Insertion of Embedded Infosphere Support Technologies
Enabling Time Critical Target Prosecution

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Today’s Operational Picture

- Individual stove-pipe systems (many consisting of legacy hardware and software)
- Little interoperability among systems
- Labor intensive collection and coordination
- Difficult to build recognized operational picture
- Scattered snapshots of the battlespace
- Non-standard C2 systems/centers

“Data Overloaded, Information Starved” -- SAB
The Way Ahead

Platform Centric

Interconnect Centric

Information Centric

USAF still here

Some say we’re here

We all want to be here
Future Operational Picture

Global Grid

- Sensors
- Weapon Systems
- C2 Centers
- Processing & Exploitation Centers
- Aerospace Warriors
Benefits of an Infosphere based Information Exchange Infrastructure

- Improved sensor-to-shooter timeline.

- Reduced human involvement in the decision making process.

- Data is distributed more effectively because it is processed and shared.

- Connection dependencies between participants is eliminated.
Infosphere Terminology

• **advertise** - send a message to the infosphere describing the data to be published.

• **publish** - make data available for sharing.

• **subscribe** - make a request to the infosphere for future data.

• **query** - make a request for a one time transfer of historical data.

• **participant** - any application that sends or receives data.
  – fuselet - performs simple tasks on data objects. Ex., filtering, aggregation, transformation.
  – adapter/wrapper - adapts legacy data for use in the infosphere.
JBI Provides Information Exchange Infrastructure

• The Infosphere is a system of systems that integrates, aggregates, & distributes information to users at all echelons, from the operation and command centers and into the field.

• The Infosphere is built on four key technologies:

  • Information exchange
    – Publish/Subscribe/Query
  • Transforming data to knowledge
    – Fuselets
  • Distributed collaboration
    – Shared, updateable knowledge objects
  • Force/Unit interfaces
    – Templates
      - Operational capability
      - Information inputs
      - Information requirements
JBI Core Services Architecture

Specific Example of Publish/Subscribe Services

(1) Advertisement for TCT Evidence Files
(2) Subscription for TCT Evidence Files
(3) TCT Evidence Files published (peer-to-peer)
In addition to the set of Core Services, JBI offers a Library of Domain Specific Applications that currently includes:

- Adapters to enable legacy Time Critical Target (TCT) data sources to interface with JBI Core Services.
- Fuselets to convert track, intel and imagery data from different sources into a common format.
- Agents to track possible TCTs and publish Evidence files.
IEIST “High-Level” TCT Demo Architecture

TCT Agent
(For each TCT Candidate)
- Navigation & Discovery
- Generates TCT Evidence Files IAW Commanders Guidance

MOM
- Target Assignment
- Route Corridors (Deconfliction)

Guardian Agent
(For each Tactical Asset)
- Navigation & Discovery
- Plan Monitor
- Route Planning

Commander’s Guidance

Prioritized Objectives

TCT Criteria

Sensor Reports

Evidence Files

Tasking Route Corridors

Vehicle/Mission Status
IEIST TCT Demo Architecture

**SOURCES**
- C4Isim
- CORBA
- Commander's Guidance
- IPB
- Images
  - Tracks & ELINT
  - Wrapper
  - A2IPB Wrapper
  - Broadsword Wrapper

**JBI**
- TCT Agents
- Target Folder
- JBI Broker

**IEIST**
- Guardian Agent
- MOM

**F-15 SIM**
- Desktop F-15 Simulator
  - Collaboration Client Browser
- Strike Assets DB

Engagement Cmd: (Wpn/Tgt Pairing)

Existing: yellow
St Louis dev item: green
Seattle dev item: light green
What is a SoftwareAgent?

- An autonomous software element
- Deployed in a publish/subscribe environment to solve a specific problem
- Is data oriented, rather than process oriented
- Subscribes to all data objects necessary to solve a problem, and publishes a data object which is the solution to the problem.
- Is usually rule-based
- Performs no user interfacing
F-15 Agents Provide Information Management

- F-15 Guardian Agent monitors for threats along route
- Guardian Agent displays route threat status information
- It tracks status data from information sources
TCT Kill Cycle For F-15s

1. Create Evidence File
2. New TCT Track
3. Creates new TCT Client
4. TCT Client Factory
5. TCT Tracks
6. TCT Client
7. HUMINT On TCT
8. TCT Folder “complete”
9. TCT Info msg
10. MOM selects Optimum Weapon/target pairing (uses locations & rules)
11. Attack Ops message
12. TCT Folder “paired”
13. Paired TCT Evidence Folder message
14. Update F-15 route to attack TCT
15. TCT Image Displayed in F-15 DTE
16. TCT Folder

F-15 Guardian Agent

JSTARS or UCAV

SOP

F-15 DTE System

MOM

C4ISIM Wrapper

C4ISIM

Friendly platform tracks
The Scenario

• Kosovo based scenario

• Two F-15s flying search and destroy missions
  - DTE’s for each F-15

• Two pairs of UCAVs flying search and destroy missions

• One UCAV flying mission to destroy pre-defined target

• A total of five TCTs appear during scenario run
  - SCUD-style Transporter/Erector Launcher (TEL)
    - Armor
    - Three SAM’s

• All TCTs confirmed by Special Operation Personnel (HUMINT)
The Scenario (Cont.)

- F-15’s
- UCAV’s
- JSTARS
- Special Ops (SOP’s)
- Five TCT’s (SAMs, armor & TEL)
TCT Agent
Scenario @ Time 0:30 minutes

- F-15 #1
- F-15 #2
- UCAVs #3 & #4
- UCAVs #1 & #2
- JSTARS
- UCAV #5
Scenario at 1:00 Hrs.

F-15 #1 assigned TEL (TEL on current route)
Scenario @ Time 1:25 Hrs.

- F-15 #1 GA warns of threat
- UCAVs #3 & #4 heading to SAM 02
- UCAVs #1 & #2 will soon be assigned to attack SAM 01
 Scenario @ Time 1:45 Hrs.

F-15 #1 GA shows no threat (UCAVs destroyed SAMs)

F-15 #2 will attack armor

UCAV #5 will re-route to SAM 03

F-15 #1 re-routed around threat

SAM 03 radiating

TEL

SAM 02 & SAM 01 destroyed