Object-Oriented Programming with Java

Recitation No. 8: JUnit and more

Software Testing

- Motivation:
  - Automatic formal proofs can be impossible
  - Manual proofs are costly
- Definition:
  - Running the software on a set of input data
- Goals:
  - Finding faults
  - Providing confidence of (probable) correctness and of satisfying all requirements

Software Testing (cont.)

- Granularity Levels:
  - Unit Testing (developers)
  - Integration Testing (QA)
  - System testing
  - User Acceptance Testing
  - Regression Testing
- “Testing is not a phase, but a lifestyle”

Unit Tests

Two Types:

- Black-box tests:
  - assert the contract
  - independence of the implementation
- Coverage tests (Glass-box tests)
  - assert each piece of code

JUnit

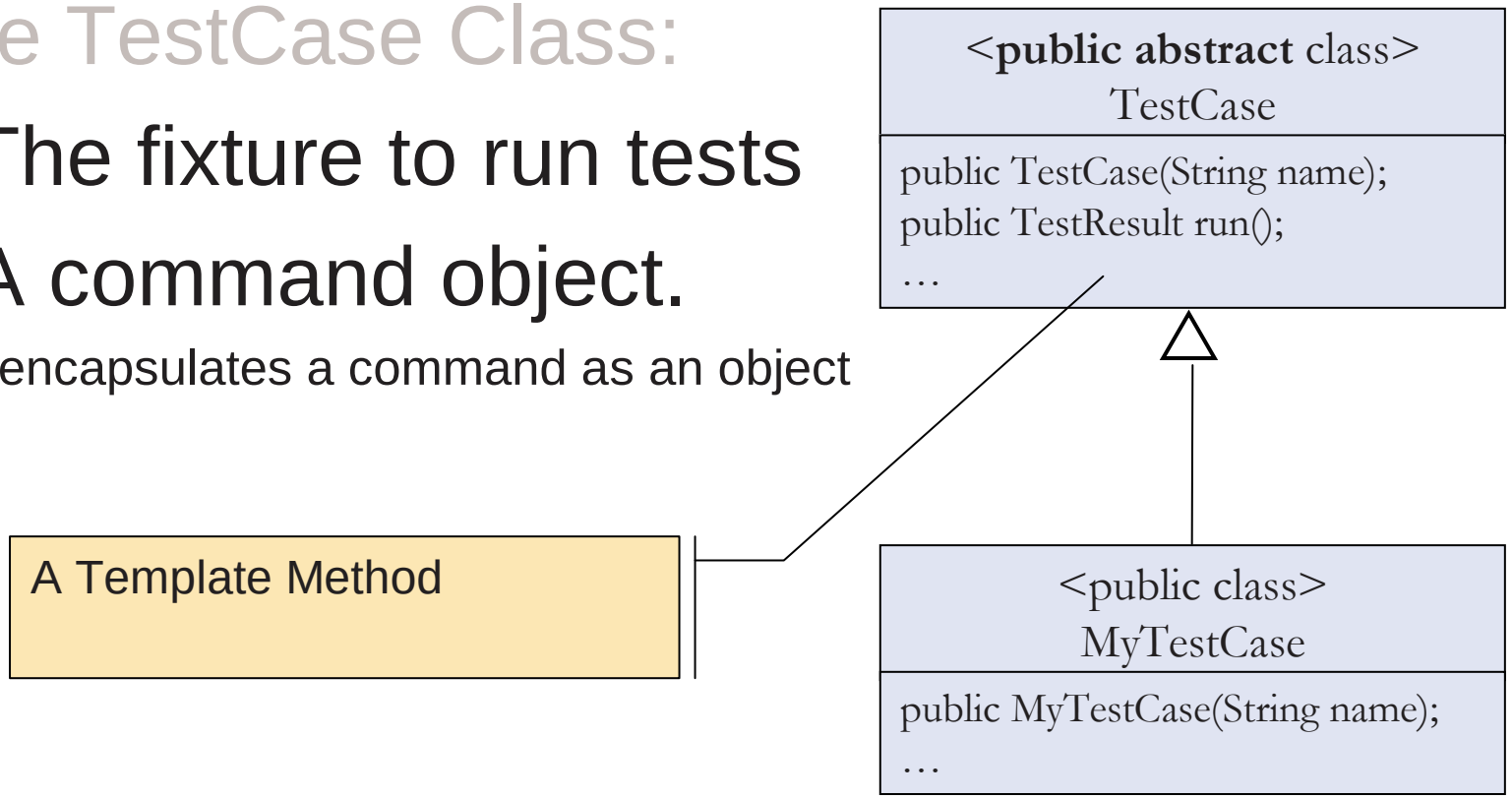
- A testing framework for Java programs
- Useful mainly for unit testing
- Integrated with Eclipse
- home-page: http://www.junit.org

