

Automation of Flight Software Regression Testing

Scott B. Tashakkor, P.E.

ES52 Software Development Branch
Marshall Space Flight Center, NASA

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Outline

- Introduction
- Requirements
- Test Harness Setup
 - Modularity
 - Inputs
 - Outputs
- Running Test Cases
- Conclusion

Introduction

- Automation developed during Space Launch System (SLS) Flight Software (FSW) development
 - SLS
 - Man-rated Heavy lift launch vehicle
 - FSW being developed in-house at NASA/Marshall Space Flight Center
 - FSW will provide flight computer software functions
- Incremental “Agile” software development

Requirements for Harness

- Continuous Testing
- Informal and formal testing of requirements
- Independent Testing
 - Stand-alone Software Module Testing
 - Tests of routines within modules
- Configurable
- Inputs
 - Maintainability of Test Inputs
 - Vary scenarios through updates to parameters, phases, off-nominal, ...
- Automation of Testing

Test Harness Setup (Base Class)

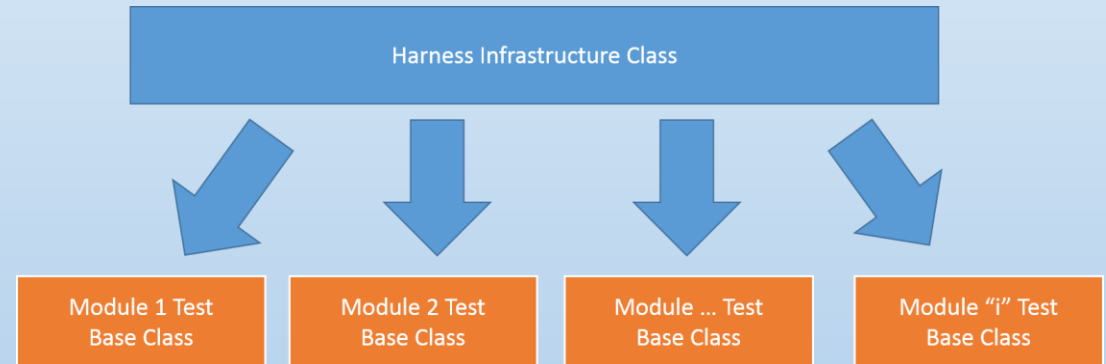
- Base class (Blue)
 - File Input/Output
 - Harness initialization
 - Operating system calls
 - Generic value comparison system
 - General System emulation



Harness Infrastructure Class

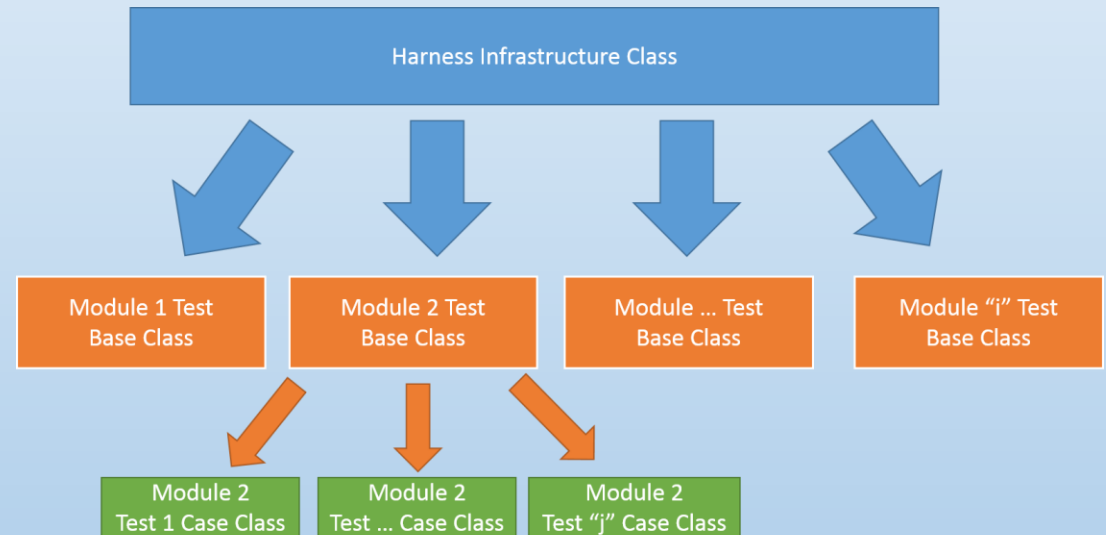
Test Harness Setup (Module Base Class)

