7. Unit and Integration Testing

Andrea Polini

Software Engineering II – Software Testing
MSc in Computer Science
University of Camerino

Testing Phases and Objectives

- ▶ Unit test: each program unit functions as expected
- ▶ Integration test: integration of more units interact as expected
- ▶ System test: the whole systems behave as expected

Unit testing

Main characteristics

- generally performed by the developer of the unit
- test could be defined before writing the code
- white box adequacy criteria should be defined and targeted

Testing activities

- Test plan
- Test design
- Test codification
- Test environment setting
- Test execution
- Test result analysis

JUnit

What's that

JUnit is the implementation for the Java world of the xUnit framework. This is a framework that support the phases of:

- coding
- environment setting
- execution
- analysis

Integration testing

Integration testing rationale

Integration testing aims at showing mismatches in the interactions among components

Questions to answer

- Integration hierarchy
- Sequencing and stubbing
- Test generation

Assumption: all components have been tested well during unit testing

Integration sequence

Dependencies

The definition of an integration strategy should consider dependency (relations) among units.
In OO programming particularly complex is the management of polymorphism

Programming paradigm

- ► OO Programming
  - inheritance, association, aggregation/composition, dipendenze (uso, chiama, parametro, invia, istanzia)
- ► Procedural programming
  - call graph

Deciding on the integration strategy

Integration hierarchy

- ► Big bang
- ► Top-down
- ► Bottom-up

- ► availability of code
- ► difficulty or ease of constructing stubs
- ► difficulty or ease of constructing drivers
- ► size of the test team
- ► need of showing partially working programs

Optimal test order

The problem of finding an optimal integration sequence is
NP-complete in literature different approaches to derive sub optimal
solutions have been proposed.

- Tai-Daniels
- Traon-Jeron-Jezequel-Morel
- Briand-Labiche-Wang