

CS 4350: Fundamentals of Software Engineering

Lesson 2.1 Three Scales of Design: Introduction

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Outline of this week's lessons

- Design as a way of communicating
- Three Scales of Design
 - The Architectural Level
 - The Interaction Scale ("Design Patterns")
 - The Object Scale (UML, etc.)

Learning Goals for this Lesson

- At the end of this lesson, you should be able to
 - explain why design is important
 - identify three different scales of design
 - for each of the scales:
 - be able to give examples of vocabulary words at each scale

Overall question: How to explain some mass of code

- A Design is an Explanation
 - of what?
 - for whom?
 - what gets added to the code?
 - what gets left out?



Explain to whom?

- Software systems must be comprehensible by humans
- Which humans?
 - The other members of your team
 - The folks who will maintain and modify your system
 - Management
 - Your clients
 - and ...
 - You, a week from now or 6 weeks from now

A Design is more than code

- Design is about **how your code relates to the real world**
- Design is about the **organization** of the code
- Design is about the **relationships** between different pieces of the code
- So: you need a different language to talk about your design

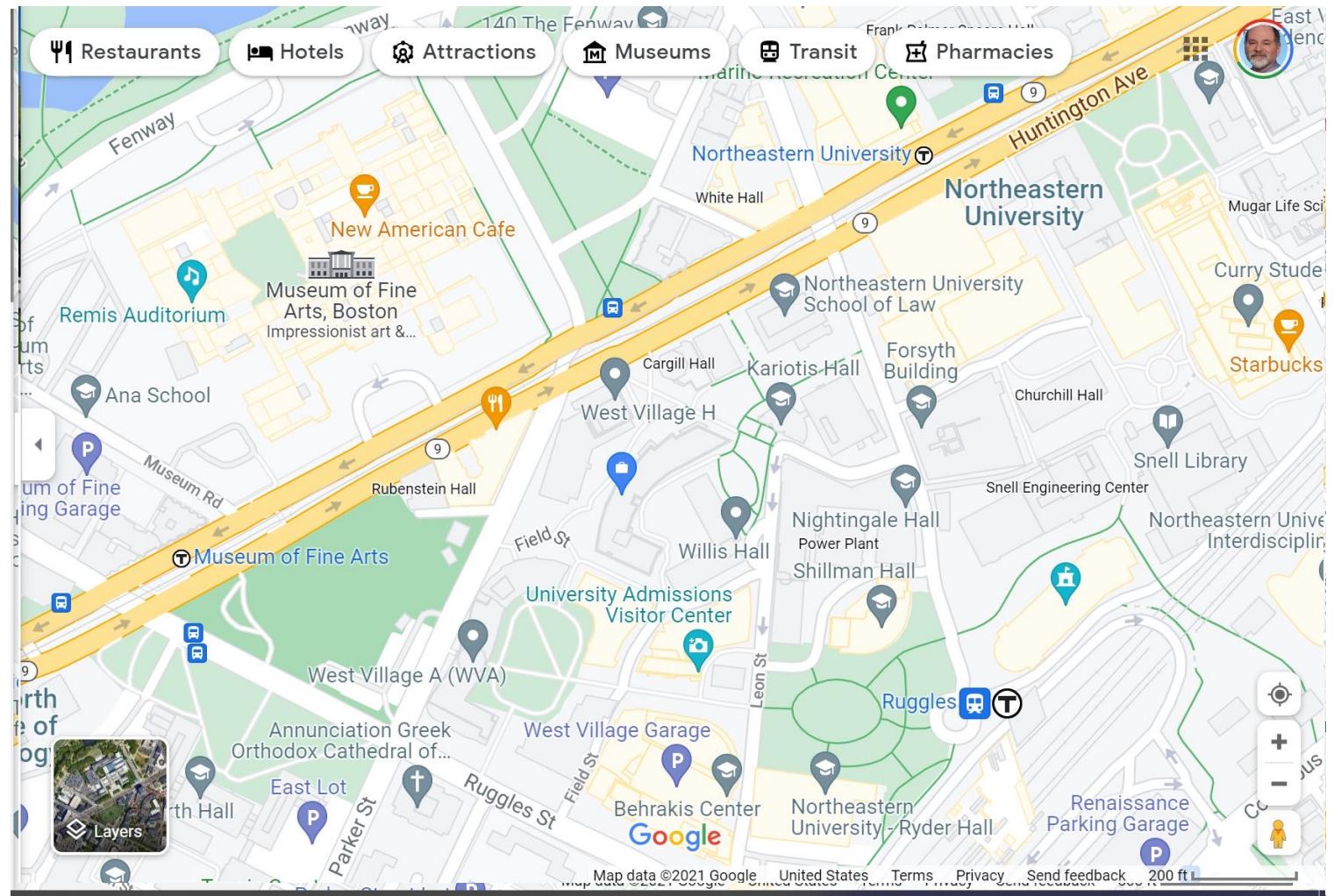
Remember Principle
#2: Make Your
Data Mean
Something!

