Challenging Common Software Design Principles: Do they always make for better software?

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Webinar Outline

- Brief History of some Common Software Design Principles
- Iterative Development
- “Form Follows Function”
- The SOLID principles
  - Single Responsibility
  - Open / Closed
  - Liskov Substitution
  - Interface Segregation
  - Dependency Inversion
- Software Craftsmanship

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Some History

- In February 2001, a group of software professionals designed the Agile Manifesto
- **Individuals and interactions** over Processes and tools
- **Working software** over Comprehensive documentation
- **Customer collaboration** over Contract negotiation
- **Responding to change** over Following a plan

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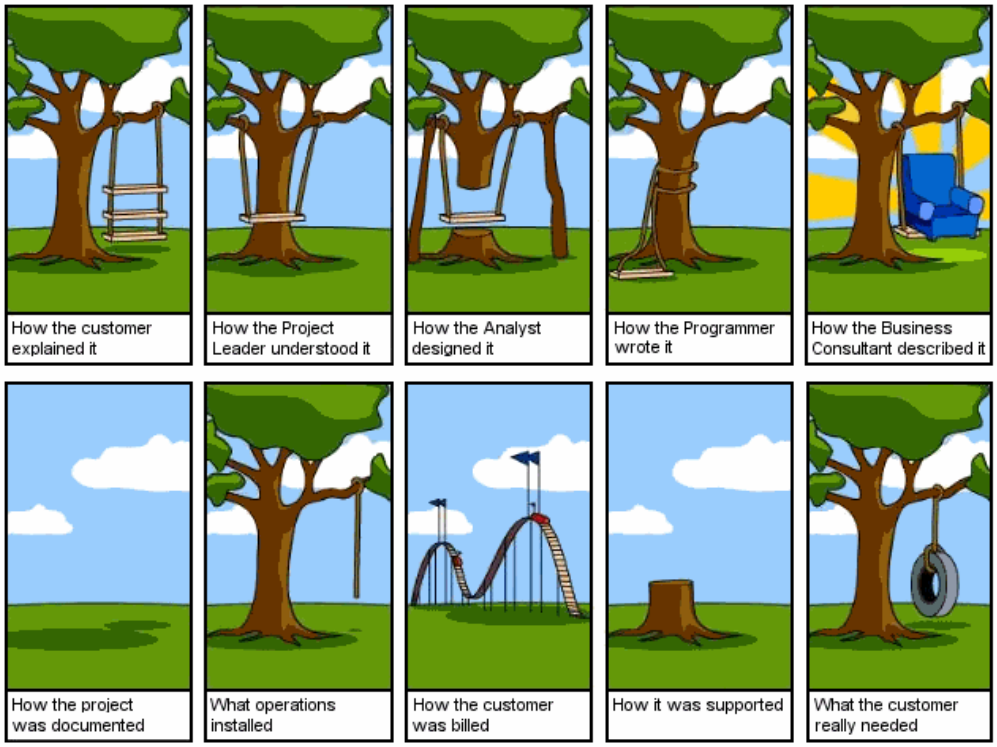
Each Iteration is Better



- "A process of repeating a set of operations until a specific result is achieved".
- With software we can typically build something quickly for stakeholders to review.
- From that feedback, we can revise the design.
- Stakeholders often don't know what they want, so iterating will help figure that out

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Why Iterating May Fail

- All stakeholders must have a clear vision of the final product
  - This is rarely the case
- Each cycle should narrow the possibilities of change
  - Sometimes the possibilities of change open up with each iteration
- Convergence may not happen
  - The project runs out of time and what ever is complete is what is delivered

Design Iteration – Denmark Furniture from the 1950s

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So What To Do?

- Iteration is still a great way to break down a large project into smaller chunks
- A design that meets all its goals perfectly will not always lead to the simplest design.
  - Sometimes meeting the top few most important goals leads to the simplest design
  - The simplest software is the most beautiful software
- Stop before you made it too perfect

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Form Follows Function

- Attributed to a book by Peter Blake called "Form follows Fiasco"
  - Function should be the utmost important in any design
- If function is met in the purest, most simple way, the form follows and it will be beautiful
- What is the success criteria?

