IOA Interoperable Open Architecture for Defense Acquisitions

rti
Your systems. Working as one.

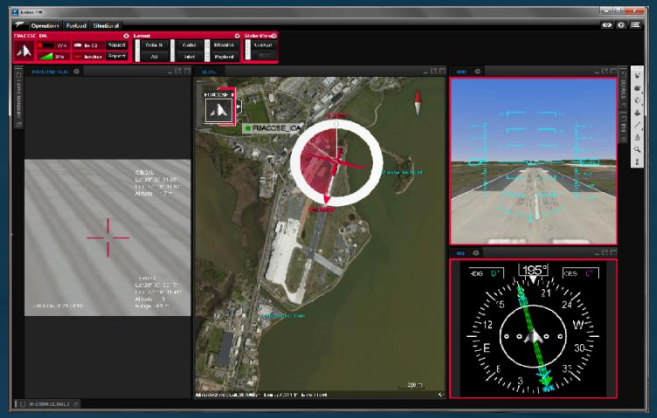
Interoperable Open Architecture Demo: UCS + FACE + COTS

Richard Williamson MBA

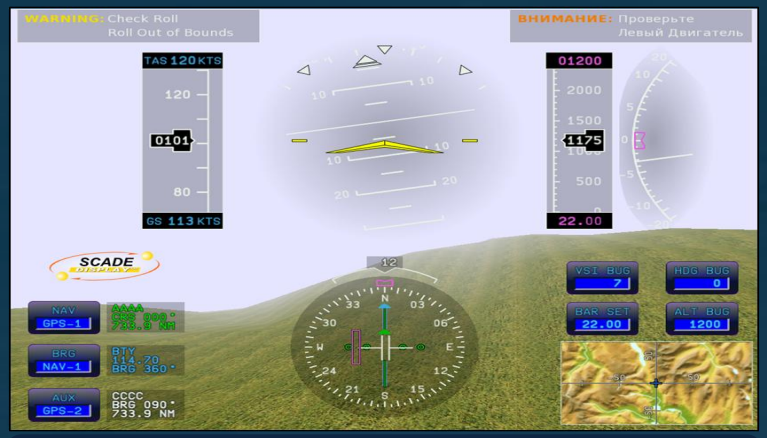
September 10th, 2013

UCS and FACE Integration Demo

DreamHammer
UAS Control Segment



WindRiver SBC
Esterel SCADE Graphics



RTI FACE Transport Service Segment

Open Source
Flight Simulator

UCS Bridge

UCS Defined Messages:

- AssetResourceType
- VehicleStatusType
- PayloadResourceType
- PayloadSteeringReportType
- PayloadSteeringCommandType
- …

UCS Specified Message Mesh - Distributed across RTI Data Bus

IOA + Open Standards + COTS + Open Source

Why, not how.

- Room demographics suggests “Why”
  - Business Development
  - Project/Product Managers
  - System Design/Architecture
- For the Engineers who want “How”
  - The RTI booth will have the demo running.
  - Representatives available to talk about their bit

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$f\{1+1\} > 2$

- Interoperable Open Architecture
  - Simplify integration of disparate applications
  - More than the sum of its parts

- Integrating Systems
  - System + System == System of Systems
  - System + sysTem == SysTem

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When is IOA overkill?

- Trick question. It isn't.
- System:
  - Inputs
  - Outputs
  - Design
- You might tightly control all three now
  - But "technology refresh" will cost almost as much
  - Risk Mitigation

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The Demo

- High level
- Things to keep in mind:
  - The Communications Model
  - Merits of Baked-in and Bolted-on
  - Demo Project Management information

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The Demo

- High level
- Things to keep in mind:
  - The Communications Model
    - What is said -- Language
    - How it is said -- Protocol for Interchange
    - How it is transmitted -- Medium of exchange
  - Merits of Baked-in and Bolted-on
  - Demo Project Management information

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The Demo

- High level
- Things to keep in mind:
  - The Communications Model
  - Merits of Baked-in and Bolted-on
    - Both are acceptable
    - Either works
    - Baked-in is much more efficient so saves money and time
  - Demo Project Management information

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The Demo

- High level
- Things to keep in mind:
  - The Communications Model
  - Merits of Baked-in and Bolted-on
  - Demo Project Management information
    - Demo idea conceived at AUVSI 4 weeks ago
    - ~40 Hours work total
    - 4 Companies in 4 timezones