JUnit Framework

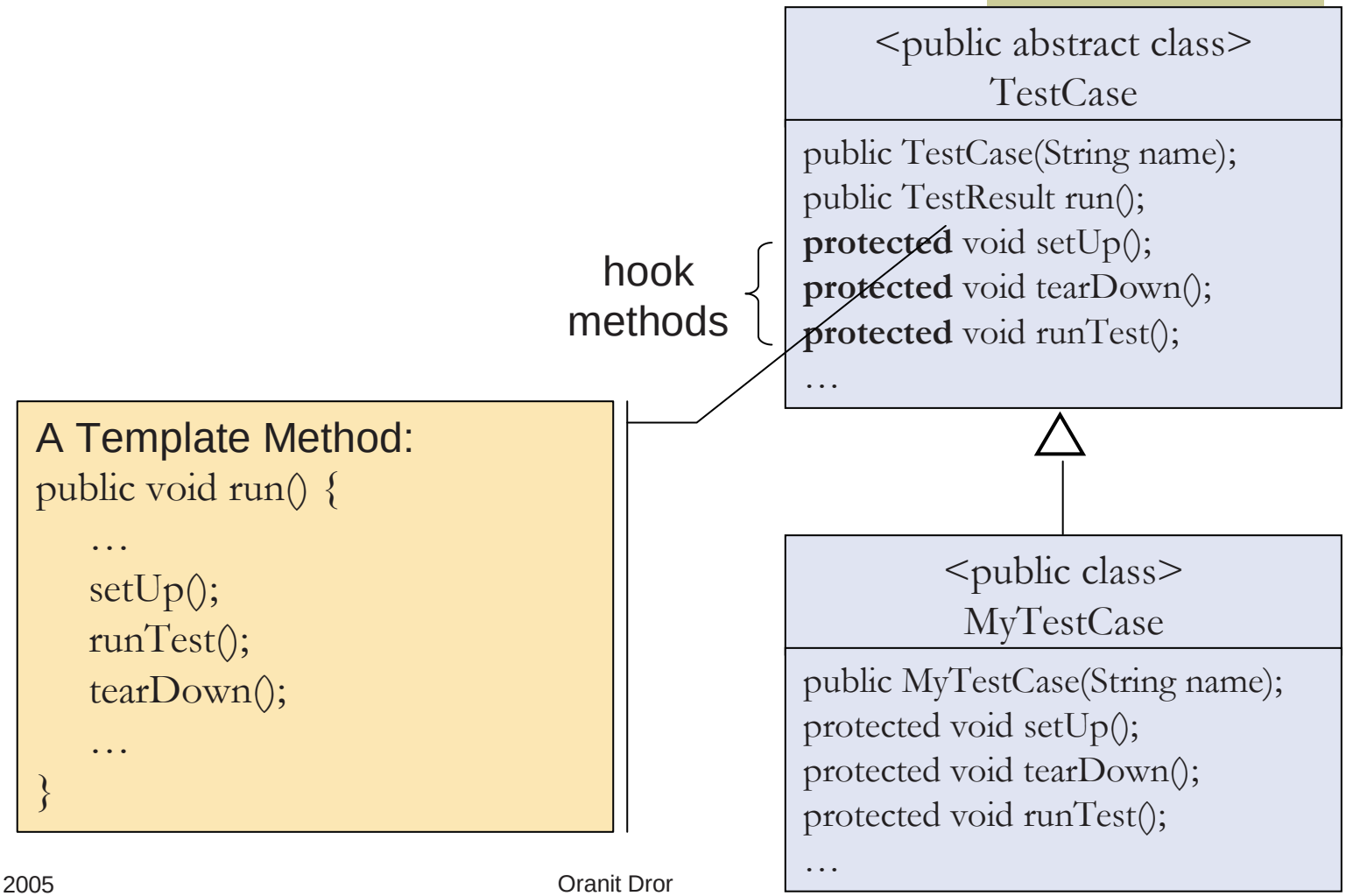
The TestCase Class:

- The fixture to run tests
- A command object.

