communications

Storm Control Systems, Inc.

An Adaptable and Market-Driven Command and Control Architecture

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COTS Solutions: Market Demands

- **COTS products offer significant benefits to complex system implementations**
- **While benefits are acknowledged, concerns and criticism still exists regarding some COTS-based approaches**
- **Top concerns center around some basic attributes**
  - ***Functionality***
    - **Ability to support necessary functions (either too much or too little function)**
  - ***Flexibility***
    - **The ability of the product to easily adapt to mission specific requirements and end user ops concepts**
  - ***Cost***
    - **The cost to maintain and evolve the COTS products**
  - ***Control***
    - **The level of dependency of the end user on the COTS vendor**

L-3 Storm Approach & Lessons Learned

- **Long term COTS product provider**
  - ***L-3 Storm has been a COTS Command and Control product provider for more than a decade***
- **Mission Unique Development/Integration**
  - ***During this time, L-3 Storm has adapted baseline COTS products to support numerous missions with mission unique requirements and ops concepts***
- **Lessons Learned**
  - ***Sometimes "learned the hard way" how to adapt COTS products to support mission unique requirements***
- **Extensive R&D**
  - ***Decided to invest R&D to define a comprehensive architecture capable of evolving to support future requirements.***

InControl-NG Architecture Characteristics

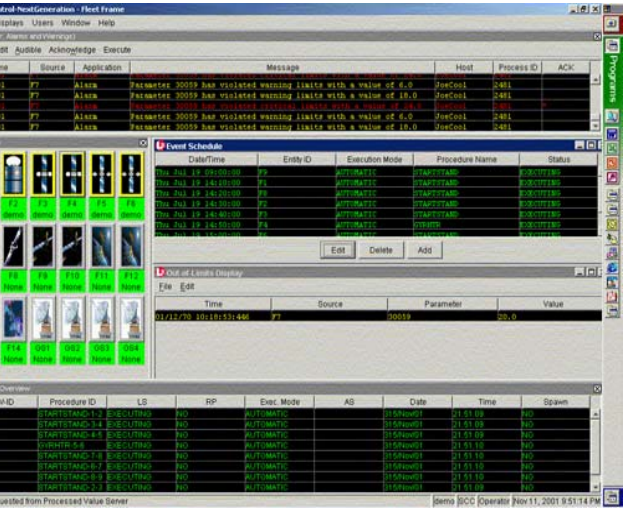
- **A Software Product AND a Comprehensive Architecture**
  - *InControl-NG designed to serve as an operational software product and a comprehensive system architecture to support evolution*
- **Use of proven tools and processes**
  - *Architectural design & implementation initially based on Rational processes and tools*
  - *Migration to RM-ODP to support more rigorous architectural views and evolution*
- **Component-based design**
  - *Well defined components and to support flexibility and encapsulation*
- **Use of well-defined interfaces**
  - *IDL and well structured/documented interfaces to support third party product integration and system evolution*
  - *XML file formats to support data definition*
- **Support for and use of industry standards and broad market technologies**
  - *CORBA, Java, C++, XML, UML, RM-ODP, CCSDS, CCSDS/SLE, etc.*
- **Careful use of open source products**
  - *Careful selection and use of accepted open source products*
- **Emphasis on platform independence**

