

SOFTWARE ARCHITECTURE AND DESIGN

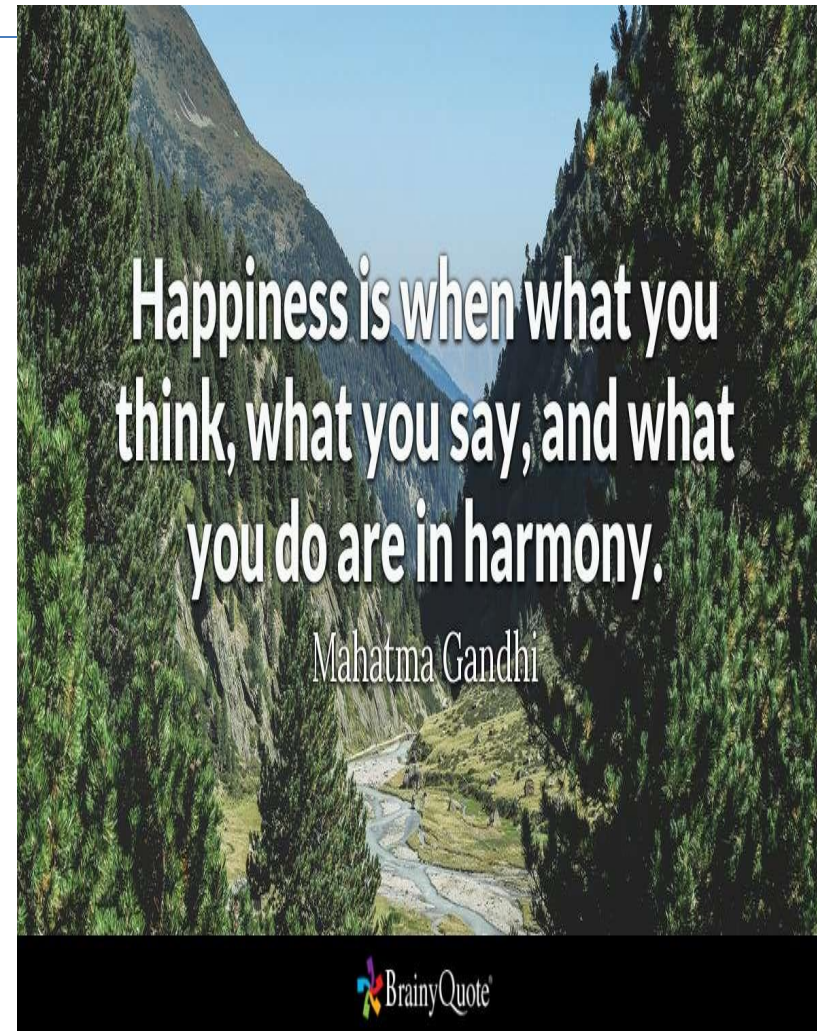
Trần Đình Quế

Mail: tdque@yahoo.com

Phone: 0904066883

Course Contents

- Architecture design
- Architecture patterns
- **Subsystem/detailed design
[components/packages
/classes]**
- Design patterns
- Design intelligent systems



Questions???

1. How to identify/discover classes?
2. How to define relationships among classes? Based on what? (attributes, methods)
3. How to identify packages?

1. Identify/discover classes?

- Use case - Scenarios? Extracting nouns
//refer to Giáo trình PT&TK, tdque
- Agile methodology? User stories
- CRC Card?
- VP for constructing user stories & crc cards

Agile Methodology: User stories

- <http://yodiz.com/help/agile-user-stories-and-groomed-product-backlog/>
- <https://www.yodiz.com/blog/writing-user-stories-examples-and-templates-in-agile-methodologies/>
- <http://www.agilemodeling.com/artifacts/userStory.htm>
- <https://www.alexandercowan.com/best-agile-user-story/>
- <https://reqtest.com/agile-blog/better-user-stories/>
- <https://stormotion.io/blog/how-to-write-a-good-user-story-with-examples-templates/>