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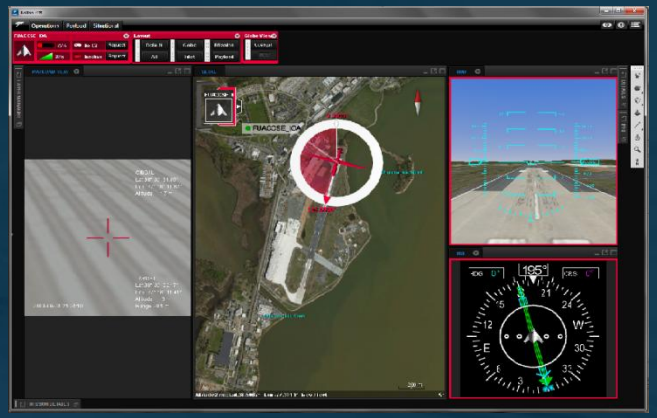

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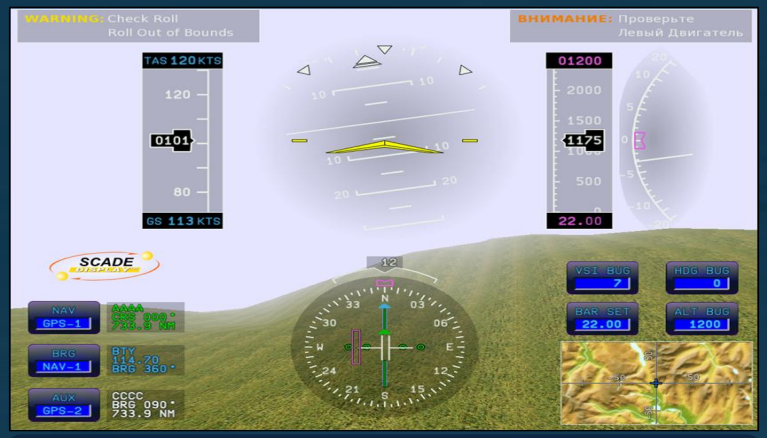

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DreamHammer Control Segment

- Control Segment for unpiloted systems
  - Might be on land, on a ship, in an aircraft, etc
  - Aerial, Ground, Sea or Subsurface System
- Operators/Mission Commanders
- Availability of system inertials/location
- Availability of system payloads (C4ISR, etc)

- UCS: UAS Control Segment

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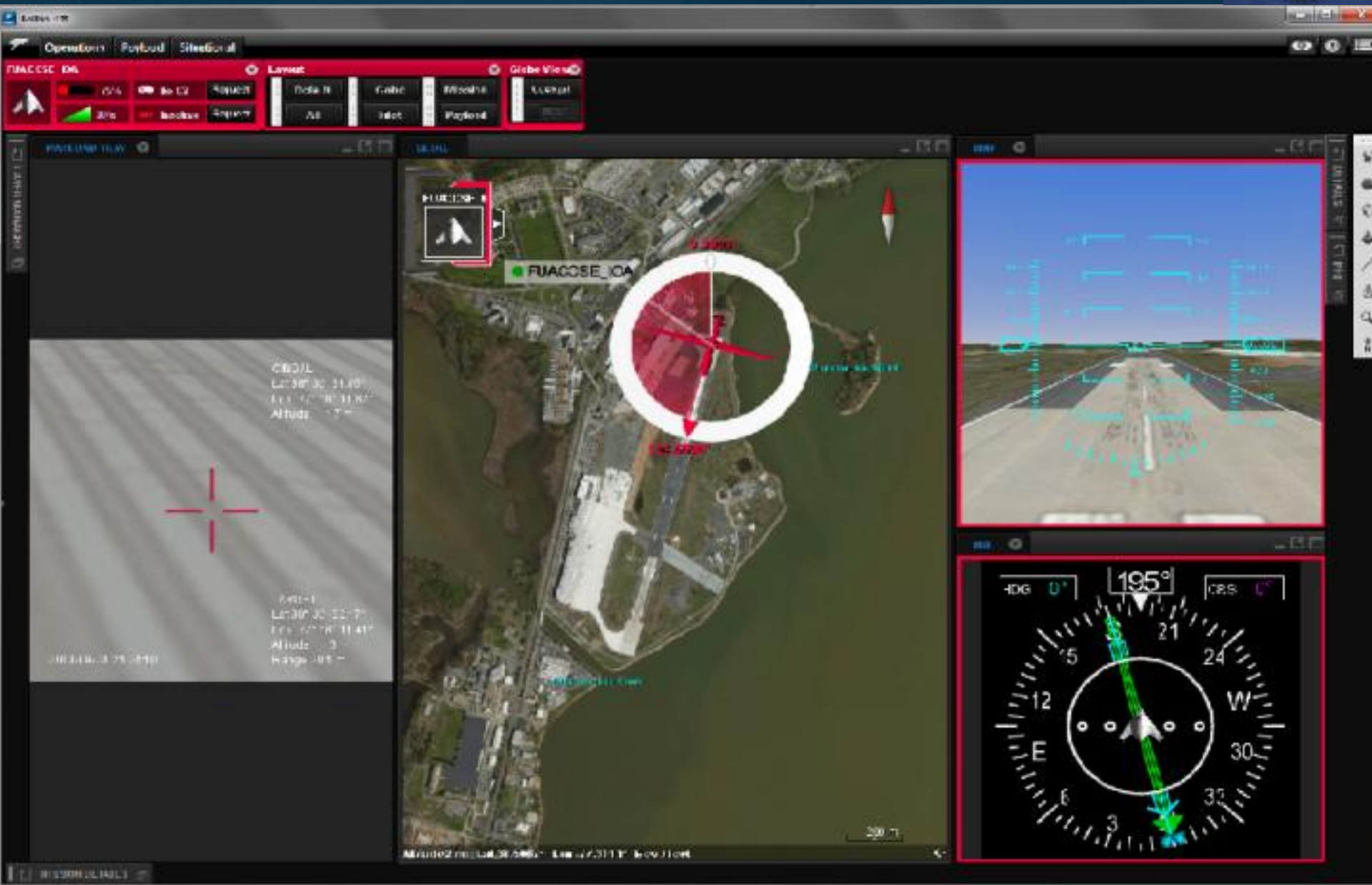
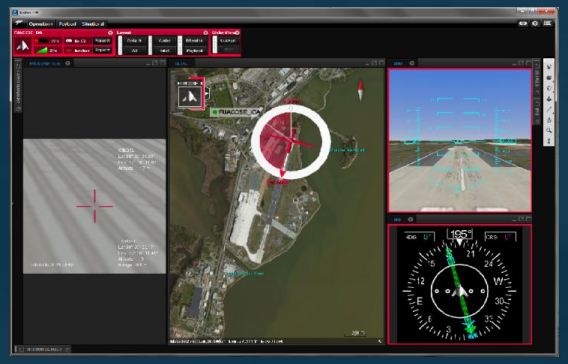
Ballista