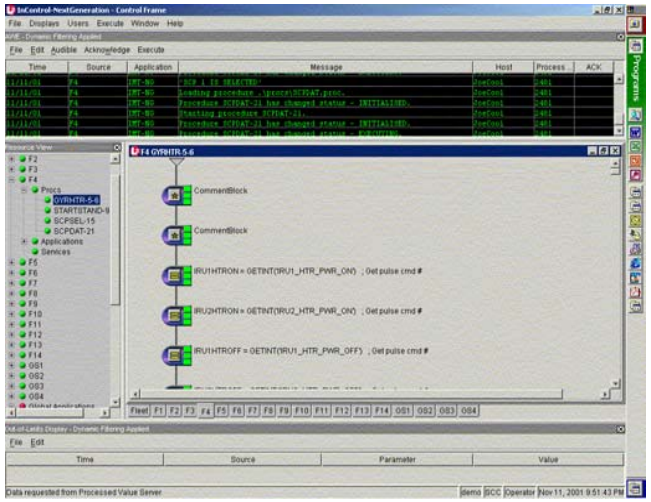
Support for Mission Unique Requirements

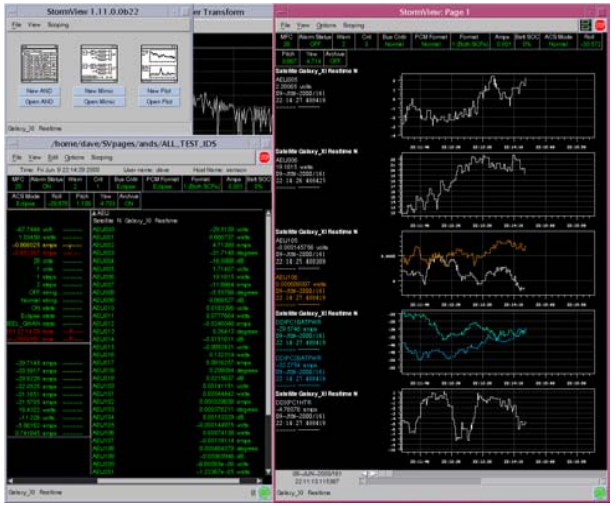
- **Significant goal to satisfy mission unique requirements with minimal NRE**
- **Use of "layers", "strata", and design patterns to support unique requirements**
- **Goal to minimize/eliminate impact to "core" system components**
  - ***Minimize development/integration***
  - ***Simplify maintenance***
- **Support the ability to add unique processing**
  - ***Use of well known design patterns for dynamic functions***
    - **Use of Chain of Responsibility design pattern to support any spacecraft specific on-board command queue**
    - **Use of interceptors in the telemetry engine to allow mission specific processing to be added with no impact on the core functionality**

Modular and Adaptable User Interface

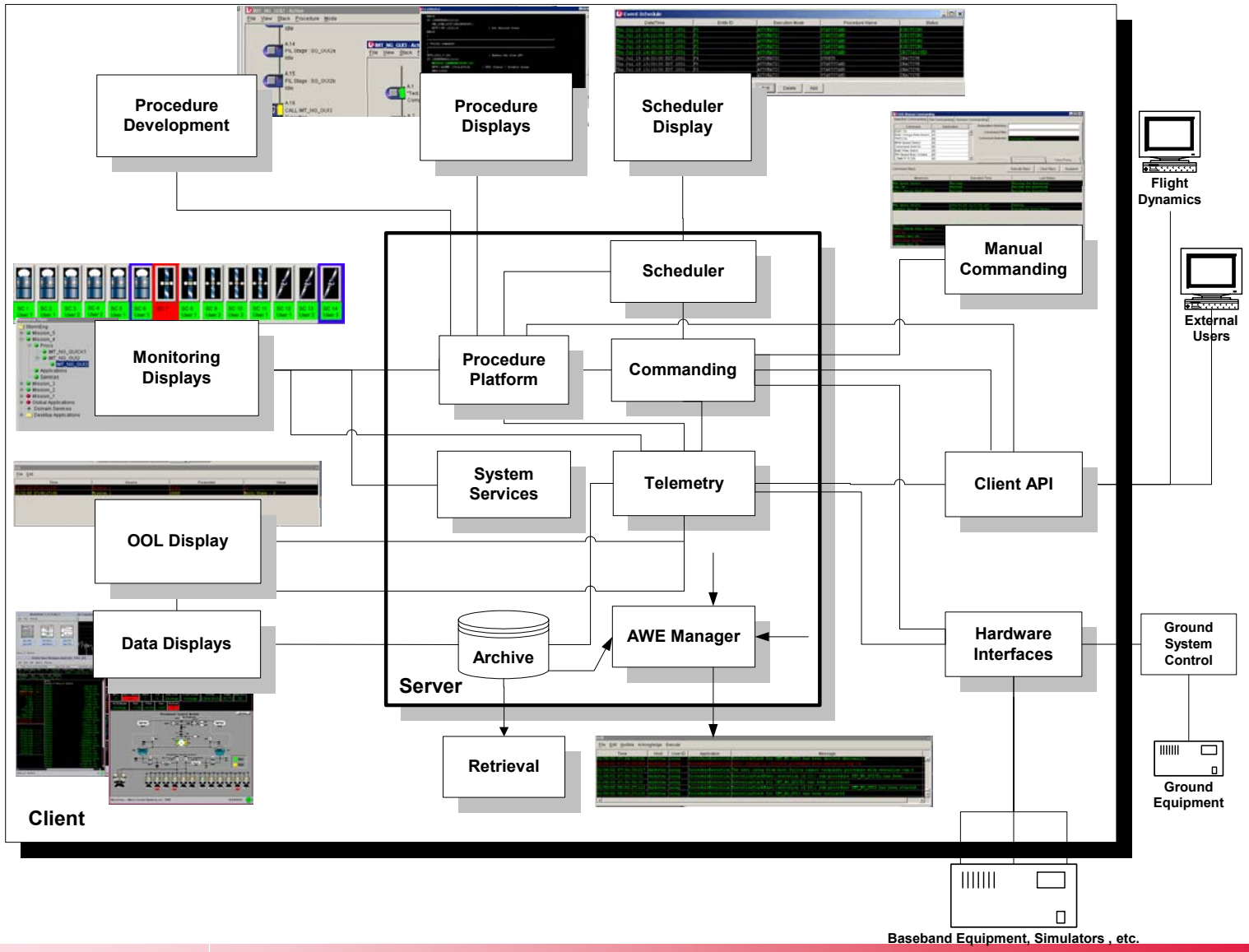
- **Support for multiple system "views"**
  - ***Configurable displays and ops concept support***
  - ***Independent implementation (from baseline functions) – supporting flexibility***







Support for Multiple Display Views



Summary

- Creation of a product and an architecture
- Support for industry standards for system expansion and evolution
- Strong component based design
- Well defined API's
- Use of layers, strata, and design patterns to minimize NRE and support evolution
- Integrated and flexible user interface design