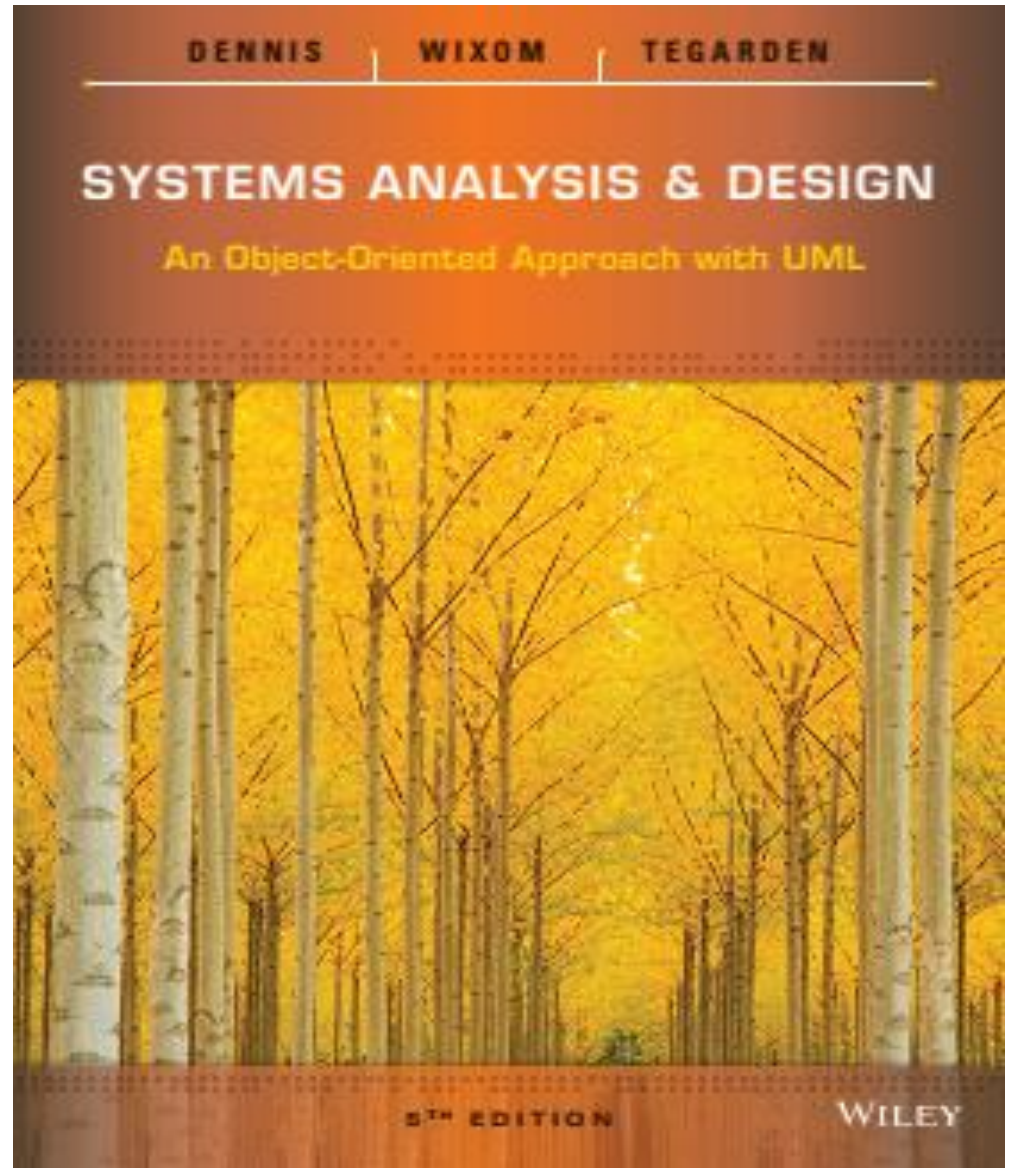
VP for user stories

- https://www.visual-paradigm.com/support/documents/vpuserguide/2607/2825_userstory.html

CRC card: what? How?

**Class Responsibility
Collaborator (CRC)**

**This book, page
172**



CRC card: what? How?

- <http://agilemodeling.com/artifacts/crcModel.htm>
- <https://www.youtube.com/watch?v=59tkQ-FwcpA>

CRC Card

- **Class-Responsibility-Collaborator cards** https://www.cs.uct.ac.za/mit_notes/software/htmls/ch05s19.html
- Class-responsibility-collaborator cards (CRC cards) are not a part of the UML specification, but they are a useful tool for organizing classes during analysis and design.
- A CRC card is a physical card representing a single class. Each card lists the class's name, attributes and methods (its responsibilities), and class associations (collaborations). The collection of these CRC cards is the CRC model.
- Using CRC cards is a straightforward addition to object-oriented analysis and design:
 - Identify the classes.
 - List responsibilities.
 - List collaborators.
- CRC cards can be used during analysis and design while classes are being discovered in order to keep track of them.
- CRC cards have various benefits, which you might notice makes them very amenable to iterative and incremental process models, especially agile ones:
 - They are **portable**: because CRC cards are physical objects, they can be used anywhere. Importantly, they can easily be used during group meetings.
 - They are **tangible**: the participants in a meeting can all easily examine the cards, and hence examine the system.
 - They have a **limited size**: because of their physicality, CRC cards can only hold a limited amount of information. This makes them useful to restricting object-oriented analysis and design from becoming too low-level.
- Class responsibilities are the class's attributes and methods. Clearly, they represent the class's state and behaviour. Collaborators represent the associations the class has with other classes.
- CRC cards are useful when the development of classes need to be divided between software engineers, as the cards can be physically handed over to them. A useful time to do this is when classes are being reviewed, for, say, determining whether they are appropriate in a design.

VP for CRC card??