From *Universal Principles of Design.*

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 {
"coord":{"lon":12.4958,"lat":41.903},
"sys":{"country":"Italy","sunrise":1369107818,"sunset":1369160979},
"weather":[{
        "id":802,"main":"Clouds","description":"scattered clouds",
         "icon":"03d"}],
"base":"global stations",
"main":{
           "temp":290.38,
           "humidity":68,
           "pressure":1015,
           "temp_min":287.04,
           "temp_max":293.71},
"wind":{
           "speed":1.75,
           "deg":290.002},
 "clouds":{"all":32},
"dt":1369122932,
"id":3169070,
"name":"Rome",
"cod":200
}
```


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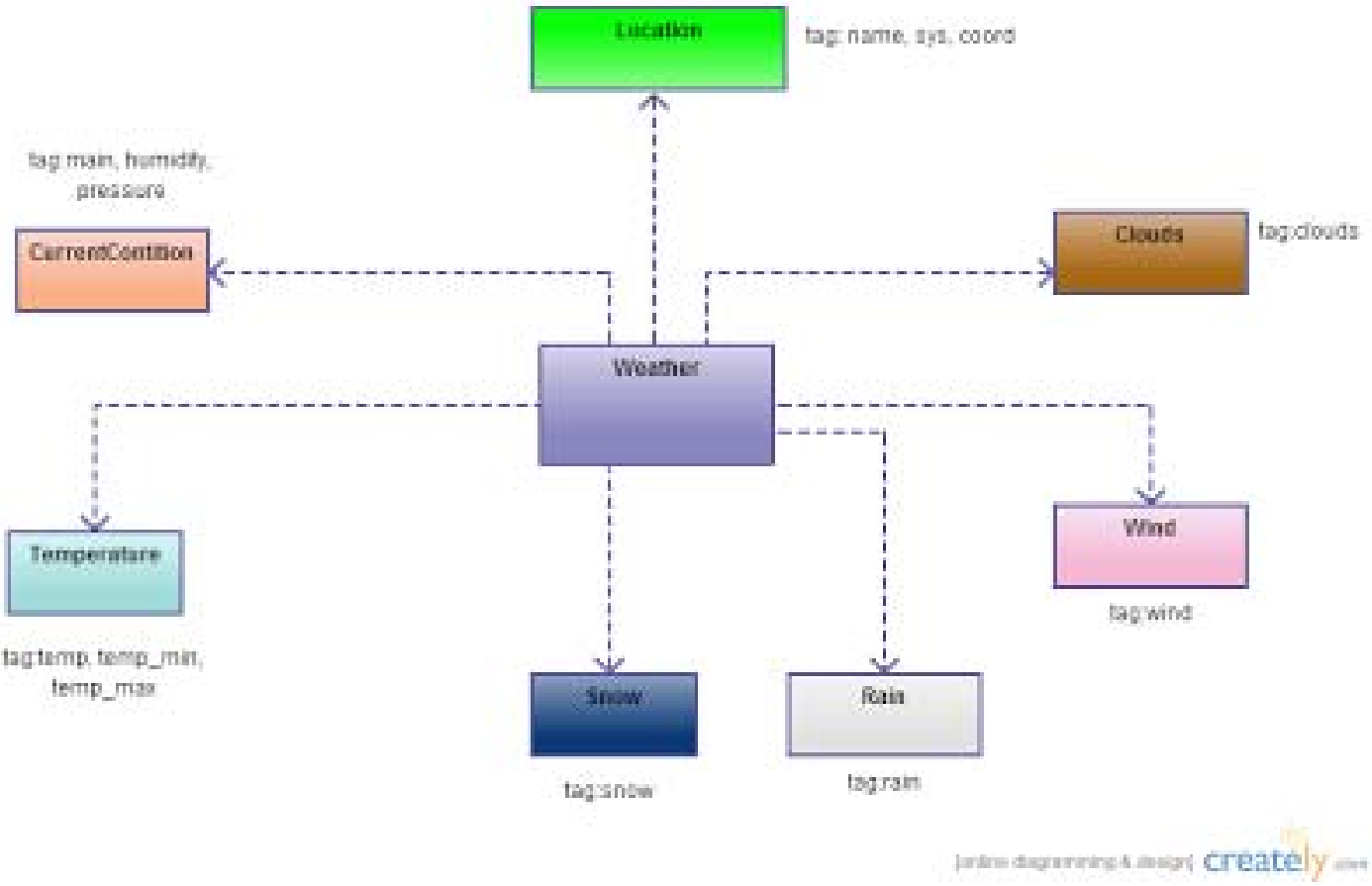
Form Follows Function Example in Software



From http://www.survivingwithandroid.com/2013/05/build-weather-app-json-http-android.html

Show Code Examples

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Building 20

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Form Varies With Function

- Chair made to be also a Clothes Hanger

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Single Responsibility Principle (Robert Martin)

- Every class/module should have a single responsibility over a part of the function.
- The function-part should be encapsulated and the class should do that and only that.
- Example:
  - A class that compiles AND prints a report violates this principle
  - If the content of the report changes, the class must change.
  - If the format of the print must change, then the class changes.

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Issues with SRP

- Needs change over time and software is repurposed
  - Examples

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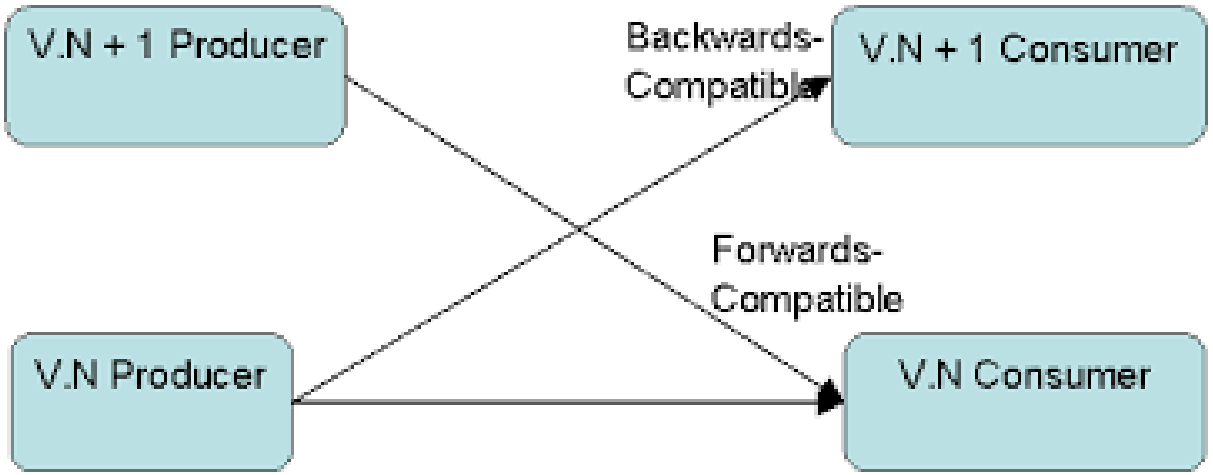
Open/Closed Principle

- Classes/modules should be closed for modification but open for extension



From www.w3.org

Liskov Substitution Principle

- If S is a subtype of T, then objects of type T may be replaced with objects of type S (i.e., objects of type S may *substitute* objects of type T) without altering any of the desirable properties of that program (correctness, task performed, etc.)
- Also called (strong) behavioral subtyping

LSP Examples

- Classic example of breaking LSP
  - Inheritance: Square *is a* Rectangle
- In Windows
  - Grid, StackPanels, Canvas
  - Each based on the Panel Class
    - *Can contain* multiple controls
  - Programmers subclass Canvas instead and create their own custom controls
