Design Principles and Design Patterns

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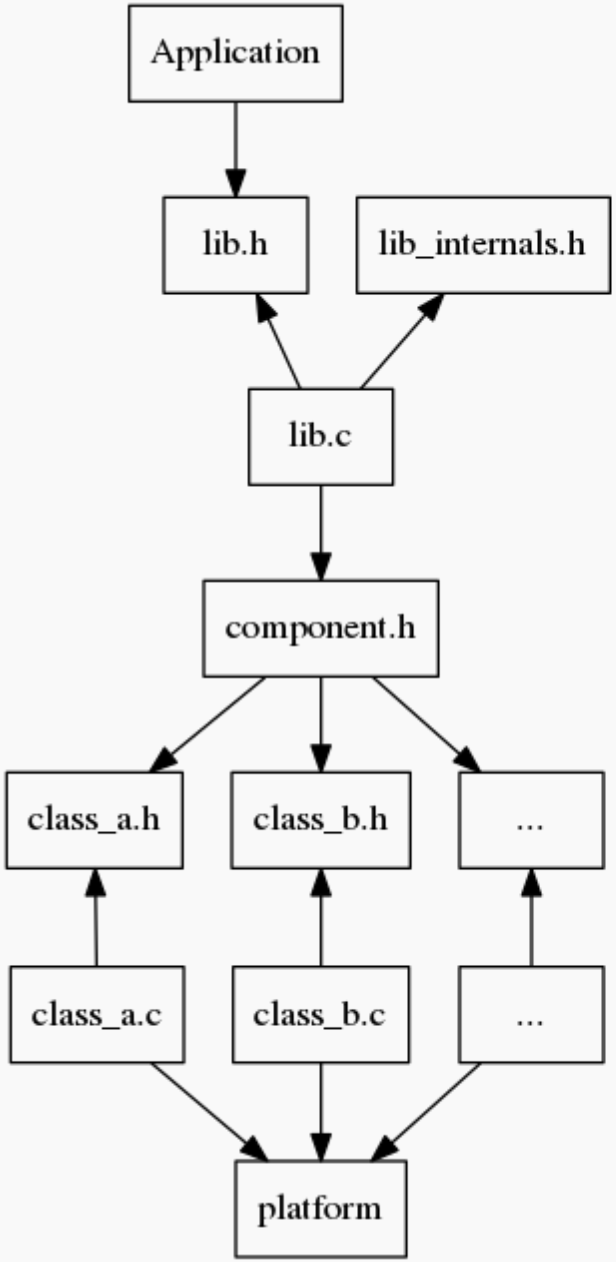
Outline

Outline for section 1

Architecture and Dependencies



User's application code

Library code

Low level code,
written by implementor

Outline for section 2

Symptoms of Rotting Code

Four Symptoms of Rotting Code

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Four Symptoms of Rotting Code

1. Rigidity

Symptoms of Rotting Code

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1. Rigidity
2. Fragility

Symptoms of Rotting Code

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1. Rigidity
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3. Immobility

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1. Rigidity
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4. Viscosity

Symptoms of Rotting Code

Four Symptoms of Rotting Code

1. Rigidity
2. Fragility
3. Immobility
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Rigidity

Rigidity

- Deficient in or devoid of flexibility

Rigidity

- Deficient in or devoid of flexibility
- Software for which extra effort is expended in order to make changes.

Rigidity

How it happens

- Code written in a procedural way

Rigidity

How it happens

- Code written in a procedural way
- Lack of abstractions

Rigidity

How it happens

- Code written in a procedural way
- Lack of abstractions
- Solving a generic problem with implementation specific details

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- Spreading a single responsibility throughout several parts

