Adaptable System Integration on Multiple Platforms

System of Systems Engineering Collaborators Information Exchange

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1. Problem Overview
2. Software Methods
3. Program Methods
4. Test Methods
5. Conclusion
1. Problem Overview
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3. Program Methods
4. Test Methods
5. Issue Tracking
• Controller Product
  • Controls and integrates multiple systems
  • Used on a Fighter
Problem Overview

- Bomber Integration
  - Add Targeting system
  - Add different Radar
Problem Overview

- Transport Integration
- Add different Altimeter
• Each new platform increases complexity and the size of the program
• How do we reduce risk, effort, and costs?
• Can the different platforms leverage capability from one another?
  • Software, System, and Test methods must be considered as a whole to achieve goals
1. Problem Overview
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• Software Practices
  • Platform checked at runtime
  • Separate software baselines
  • Platform decided at compile time
• Helpful Software Architectures
• Pros
  • Very adaptable to new platforms
  • Less software in the field
  • Changes benefit all platforms
    • Bugs will be fixed once
• Cons
  • More Complex Software
  • More processing and memory needed
• Program Effects
  • Depot software load is operational for any platform
  • Low effort in issue tracking
• Test Effects
  • Unit level testing can be used for any platform
  • Similar tests can be created to execute for each platform
Software Methods-
Separate Software

- Pros
  - Clean Code
  - Minimal memory usage
  - Minimal Processing

- Cons
  - Changes only benefit one platform
    - A bug will need to be fixed for each platform
  - Not adaptable to new platforms
  - Code could diverge into multiple designs
• Program Effects
  • Software must be loaded in the field
  • High effort in issue tracking
• Test Effects
  • Code inspections quicker with less code to review
  • Unique tests must be created for each platform
• Pros
  • Adaptable to new platforms
  • Changes may benefit all platforms
  • Less memory usage

• Cons
  • Multiple releases in the field
  • Changes may only benefit one platform
  • May need to fix one bug multiple times
• Program Effects
  • Software must be loaded in the field
  • Medium effort in issue tracking

• Test Effects
  • Unit level testing may be used for any platform
  • Similar tests can be created to execute for each platform
• Runtime platform decisions, while initially more risky and more expensive, have a more favorable long term outcome

• Compilation platform decisions, while initially less risky and less expensive, do not offer long term advantages

• Separate software is a tempting short term solution but is the most risky and costly method over the long term
• Separate inputs from core software
  • Minimize subsystem impacts on core software
  • Allows core software to easily add new systems or adapt to subsystem updates
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• Change Request (CR) Tracking Database
  • Users of tracking system
  • Data/metrics tracked
    • Platform found, Applicable platforms
  • Traceability from test to issue documentation
• CR Tracking Database Entries
  
  • One entry for each CR on each platform
  
  • CR is closed when software is tested for a platform, even if the fix applies to multiple platforms
  
  • Sibling CRs track a common change on multiple platforms
• Configuration Management
  • Development paths allow different platform development efforts to occur in parallel
  • Merge development paths to reduce the amount of variants
    • Only for Runtime or Compile time software
  • Configuration Management tools help manage multiple development paths
• Requirements Management

  • Use a requirements management tool such as DOORS
  • Each requirement is assigned to one or multiple platforms
  • Filters allow for one platform’s requirements to be viewed
  • Used for System and CSCI level requirements

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<tr>
<td>10003</td>
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• **Common Functionality Test**
  - Generic test cases with customizable fields to quickly transition test from one platform to another

• **Test File Creation and Maintenance**
  - Careful test case planning can assist in reducing effort level when converting existing test files for one platform to test another platform
• Creation of single test set to verify multiple platforms

• Requirements mapped to test cases only once
• Configuration manage files by platform, test tool type, and software version

• Utilize commonalities across platforms for test file creation
Software, System and Test of an integrated system are interrelated components that must be considered as a whole.

Supporting multiple platforms or configurations to leverage existing technology can be cost effective and improve common capability.