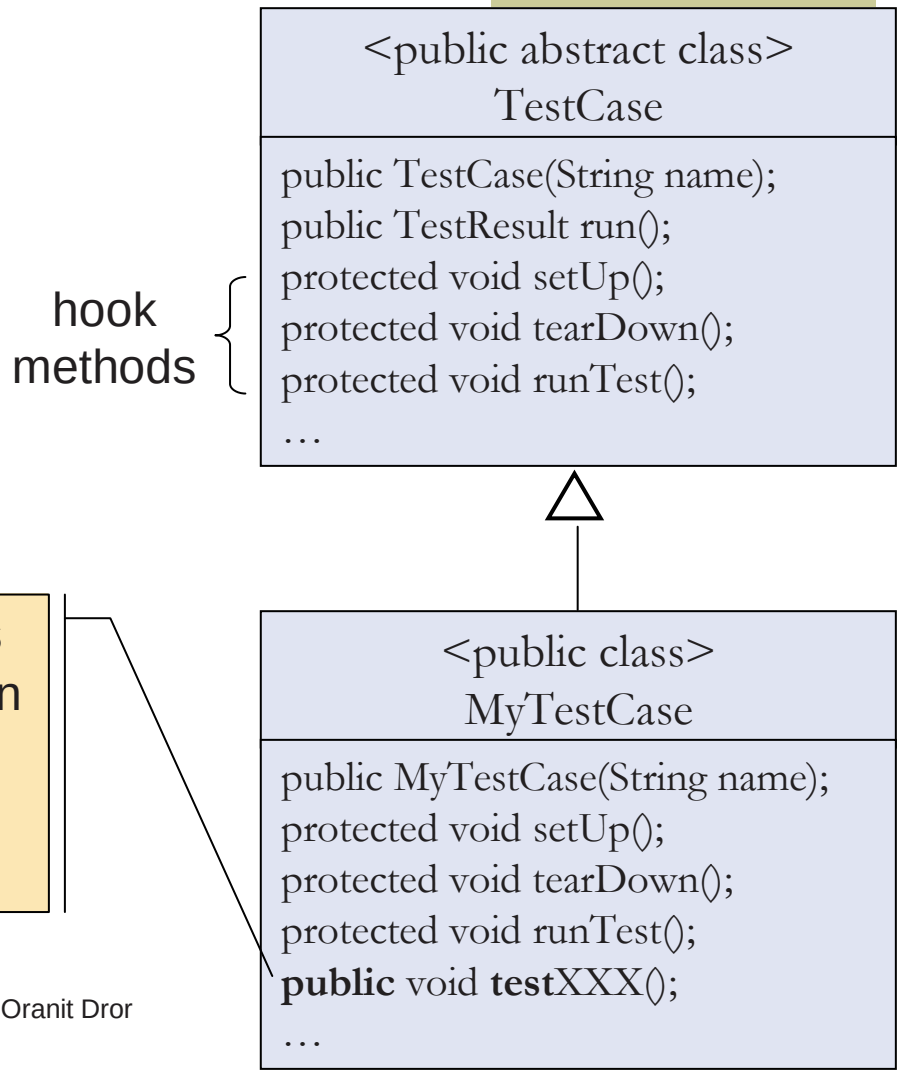
  - encapsulates a command as an object



JUnit Framework (cont.)



JUnit Framework (cont.)

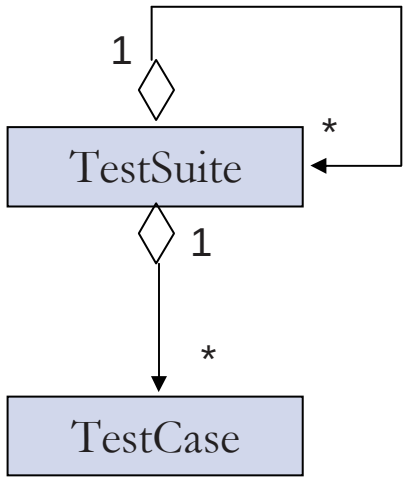


- All public testXXX() methods are invoked through reflection
- setUp() & tearDown() are invoked before & after each testXXX() method.