Ballista - DreamHammer

- What is said -- Language
  - UCS defines a message set -- a vocabulary and grammar for how an unpiloted system will communicate with a control segment
- DreamHammer's Ballista is the first generation of UCS common control segments



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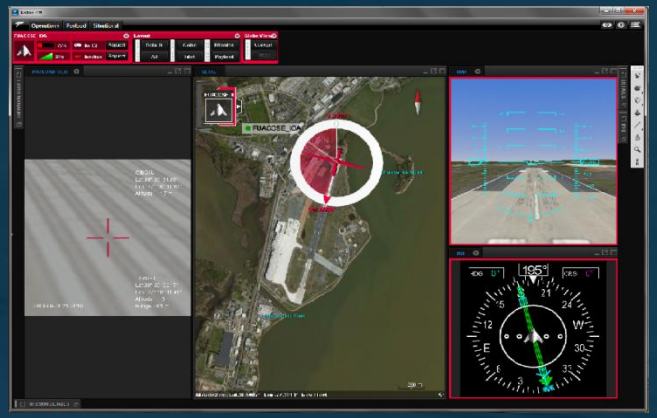

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VxWorks 653 + SCADE

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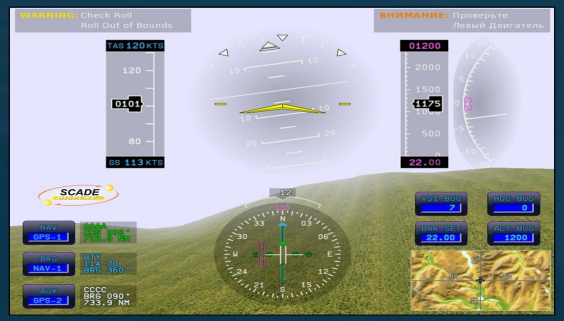
SCADE Graphics - Esterel VxWorks 653 - Wind River

- How it is said -- Protocol
  - FACE (Transport Services Segment) defines a standardized API for inter- and intra-application communication.
  - With the API fixed, applications need not worry about the underlying implementation
- Esterel SCADE graphics receive their input from off-board using a DDS-backed FACE TSS



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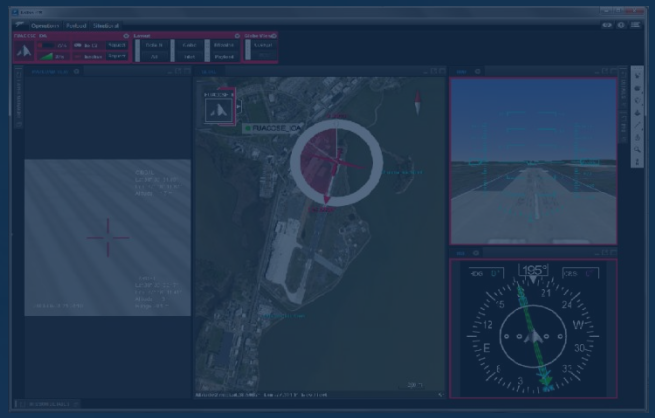

