An Object-Oriented Architecture for the ICO Payload Control System

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Overview

• What is ICO?
  – ICO is a MEO based global mobile telephony system.
  – www.ico.com

• What is the ICO Payload Control System?
  – Provides transparent delivery of payload commands to the satellite constellation across a distributed ground system.
    • Operator Interface
    • Autonomous Commanding
  – Tracks the payload via telemetry
Context of ICO PCS Custom Software Development

ICO
- Application
- Presentation
- Session
- Transport
- Network
- Data Link
- Physical

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- COTS H/W & S/W
- Custom Software
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Why OO for ICO PCS?

• OO is being used for the custom software for ICO PCS.

• Why OO rather than procedural?
  — ICO expects flexible ground station software.
    • OO imposes protocol between software components
  — Ability to use COTS C++ libraries greatly increases the maturity of our product
    • Standard Template Library
    • RogueWave Libraries
• Used Integrated Systems Design Methodology (ISDM), developed by Dr. Dan Port of USC.

• Key analysis questions:
  — What are the components of our system?
    • Command sources?
    • Spacecraft?
  — What are our responsibilities as a subsystem?
    • Interactions with the ground system?
    • Interactions with operators?
    • Interactions with the spacecraft?
  — How do our responsibilities map to the components of our system?
• We selected a CASE tool using these criteria:
  — Concurrent design
  — OMG UML 1.0 compliance
  — Ease of use
• CASE tool selected: ObjectTeam by Cayenne.
  — www.cayennesoft.com
• Key design questions:
  — What additional classes or code must we create to implement our analysis?
  — How can we break development into manageable units?
  — How do we develop shared code (e.g. inheritance)?
Acronyms

- CASE - Computer Aided Software Engineering
- COTS - Commercial Off The Shelf
- ICO - Intermediate Circular Orbit
- ISDM - Integrated Systems Design Methodology
- MEO - Middle Earth Orbit
- OMG - Object Management Group
- OO - Object Oriented
- PCS - Payload Control System
- UML - Unified Modeling Language