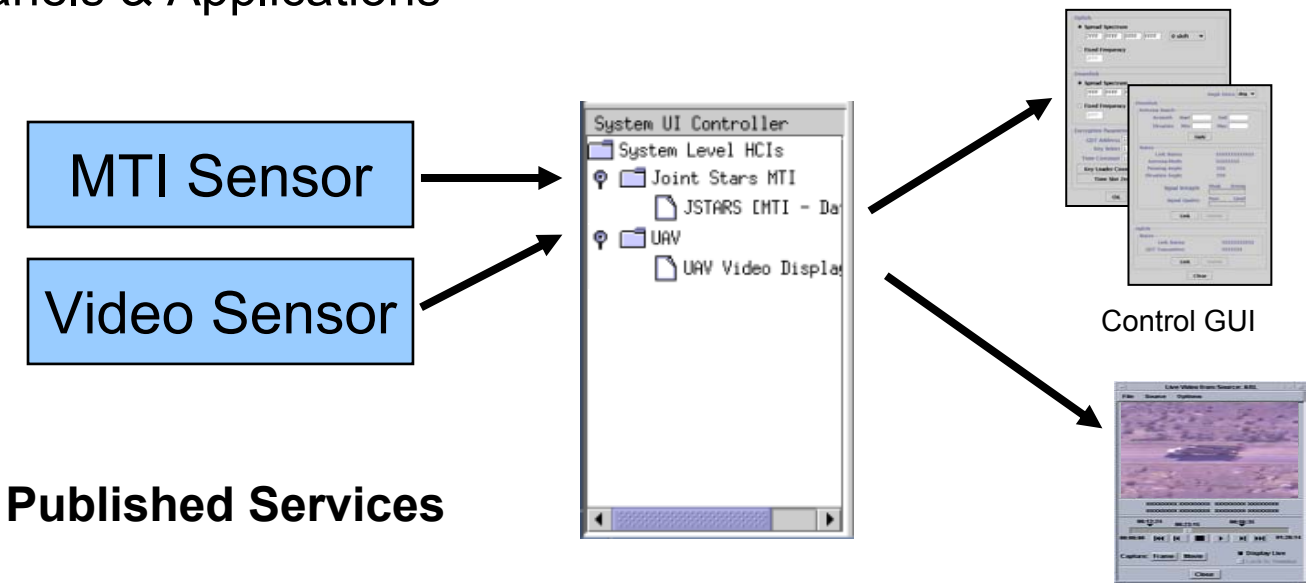


GENERAL DYNAMICS
C4 Systems

Example Frameworks

System Framework

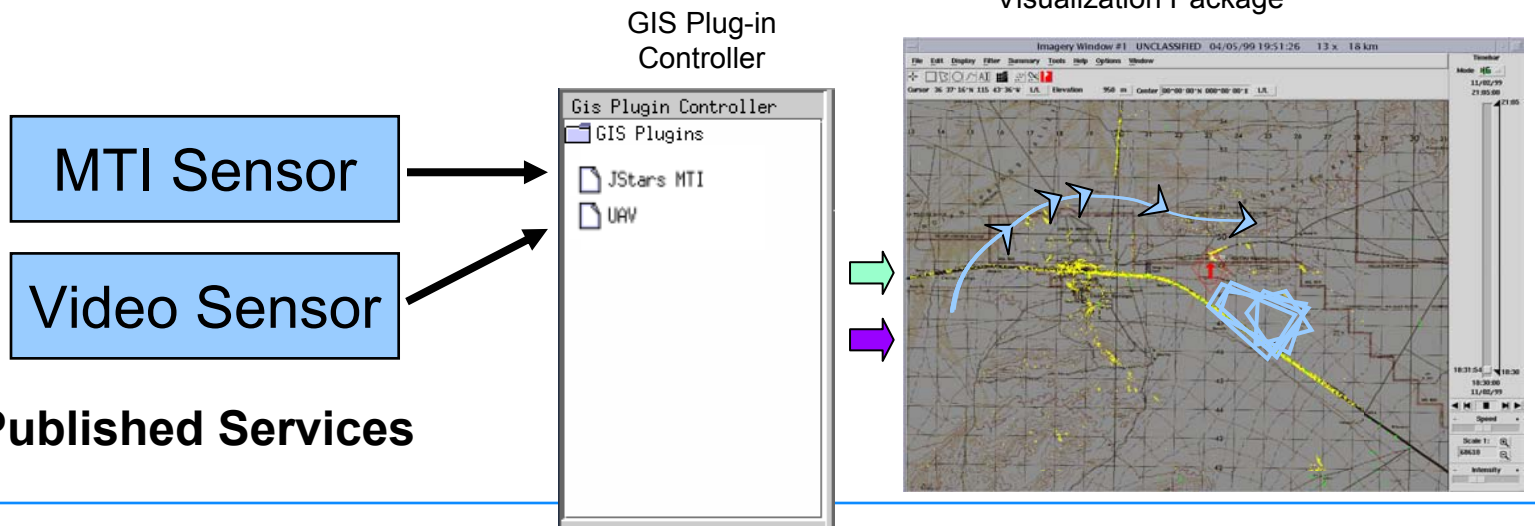
- **System User Interface Components**
  - ↗ Provided by devices as they are inserted into the system
  - ↗ Provides system level control panels & Applications
- **System UI Controller**
  - Detects and registers GUI services
  - Provides the interface for an operator to launch GUIs



