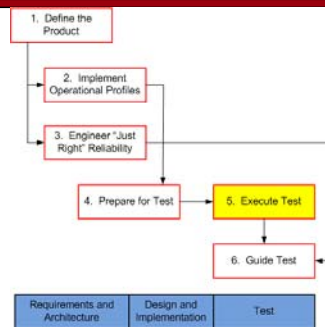


## SRE: Executing Test



This lecture provides reference material for Chapter 5 of the book entitled "Software Reliability Engineering: More Reliable Software Faster and Cheaper" by John D. Musa © 2004

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For PowerPoint version of the slides, contact Laurie Williams at [williams@csc.ncsu.edu](mailto:williams@csc.ncsu.edu).

## Two Types of SRE Testing

- Reliability Growth Testing
  - Objective: to find and remove faults; estimate and track failure intensity; guide development and to guide release
- Certification Testing
  - Objective: to obtain information to use to make a binary decision: accept the software, or reject the software and return it to the supplier

## Types of SRE Testing

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- Feature Test
  - reliability growth only, not certification
  - all new test cases for new operations
  - independent of each other (need set up and clean up for each operation)
  - test cases not replaced in group for possible future re-selection
- Load Test
  - both reliability growth and certification test
  - all valid tests for all releases including acceptance tests and performance tests
  - full interaction with other test cases in different environments, no setup before test
  - test cases are replaced in group for possible future re-selection
- Regression Test
  - reliability growth only, not certification
  - all critical test cases + subset of all valid test cases from all releases
  - independent of each other [for each build during the load test period]
  - test cases not replaced in group for possible future re-selection

## Planning and Allocating test time

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1. Allocate among associated system to be tested (base, variations, supersystem of base product and variations)
2. Assign time for certification test of each of the associated systems that need it, for example if a customer is performing acceptance tests
3. Allocate rest among feature, regression, and load test for reliability growth

## Allocating testing time

Associated system	<i>F</i>	<i>D</i>	<i>R</i>	<i>N</i>	<i>A</i>	Test time (hr)
Fone Follower (base product)	0.6	1	1	0.6	0.521	167
Fone Follower Japan (variation)	0.4	0.3	1	0.12	0.104	33
Supersystem FF	0.6	1	0.6	0.36	0.313	100
Supersystem FF Japan	0.4	0.3	0.6	0.072	0.062	20
Totals				1.152		320

- *F* = expected fraction of field use
- *D* = difference between base product and variations (so base product = 1)
- *R* = relative reliability risk increase prior to test caused by independent systems of subsystem (base = 1)
- $N = F \times D \times R$
- Add *N*'s, normalize, and allocate test time



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Table from Musa, J., *Software Reliability Engineering*, 2004.

## Then . . .

- For each system
  - Subtract certification test time
  - Allocate remaining time for reliability growth
    - Execute to completion all new tests for the new release
    - Allocate regression test time
      - Expected number of builds for the new release multiplied by the average time required to execute the test cases
    - Remaining time to load test
      - Usually at least several times the length of feature test + regression test (combined)
      - If remaining time is too low or negative, negotiate immediately



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## Invoke Test

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- Feature
  - Select randomly from set of new test cases for release
  - Run one to completion before running the next
  - Provide setup and cleanup
  - Do not replace test case after execution
- Load
  - Using test procedure, choose from set of all valid test cases according to test operational profile
  - Replace test case after execution
- Regression
  - Choose subset, including all critical test cases and specified number of randomly-chosen non-critical test cases
  - Do not replace test case after execution

## Summary

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- Test operational profile is used to guide the invocation of test
- Time is split between reliability growth testing and certification testing