Programming errors to avoid

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Playing with HashMap

- **Some eclipse tests**
  - See lesson1 in codeSamples
    - Demo1 to 4

equals and hashCode

- **Always redefined together**
- **Mostly redefined for data object**
- **Eclipse settings :**
  - Preferences - java - compiler - errors/warnings
    - Potential programming problems – Class overrides ‘equals()’ but not ‘hashCode’ => Error

Fields used to compute equals and hashCode

- **Are used in both methods**
- **Generally those who defined object state**
  - Fields that do not define state
    - Cache, temp working variables, coworkers (eventually)
- **Should be immutable (with final reference)**
  - Eclipse preferences - save actions - code style - use ‘final’

2 ways to define equality

- **Object identity defined by reference**
  - Its memory location defines it
  - Fields mutation does not change identity
- **Object identity defined by value**
  - Memory location does not matter
    - You could even have many copy of it (still the same object)
  - Mutate fields destroy the object and create a new one
    - So object defined by value are immutable
- **This is not only a Java issue**

Lessons to learn

- **Difficult to conform to an API**
  - For client and provider (you have to read the doc for correct use)
  - Even hashCode and equals are misused
- **Hard to foresee impacts of variable changes**
- **Most bugs come from wrong state**
  - Programming instructions do not change unlike data
  - Test from clear state ok but crash in running application
- **Mandatory to take care of object state**
- **Prefer usage of immutable**
  - Most simple way to keep state clean
  - Naturally avoid many programming errors
  - Force to define state at construction

Better programming techniques

- **Use immutable objects as much as possible**
  - Immutable collection in guava
  - At least set the maximum possible fields ‘final’ and even immutable
  - http://www.javapractices.com/topic/TopicAction.do?Id=29
- **‘final’ keyword is your friend**
  - Mutable setters should be avoid most of the time
  - Object state defined at construction time (see Demo5)
- **Every implementation class should derived from an interface**
- **Never use ‘new’ operator outside a factory/builder**
  - Inject dependencies (coworkers)
  - Create factory or factory methods for every implementation (see Demo6 - 7)
- Avoid **(see Demo8)**
  - Public static methods
  - Private static fields

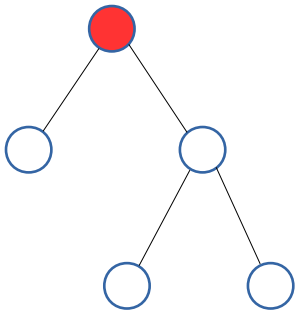
Limitations with immutables

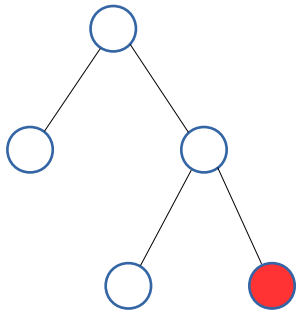
- **Performance issues**
  - Often change the ‘same’ Type object locally
    - Create a TypeBuffer (like StringBuffer)
  - Small updates in a complex object (like tree or list)
    - Collections from vavr library
  - Lot of objects to change often in multiple place
    - Make them mutable
- **But also allow performance improvements**

Immutable Complex Objects

- **Performance issues**
  - List: Changing only one element force to regenerate the whole list

  - Tree: The most inner node force to regenerate the whole tree





Long term objectives

- **Introduce good practices**
  - Annoying for now
  - Basis for other improvements
    - True object oriented programming
    - Introduce to functional programming
    - Truly reliable and fully automated tests
    - State of art in clean architecture design

Reference

- **Effective Java - Joshua Bloch**
- **Out of the Tar Pit - Ben Moseley, Peter Marks**