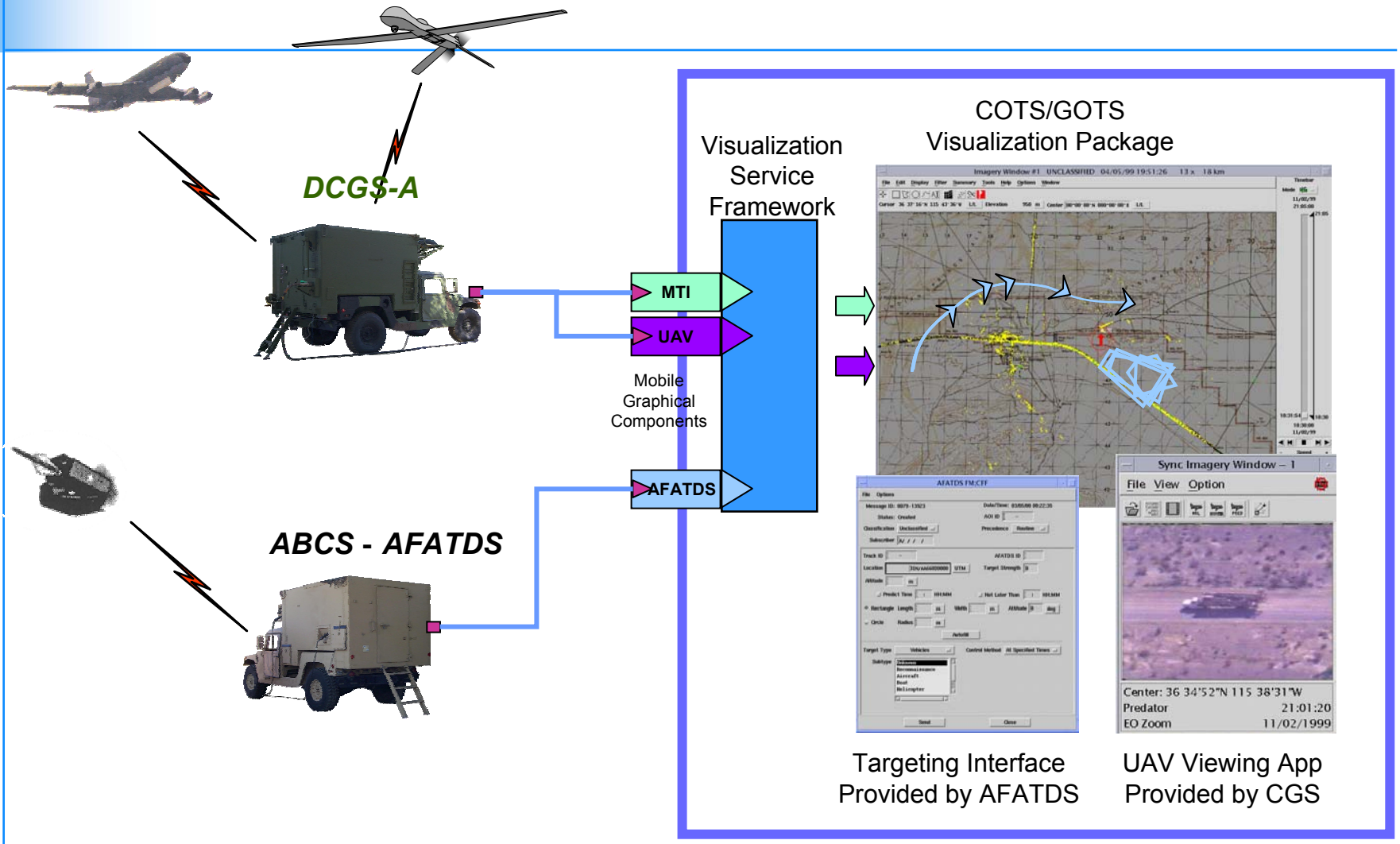
Published Services

Visualization Framework

- **GIS Plug-In Components**
  - Mobile components that provide the the ability to display geo-referenced information
  - Understands the data and how it should be represented
- **GIS Plug-In Controller**
  - Detects and registers GIS Plug-In components
  - Translates the “normalized” calls into the appropriate calls for the GIS



Distributed Services



Summary

- **Interoperability needs to encompass more than just data**
  - Other factors such as Discovery, Security, Messaging and Workflow need to be considered as well

- **Managed connectors and Service Frameworks are a viable mechanism for achieving application interoperability and portability**

THANK YOU