JUnit Framework

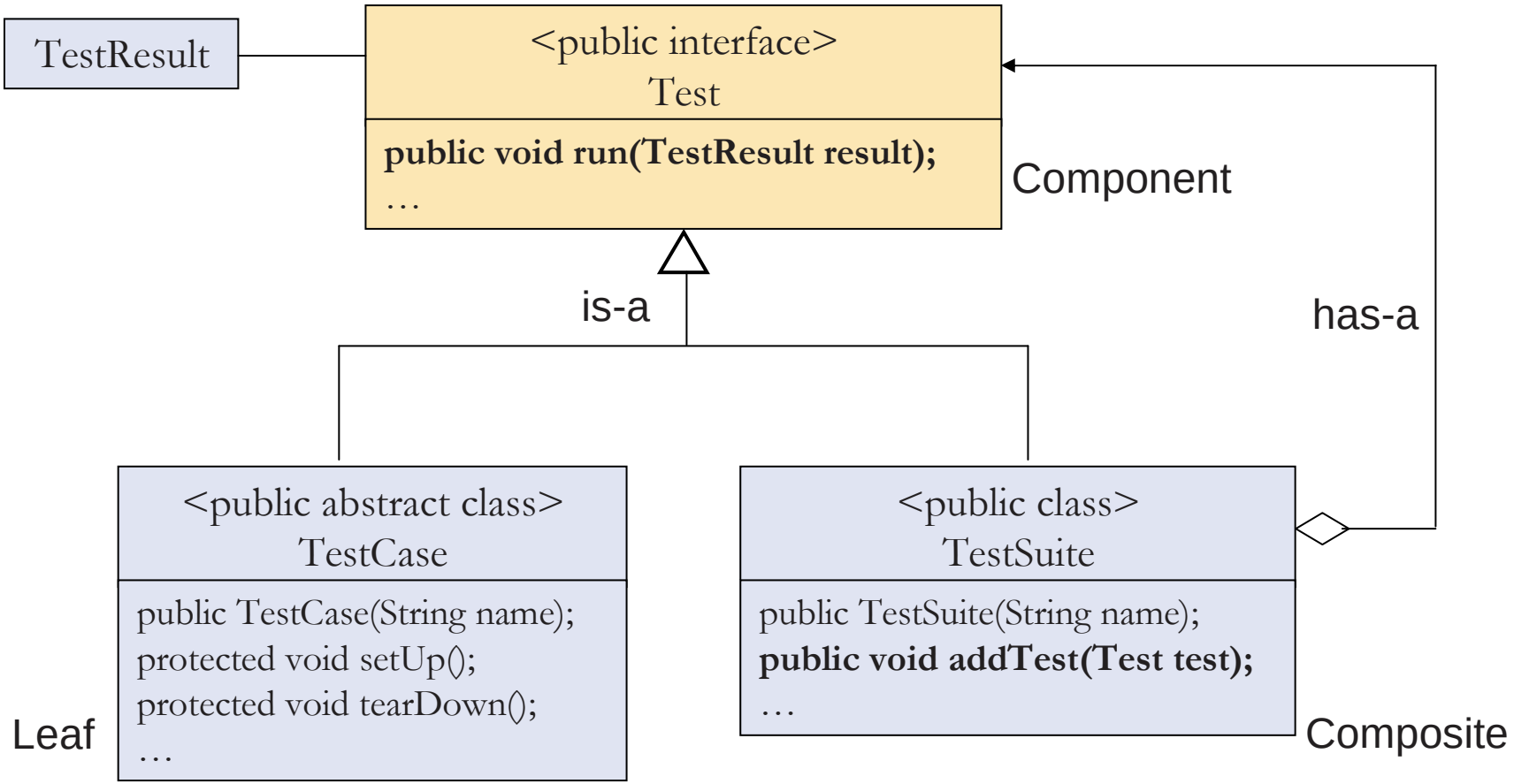
The TestSuite Class:

- TestCases can be grouped into TestSuites
- Grouping is implemented using the Composite design pattern.
- A Composite is a group of objects in which some objects contains others



JUnit Framework (cont.)

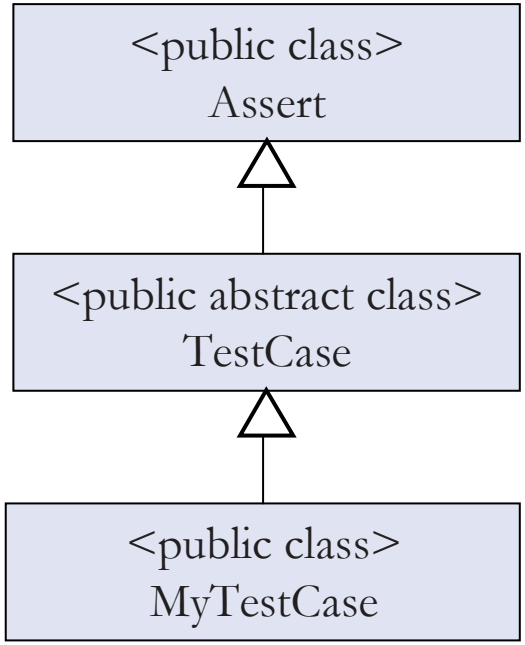
- The Composite Design Pattern:



JUnit Framework (cont.)