- Module Base Class (Orange)
 - Initialization of Software module under test
 - Module specific support
 - Independence among modules
 - Fault interpretation
 - Enumerations
 - Set values
 - Set lengths



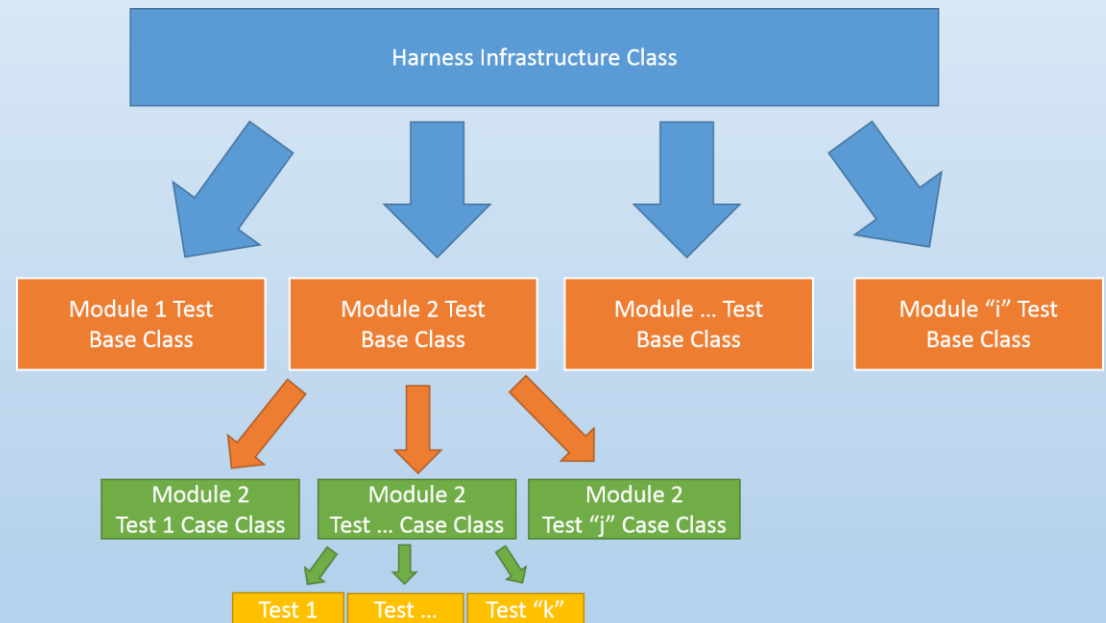
Test Harness Setup (Module Test Case)

- Module Test Case class (Green)
 - Specific support for groups of test
 - Specification of comparisons
 - Test dependent inputs



Test Harness Setup (Test cases)

- Test Cases (Yellow)
 - Comma Separated Value inputs
 - Comma Separated Value (CSV) comparisons
 - Specification of what to fault



Running Test Cases

- Compilation
 - Full compilation of FSW
 - Conditional compilation of test modules
 - Compiled for software development units
- Inputs loaded via CSV
- Outputs are PASS/FAIL
- Tests are run through file specification
- Automation through scripts

Advantages/Conclusions

- Execution support for multiple independent test cases
- Ability for developers to specify precisely what they are testing and how
- Ability to add automation multiple ways
- Ability of the harness and cases to be executed continually
- Approach that can be adapted to support other projects

Questions?