

Quality Assurance Activities

- Verification
 - Check product against specification
- Validation
 - Check product against world (stakeholder expectations)
- van Vliet considers all quality assurance activities as testing
 - Even before you have code!

Week 5
Lecture Slide 1

Testing

- Software lifecycle diagrams show testing as an activity or box
 - In practice, testing is performed constantly
- There has never been a project where there was too much testing.
 - Products always ship with some defects
- Test cases are a valuable resource
 - Should be managed like code
 - Used for testing as you add code

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Testing in Lifecycle Phases

Phase	Activities
Requirements	-Determine test strategy -Test requirements specification -Generate functional test data
Design	-Check consistency between design and requirements specification -Evaluate the software architecture -Test the design -Generate structural and functional test data
Implementation	-Check consistency between design and implementation -Test implementation -Generate structural and functional test data -Execute tests
Maintenance	-Repeat the above tests in accordance with the degree of redevelopment

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Review

- Name and describe four types of testing.

Unit testing	Error-based testing	Structural testing
Integration testing	Fault-based testing	Functional testing
System testing	Coverage-based testing	
Acceptance testing		
- What is the difference between black box and white box testing?

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Test Stages

- Unit Testing
 - Same as Module Testing
- Integration Testing
- System Testing
- Acceptance Testing
- Installation Testing

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Testing Techniques

- Manual Test Techniques
 - Reading
 - Walkthroughs and Inspections
- Scenario-Based Evaluation
- Correctness Proofs
- Stepwise Abstraction
- Coverage-Based Techniques
- Fault-Based Techniques
- Error-Based Techniques

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Properties of Good Tests

- Automatic
- Thorough
- Accurate
- Repeatable
- Independent
- Professional

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Benefits of Unit Tests

- Specify software
- Reconcile conflicting concepts
- Clarify assumptions
- Starting point for QA
- Code is written to be testable

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Junit

- Widely accepted standard for unit testing
- Simple
- Automatically compares expected and actual results
- Easy to run (and rerun!) many tests
- Oriented towards developers. Unit tests
- Free, open source
- It's a tool, not a panacea
 - Still need to design good test cases
 - Expose assumptions!

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To test: Add.java

```
package add;

public class Add {
    public int addInts(int int1, int int2)
    {
        return int1 + int2;
    }
}
```

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AddTest1.java – as generated

```
package addUnitTest;
import junit.framework.TestCase;

public class AddTest1 extends TestCase {
    protected void setUp() throws Exception {
        super.setUp();
    }
    protected void tearDown() throws Exception {
        super.tearDown();
    }
    /*
     * Test method for 'add.Add.addInts(int, int)'
     */
    public void testAddInts() {
    }
}
```

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AddTest1.java – as edited, part 1

```
import add.Add;

public class AddTest1 extends TestCase {
    Add myAdd;
    protected void setUp() throws Exception {
        myAdd = new Add();
        super.setUp();
    }
    protected void tearDown() throws Exception {
        myAdd = null;
        super.tearDown();
    }
    /*
     * Test method for 'add.Add.addInts(int, int)'
     */
    public void testAddInts() {
    }
}
```

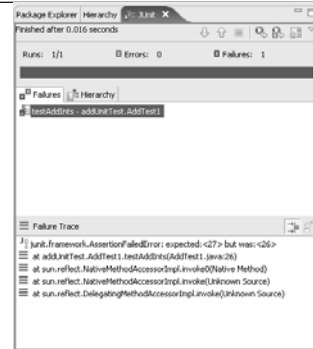
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AddTest1.java – as edited, part 2

```
public class AddTest1 extends TestCase {
    /*
     * Test method for 'add.Add.addInts(int, int)'
     */
    public void testAddInts() {
        Assert.assertEquals(4, myAdd.addInts(2, 2));
        Assert.assertEquals(-4, myAdd.addInts(-2, -2));
        Assert.assertEquals(27, myAdd.addInts(28, -2));
    }
}
```

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Run the Junit – results:



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