

# Unit Testing in Object Oriented Design vs Waterfall Software Life- Cycle Management

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# Analysis Phase

## •WF Analysis

- Problem description
- Functional and non-functional requirements
- Diagrams of the system
- Data Dictionary
- Prologue describing each major function
- Black box system validation test cases

## •OO Analysis

- Problem description
- Functional and non-functional requirements
- Entity Relationship Diagrams
- Entity Dictionary
- Prologue describing each entity
- Black box entity validation test cases

# Design Phase

## •WF Design

- Decompose system into modules
  - Determine data structures
  - Develop algorithms
- Develop pseudo-code and/or flow-charts
- Develop cross-reference showing how reqs met by design
- Develop test strategies/classes for integration

## •OO Design

- Develop object diagram
- Determine data structures
- Develop specifications for each object
  - Develop pseudo-code for each operation
- Develop cross-reference mapping functions to objects
- Develop test strategies for class integration

# Programming Phase

## •Structured Programming

- Develop source in pascal, C
- Debug source code including any reused (library) code
- Clean compile of source

## •OO Programming

- Develop source in object pascal, C++, Java
- Debug source code including any reused objects
- Clean compile of source

# Testing Phase

## •WF Testing

- Unit test each function
- Integration test
- Validation test
- Black-box system test
- Regression test as needed
- Log all tests

## •OO Testing

- Unit test each class
- Integration test
- Validation test
- Black-box system test
- Regression test as needed
- Log all tests

# Maintenance Phase

- **WF Maintenance**

- Easier to Implement 4 earlier phases
- Easier to ensure changes do not introduce new bugs

- **OO Maintenance**

- Easier to Implement 4 earlier phases
- Easier to ensure changes do not introduce new bugs

# Unit Test in CS Curriculum

- University of Wisconsin
  - First Class start unit testing

# Unit Test IDE Structure

- Eclipse Project
  - Code Project
  - Test Case Project

# Comparison Project Results

- Graduate Tracking Application
  - WF – 119
  - OO – 597
- ATM Simulation
  - WF – 260
  - OO – 397
- Editor
  - WF – 451
  - OO – 242

# Conclusions

- Unit testing should be integrated into all CS curriculum
- Object Oriented Life-Cycle is better in every case when combined with Unit Testing