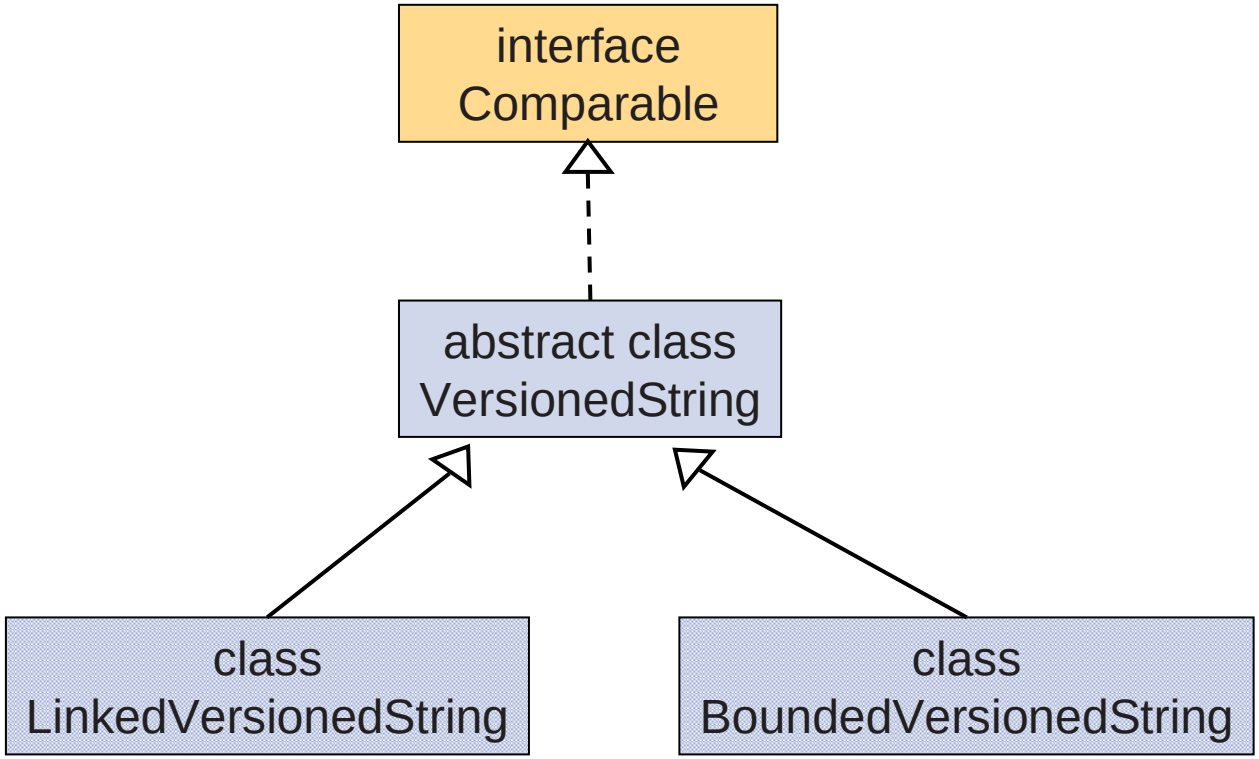
The Assert Class:

- Defines a set of assert methods:
  - assertEquals(…)
  - assertFalse(boolean condition);
  - assertTrue(boolean condition)
  - assertNotNull(Object object);
  - fail();
  - more…



JUnit with Eclipse

Demonstrating black-box tests for:



JUnit with Eclipse (cont.)

Writing a test case for LinkedVersionedString:

- Define a class named LinkedVersionedString**Test**:
  - Extend junit.framework.TestCase
  - Override the setUp() and tearDown() methods
  - Write testXXX() methods with no arguments
  - No need to write a main() method

JUnit with Eclipse (cont.)

- Black-box tests for LinkedVersionedString:
  - *Initial State*: length() == 0
  - add(String s):
    - *Requires*: *s != null*
    - *Ensures*: *length() = old length()+1*
      getVersion(length()) = s
  - int length():
    - *Requires*: *nothing*
    - *Ensures*: *return_value = Number of calls to add() so far*
  - String getVersion(int i):
    - *Requires*: *0 < i ≤ length()*
    - *Ensures* : *return_value != null*

inputs:
0<i<length()
0<i=length()