Communication Requires a Shared Vocabulary

- You and your teammates need to have a common understanding of the **things** in your program.
 - What are the “things”
 - What are their names?
 - What do they represent?
 - How do they interact?

A Design is Less Than the Code

- An explanation is always a map of the code
- Just like a map, it may have more detail or less, depending on the audience and the goal



The Three Scales of Design

The Architectural Scale

- key questions: what are the pieces? how do they fit together to form a coherent whole?

The Interaction Scale

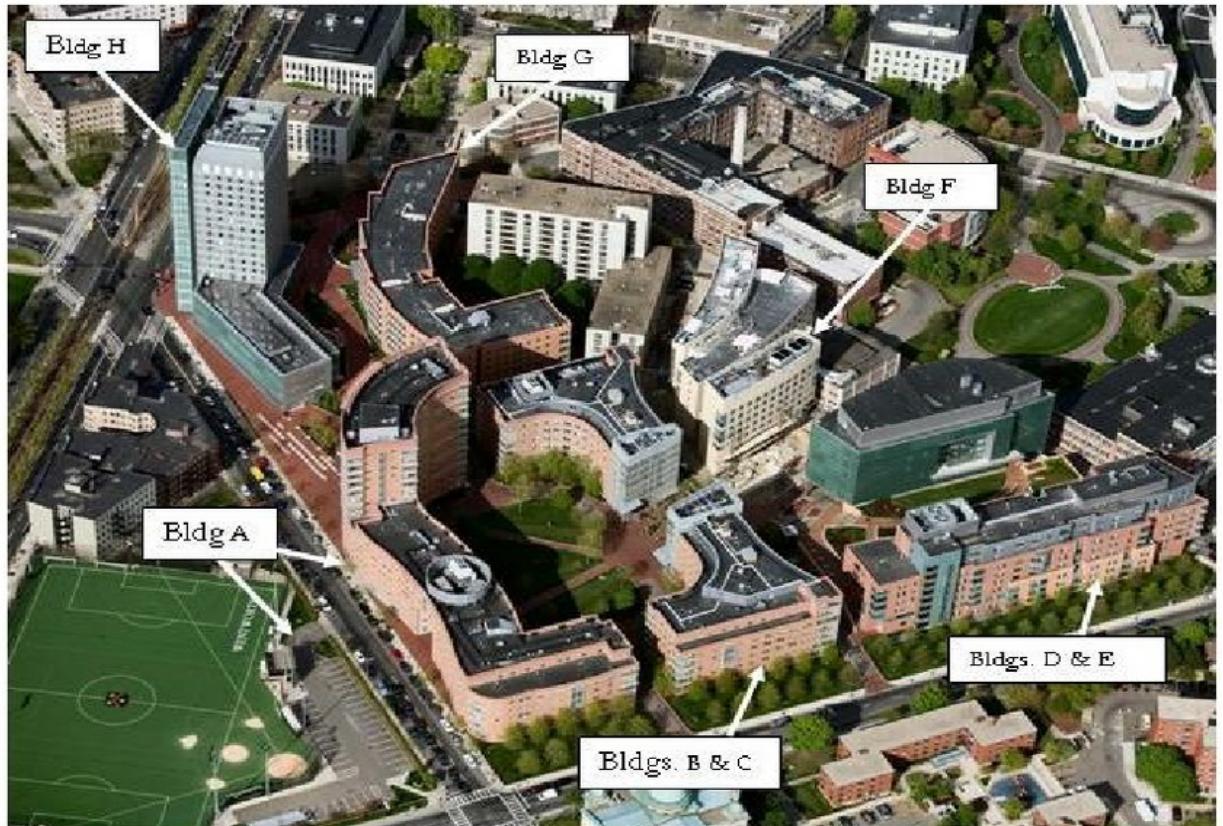
- key questions: how do the pieces interact? how are they related?

