Control Channel Toolkit
A Product Line Initiative in the NRO

GSAW 98
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The CCT vision

• Reduced maintenance costs through use of common code across multiple programs
• CCT specifically designed to support a family of systems
  – Open standards-based architecture
  – Easy integration of contractor specific and COTS products
  – Flexible implementation options
  – Increased interoperability across programs
• CCT a focal point for enhancement and evolution
  – Stable and robust due to use across multiple programs
  – Available for future use on command and control systems
A Product Line Approach

• Domain Analysis
  – Concerned with classes of real world problem.
  – An Attempt to identify the objects, operations, and relationships between what domain experts perceive to be important about the domain - Neighbors.
  – Domain Evolution
    » Evolve the domain to attain a desired level of performance.

• Domain analysis artifacts
  – Generalized specification
  – Domain definition
  – Domain specification
A Product Line Approach

- CCT
  - Based on DCCS.
  - Problem domain defined by consensus
    » Shared paradigm
  - A product line based on a domain analysis.
    » DCCS, SSCS, MALTA
  - Architecture driven
    » architecture needed to define the system context
    » system architecture key to component analysis.
    » Infrastructure services specified
  - Infrastructure based on CORBA services and facilities
    » CORBA based
  - Government use rights
    » architecture/components available to contractors for government use
CCT Issues

- Baseline management
  - a single baseline across multiple programs
- Performance
  - How do we specify system performance based on components.
Commonality Among Systems

DCCS-specific:
- Mission-specific HMI Displays
- Mission-specific Payload Management
- Mission-specific Scheduling Capabilities
- External Messaging Interfaces
- Mission-specific Ground Hardware
- Unique Maneuvers and Attitude Determination

SSCS-specific:
- Ops Concept-driven Timeline and Scheduling
- Ops Concept-driven HMI Components
- External Messaging Interfaces
- Simulate SV Contact Environment
- Unique Maneuvers and Attitude Determination
- Ops Concept-driven Data Security

Malta-specific:
- Mission-specific Interfaces to Additional Hardware
- Mission-specific Scheduling Capabilities
- Mission-specific Payload Management
- Unique Maneuvers and Attitude Determination

SBIRS
GPS
MIL-STAR
DSCS

Uncommon
Common
51%
49%
11%
89%
30%
70%
PROBLEM REPORTING

CCT PO
CCT/C
Sat SPOs
Programs WG

Satellite Programs

Operational Users

Sat SPOs

CCT CCB

• Sat Pgm CCB Coord
• CCT CCB Disposition

CCT/C CM
Builds Emergency Patch

CCB Baseline Change Approval

CCT/C (CM)

• Builds S/W for next Release
• Maintains S/W Baseline

JCRB

• Review, prioritize & forward DRs
• Baseline change (e.g. A-Spec Level) recommendations to CCB

No A-level Spec Changes

Emergency Change
(CCT WG Chair grants authority to make change)

CCT/C ERB

• Receives & processes DR
• Verify & validate if CCT DR is in scope
• Determines solution depending on severity
  • Work Around, patch, baseline update
  • Quick assessment for cost, technical approach, schedule
  • Recommendation

CCT/C ECR Processing

Contractual Impacts

Approve

Reject

Evolution, New Req’t

DR

Reject

CCT/C (CM)

Approved CCT/C (CM)

CCT/C CM

Sustainment Process

Unclassified
CCT Development Schedule

1997 | 1998 | 1999
---|---|---
System Requirements Review | Execution Pre-Ship Review | Planning Pre-Ship Review

CCT

- Increment 1
- Increment 2
- Increment 3
- Increment 4
- Increment 5
- Sustainment

• Domain Spec
• Domain Defn
• SW Arch / APIs
• Infrastructure
• Incr 2 Design
• Incr 2 Code
• Incr 3 Design
• Incr 3 Code
• Incr 4 Design
• Incr 4 Code
• Incr 5 Design
• Incr 5 Code
Anticipated Total Government Related Expenditures

Anticipated Cost Savings With CCT:
- 18.2%
- $15.8 M

Fiscal Years

- Total Govt Costs with CCT
- Total Govt Current Costs
Anticipated Total Government Development Related Expenditures

Anticipated Cost Savings With CCT:
-0.3%
-$0.1M

Fiscal Years

M$

0
5
10
15
20

97 98 99 0 1 2

Total Govt Development Costs with CCT
Total Govt Current Development Costs
**Anticipated Total Government Sustainment Related Expenditures**

**Anticipated Cost Savings With CCT:**

- **27.8%**
- **$15.9 M**

Fiscal Years

- **Total Govt Sustainment Cost with CCT**
- **Total Govt Current Sustainment Costs**

Unclassified
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OMG Taxonomy of Services

Vertical Common Facilities
- Accounting
- Application Development
- Computer Integrated Manufacturing
- Currency
- Distributed Simulation
- Imagery
- Information Superhighways
- Internationalization
- Mapping
- Oil & Gas Exploration & Production
- Security
- Telecommunications

Object Services
- Concurrency Control
- Events
- Externalization
- Life Cycle
- Naming
- Persistence
- Relationships
- Transactions
- Licensing
- Properties
- Queries
- Security
- Time Synchronization
- Change Management
- Collections
- Data Interchange
- Replication
- Trading

Horizontal Common Facilities

Applications

Object Request Broker (ORB)

Operating System and Network Services

Horizontal Common Facilities

User Interface
- Compound Presentation
- Desktop Management
- Rendering Management
- Scripting
- User Support

Information Management
- Compound Interchange
- Data Encoding/Representation
- Data Interchange
- Information Exchange
- Information Modeling
- Information Storage/Retrieval
- Time Operations

System Management
- Collection Management
- Consistency
- Customization
- Data Collection
- Event Management
- Instance Management
- Instrumentation
- Policy Management
- Process Launch
- Quality of Service Mgmt
- Scheduling Management
- Security

Task Management
- Agents
- Automation
- Rule Management
- Workflow

(Specified — In-Progress — To-Be-Done)
Inside CCT

Open Reference Architecture Allows:

- Multiple Contractors
- Varying COTS Products
- Differing Concepts of Operation & System Architecture
- Technology Evolution