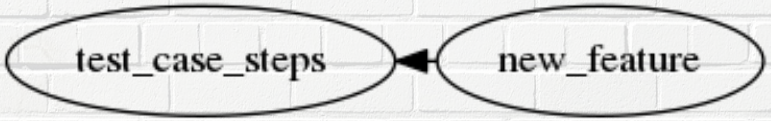
Rigidity

How it happens

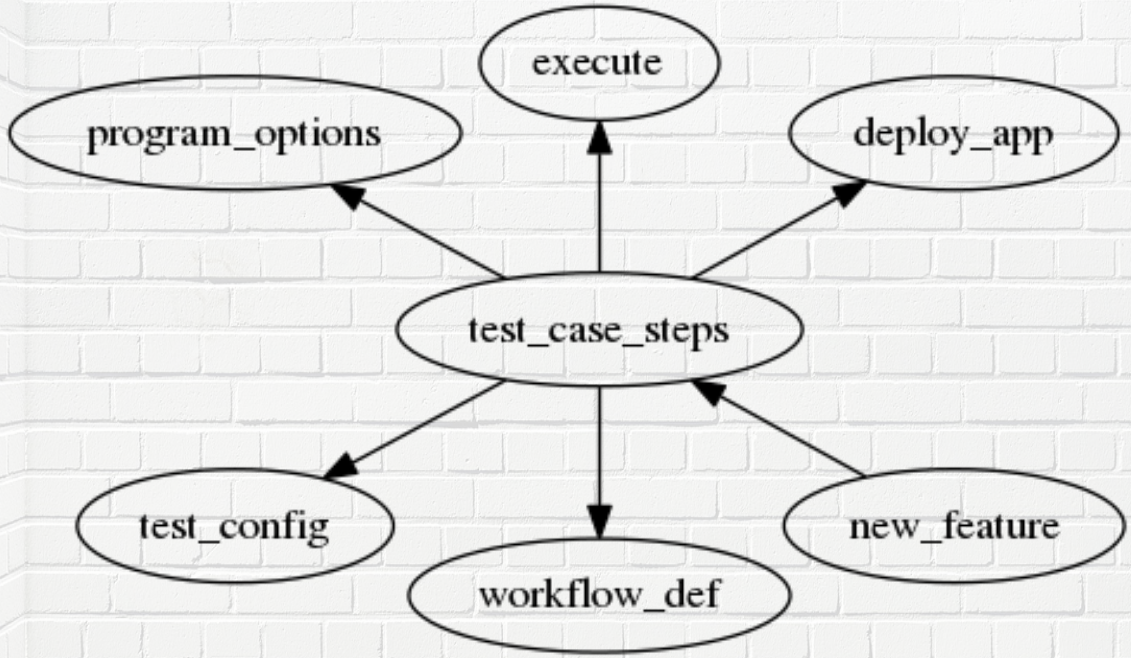
- Code written in a procedural way
- Lack of abstractions
- Solving a generic problem with implementation specific details
- Spreading a single responsibility throughout several parts
- When components need a lot of knowledge about each other in order to function

Rigidity

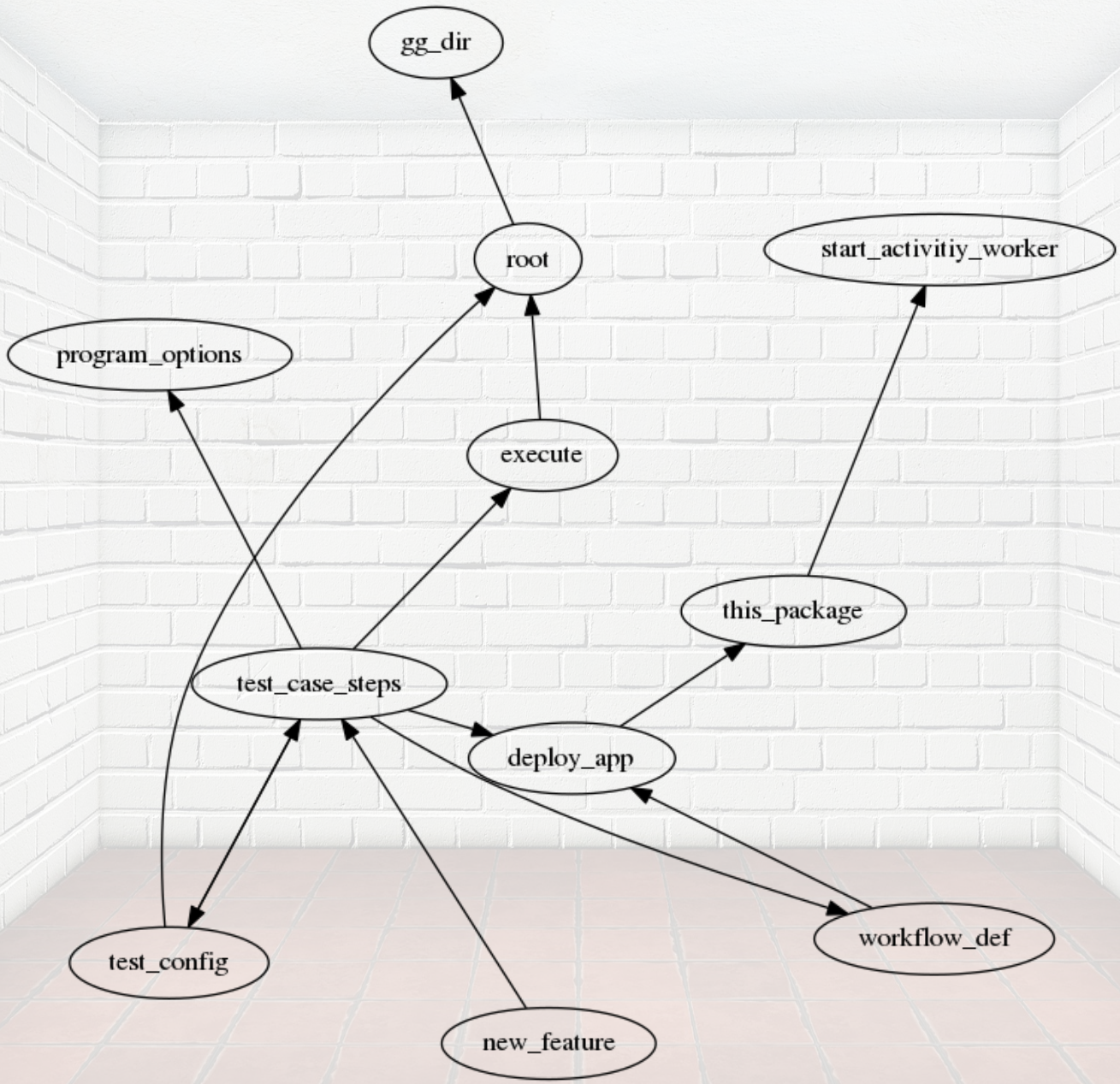
Rigidity



Rigidity


execute
program_options
deploy_app
test_case_steps
test_config
new_feature
workflow_def