UCS Defined Messages:
AssetResourceType
VehicleStatusType
PayloadResourceType
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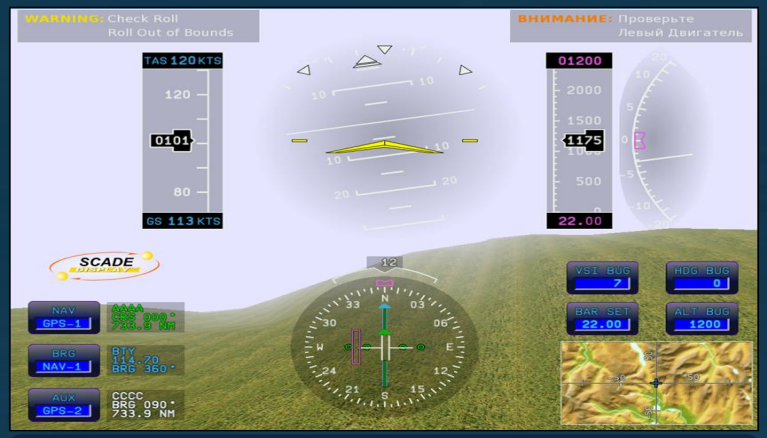

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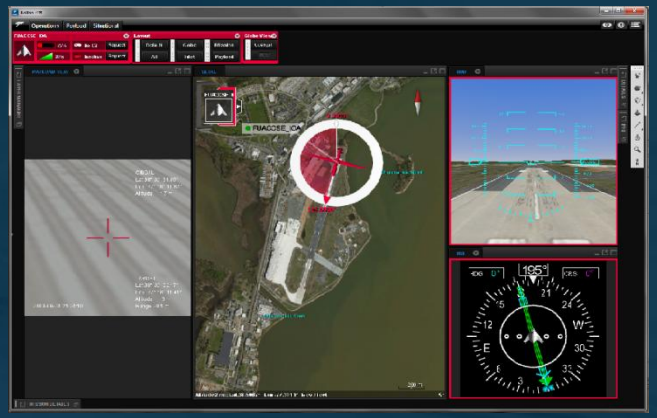

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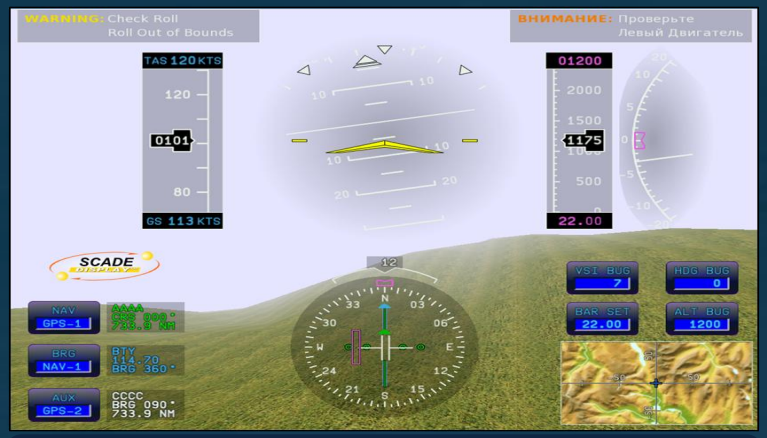

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The live Demo

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Technologies Used

- COTS
  - OS: MacOS, Linux, Windows, VxWorks 653
  - Languages: C++, Java, C
  - Hardware: 32/64bit Intel, 32bit PPC, 32bit Arm
- IOA:
  - UCS and FACE (the Language and Protocol)
- Open Standards:
  - Comms Middleware: DDS (the Medium)
- Open Source
  - FlightGear Flight Simulator

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Emergent Behavior

- Ballista and the SCADE graphics engines were designed and built in ignorance of each other
- Different design criteria
- The demo uses a single source of data to drive both engines

$$\int \{1+1\} > 2$$

- "Integration is hard" but not when Interoperability is built-in.

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Risk Mitigation

- "Why should I change my interface to match yours? YOU change YOURS."
  - Corporate/Political Risk
  - ROI of avoiding Risk
- Moore's Law
  - Technological Innovation Risk

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Thank you.

- Questions, if there is time
- If not, the demo will be at the booth in the hall
  - Will be staffed by representatives from each company involved in the demo

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