The Object Scale

- key questions: what is in each piece? how does each piece communicate with other pieces?

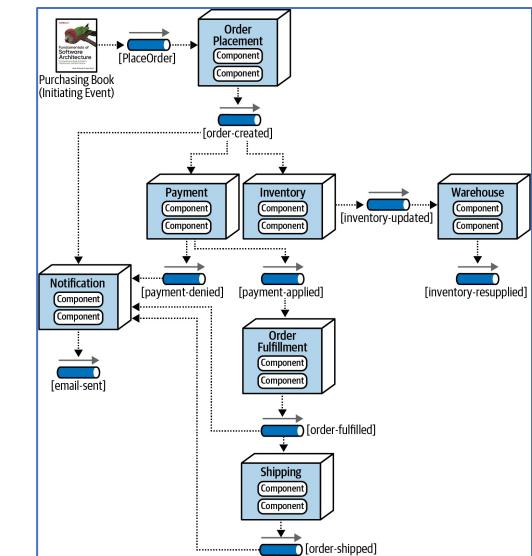
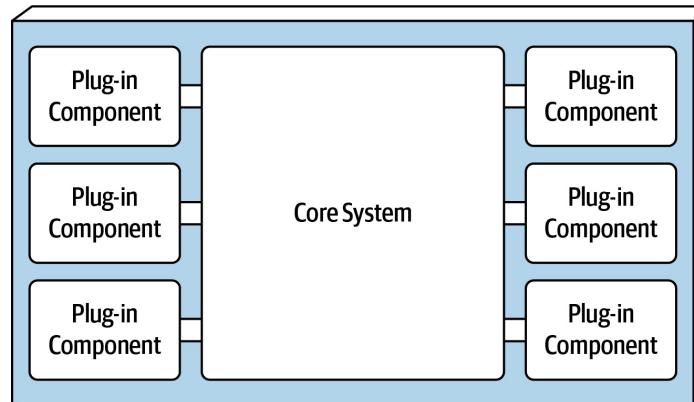
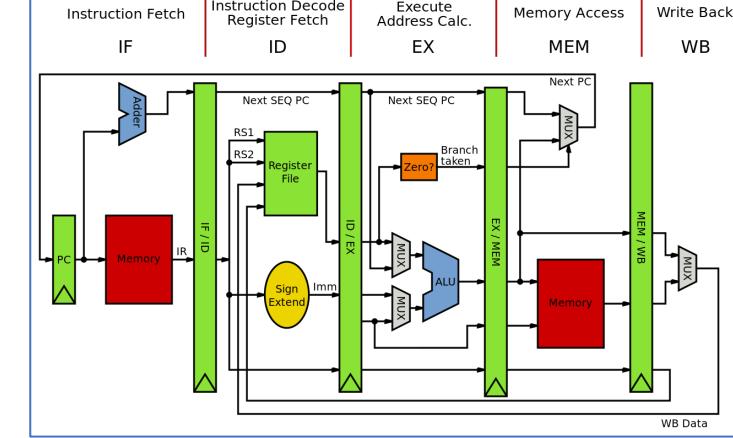
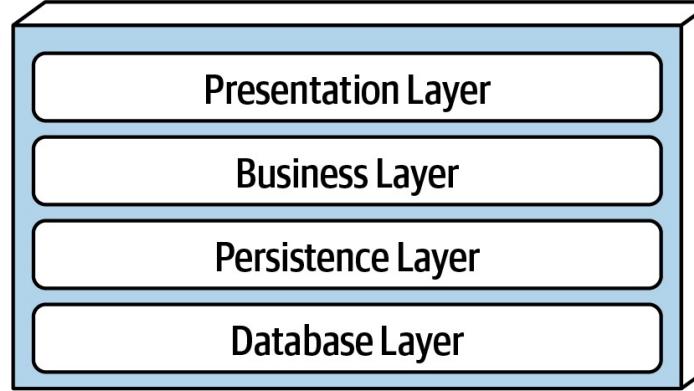
The Architectural Scale

- key questions: what are the pieces? how do they fit together to form a coherent whole?