  - This is a violation and will break when passing around panels.

Example from http://www.codeproject.com/Articles/597870/Liskov-Substitution

Interface Segregation Principle

- No client should be forced to depend on methods it does not use
- Split interfaces which are very large into smaller specific ones
  - clients will only have to know about the methods that are of interest to them

A Job doesn't violate ISP

- Consider a Print Job, a Scan Job, a Fax Job, a Copy Job
  - They are all Jobs
- There is no Staple Job, just properties on Jobs
- Jobs can be moved through a system without the system knowing what they do
- Based on job properties, things will occur while processing (like stapling)

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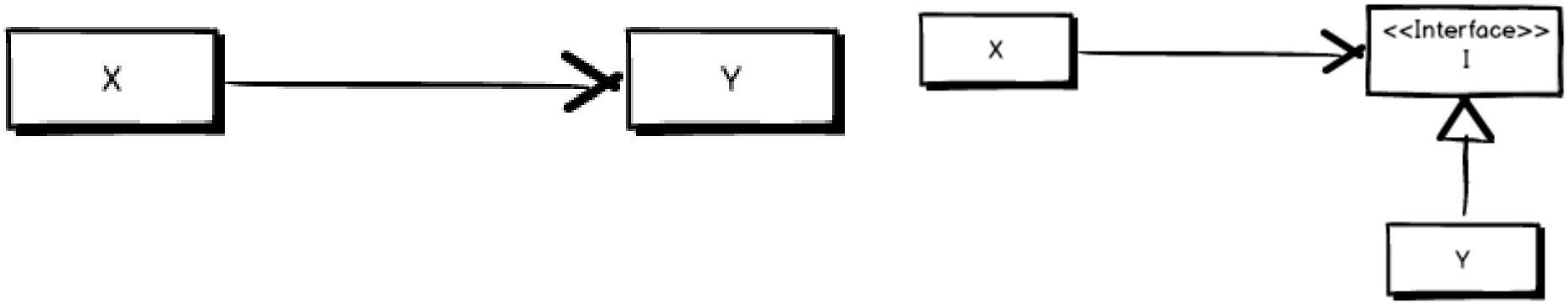
Dependency Inversion Principle

- High-level modules should not depend on low-level modules. Both should depend on abstractions
- Abstractions should not depend on details. Details should depend on abstractions.



Picture from http://joelabrahamsson.com/inversion-of-control-an-introduction-with-examples-in-net/

DIP

- Creating dependencies is a risk
  - Handling that risk has some cost.
- What is the life of your software? Is it worth breaking things apart
- We don’t use DIP in all software
  - Think of the String class – we use it directly.

Software Craftsmanship

Not only working software,
but also well-crafted software
Not only responding to change,
but also steadily adding value
Not only individuals and interactions,
but also a community of professionals
Not only customer collaboration,
but also productive partnerships

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The Software

Stage 1: Innocent

Stage 2: Exposed

Stage 3: Apprentice

Stage 4: Practitioner

Stage 5: Journeyman

Stage 6: Master

Stage 7: Researcher

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From http://www.wayland-informatics.com/The%20Seven%20Stages%20of%20Expertise%20in%20Software.htm

Summary

- Most principles were built upon previous principles and have been around a long time
  - There is some truth to them
- The principles discussed today have some goodness to them
- Depending on the context, principles should be violated
- Adhering to principles is not free and should be used wisely
- Most teams have people that do not have the skills to follow all the principles

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