Testing Real-time Avionics Software

with the OSEE Test Environment (OTE)

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Integrated Engineering Environment

- Provides seamless integration of COTS and open-source software
  - OSEE server provides REST web services
  - OSEE client built on Eclipse open source tool integration platform
  - Leverages many existing open source libraries

- Eliminate redundancy of data
  - Shared data model accessible to across full life cycle
  - Integrated Product Line Engineering to eliminate redundancy of engineering data across variants and even platforms

- Eliminate redundancy of engineering effort
  - Product Line Engineering provides strategic, systematic reuse
  - Advanced automated testing reduces repeated verification efforts
OSEE Application Servers

- RESTful API (JAX-RS)
- Web UI (Angular)
- Application Business Logic
- Core Services (search, authentication, admin, etc.)
- Artifact Data Model
- Xtext-defined Type Model
- Transactional Persistence and Branching Service

Arbitration Server
With Load Balancing
http://osee.organization.com

Active MQ Message Broker

Web Clients

Eclipse IDE Clients

Test Station
With Physical I/O

Soft Real-time
OSEE Test Environment Server

Simulated OSEE Test Environment Server

Attribute Value Store

Versioned Object Datastore

Relational DB

UDP

HTTPS

JMS

JMS

JMS

JDBC

NFS

Xtext-defined Type Model

Application Business Logic

Core Services (search, authentication, admin, etc.)

Artifact Data Model

Web UI (Angular)

RESTful API (JAX-RS)
Hardware-in-the-loop Testing

- Lab test station provides same interfaces as the real aircraft (1553 Mux, GB Ethernet, video, serial, analogs, discrete signals)
- Breakout panels allows for low level debugging using logic and protocol analyzers
- Aircraft Mission Processor running software under test
- Linux server runs Java test environment, emulators, and test scripts
Single Environment for all testing levels

▪ Reuse Test Environment and Scripts
  - Single environment supports desktop testing, integration labs, production acceptance testing, and aircraft testing
  - Run same Java test scripts (without recompiling) at all levels

▪ Single Java test script can support multiple major configurations of the unit under test

▪ Developer friendly Test Script API allows non-software developers to write test scripts
Advantages of Open Systems Approach

- Lower cost hardware with latest performance and technologies, support and easier future upgrades

- Lower operating system cost – only support costs

- Lower development environment costs – open source Eclipse Java IDE instead of high cost proprietary tools

- Eclipse/Java is a more productive software development environment than C
System Safety and Structural Coverage

- System safety report leverages end-to-end traceability

- **Uses MIL-STD-882E**
  - IDAL
  - Software Control Category
  - Severity Category
  - Software Criticality Index

- **Structural Coverage Analysis**
  - Software Criticality Index identifies level of needed SCA