The Architectural Scale: Examples of Architectural Styles

- Object-oriented
- Layered
- Pipeline
- Microkernel
- Event-Driven



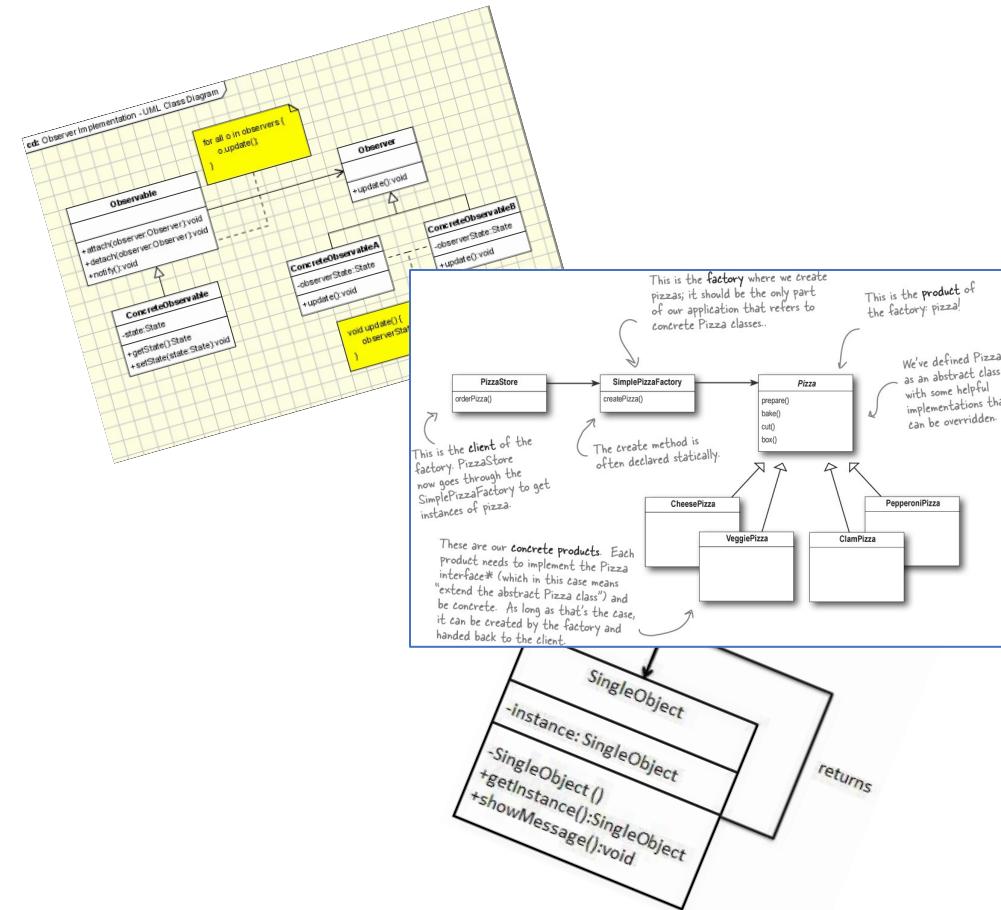
The Interaction Scale

- Key question: how do the pieces interact?
- We have names for some of the possible ways.
- A few of them are canonized as "Design Patterns".
- But the others are just as valid; we'll call them by names that people are likely to recognize.



The Interaction Scale: Examples

- Observer Pattern
- Factory Pattern
- Singleton pattern



The Object Scale

- key questions: what is in each piece? What names does each piece use to communicate with other pieces?
- An abstraction of the actual code (vs of the world)
- Choose what details to include
- Languages for recording object-scale design
 - UML diagrams
 - CRC cards
 - Javadoc, etc.



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