Rigidity


gg_dir
root
start_activitiy_worker
program_options
execute
this_package
test_case_steps
deploy_app
workflow_def
test_config
new_feature

Rigidity

How to avoid it

- Break the code into smaller, self-contained concepts

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- Solve the details and provide a problem oriented abstraction

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Rigidity

How to avoid it

- Break the code into smaller, self-contained concepts
- Solve the details and provide a problem oriented abstraction
- Solving a generic problem with implementation specific details
- Write DRY code (Don't repeat yourself)
- Define the code in logical pieces. Set boundaries and responsibilities.

Fragility

Fragility

- Easily broken or destroyed

Fragility

- Easily broken or destroyed
- Software for which extra risk is incurred in order to make changes.

Fragility

How it happens

- Implicit dependencies

Fragility

How it happens

- Implicit dependencies
- Relying on implementation details

Fragility

How it happens

- Implicit dependencies
- Relying on implementation details
- Relying upon side effects of operations

Fragility

How it happens

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- Relying on implementation details
- Relying upon side effects of operations
- Reaching past abstraction layers

Fragility

How it happens

- Implicit dependencies
- Relying on implementation details
- Relying upon side effects of operations
- Reaching past abstraction layers
- Unmanaged complexity

Fragility

```
int foo(void)
{
    // TODO: Write example of fragile code
}
```

Fragility

How to avoid it

- Implicit dependencies

Fragility

How to avoid it

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- Law of Demeter: principle of least knowledge

Fragility

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- Implicit dependencies
- Law of Demeter: principle of least knowledge
- Avoid side effects, and don't rely on the side effects of other modules

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- Rely on the published API

Fragility

How to avoid it

- Implicit dependencies
- Law of Demeter: principle of least knowledge
- Avoid side effects, and don't rely on the side effects of other modules
- Rely on the published API
- Invent and **simplify**

Immobility

Immobility

- Incapable of being moved

Immobility

- Incapable of being moved
- Software for which extra effort is required in order to reuse.

Immobility

How it happens

- Direct dependency on things you don't own

Immobility

How it happens

- Direct dependency on things you don't own
- Too many responsibilities

Immobility

How it happens

- Depend upon the concept, not the details

Immobility

How it happens

- Depend upon the concept, not the details
- Reduce responsibilities to solve distinct problems

Viscosity

Viscosity

- Having or characterized by a high resistance to flow

Viscosity

- Having or characterized by a high resistance to flow
- Software for which extra effort is required in order to reuse.

Viscosity

Code that takes effort to maintain correctly

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- Viscous Design

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Code that takes effort to maintain correctly

- Viscous Design
- Viscous Environment

Viscosity

Code that takes effort to maintain correctly

- Viscous Design
  - When changing, preserving the design is difficult
- Viscous Environment

Viscosity

Code that takes effort to maintain correctly

- Viscous Design
  - When changing, preserving the design is difficult
- Viscous Environment
  - Long builds

Viscosity

Code that takes effort to maintain correctly

- Viscous Design
  - When changing, preserving the design is difficult
- Viscous Environment
  - Long builds
  - Slow Tests

Outline for section 3

Principles of Object Oriented Class Design

SOLID Principles

- Single Responsibility Principle (SRP)
- Open Closed Principle (OCP)
- Liskov Substitution Principle (LSP)
- Interface Segregation Principle (ISP)
- Dependency Inversion Principle (DIP)

Outline for section 4

Principles of Package Architecture

- Package Cohesion

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- Package Coupling

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  - Release Reuse Equivalency Principle (REP)
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  - Stable Dependencies Principle (SDP)

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  - Stable Dependencies Principle (SDP)
  - Stable Abstractions Principle (SAP)

title

Outline for section 5

Principles of Package Architecture

Outline for section 6

Principles of Package Architecture

References

- https://fi.ort.edu.uy/innovaportal/file/2032/1/design_principles.pdf
- http://www.butunclebob.com/ArticleS.UncleBob.PrinciplesOfOod
- http://notherdev.blogspot.com/2013/07/code-smells-rigidity.html
- https://dev.to/bob/how-do-you-know-your-code-is-bad
- http://staff.cs.utu.fi/~jounsmed/doos_06/slides/slides_060321.pdf
- https://softwareengineering.stackexchange.com/questions/357127/clear-examples-for-code-smells

Questions