- https://www.visual-paradigm.com/support/documents/vpuserguide/94/1289/6518_drawingcrcca.html

2. Class Relationships

- Understand relationships??
- Discover relationships? Interesting problem?
- Use this relationship but not that ones??
- Correct or incorrect??

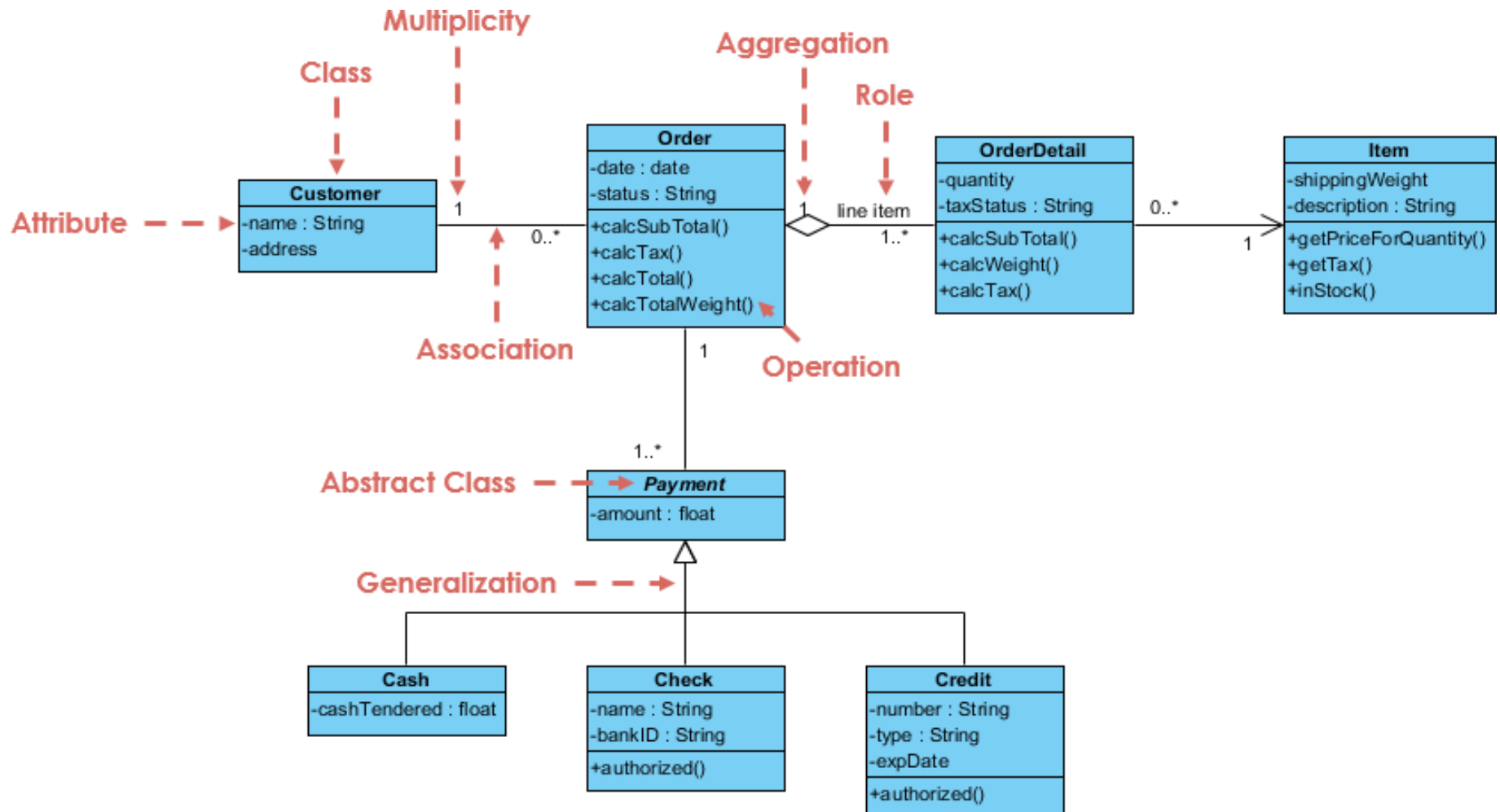
Class Relationships

- <https://www.visual-paradigm.com/guide/uml-unified-modeling-language/uml-class-diagram-tutorial/>



Relationship?

Why using association
Between Customer and
Order??



Class diagram

Student analyzes the following class diagrams

- <https://www.uml-diagrams.org/class-diagrams-examples.html>
- <http://agilemodeling.com/artifacts/classDiagram.htm>
- <https://www.uml-diagrams.org/library-domain-uml-class-diagram-example.html>
- <https://www.educative.io/courses/grokking-the-object-oriented-design-interview/RMIM3NgjAyR>
- <https://circle.visual-paradigm.com/on-demand-model-etl-example-lms/>

“The more I learn, the more I realize how much I don't know” – Albert Einstein



Happiness is when what you think, what you say, and what you do are in harmony.

Mahatma Gandhi

Questions?????

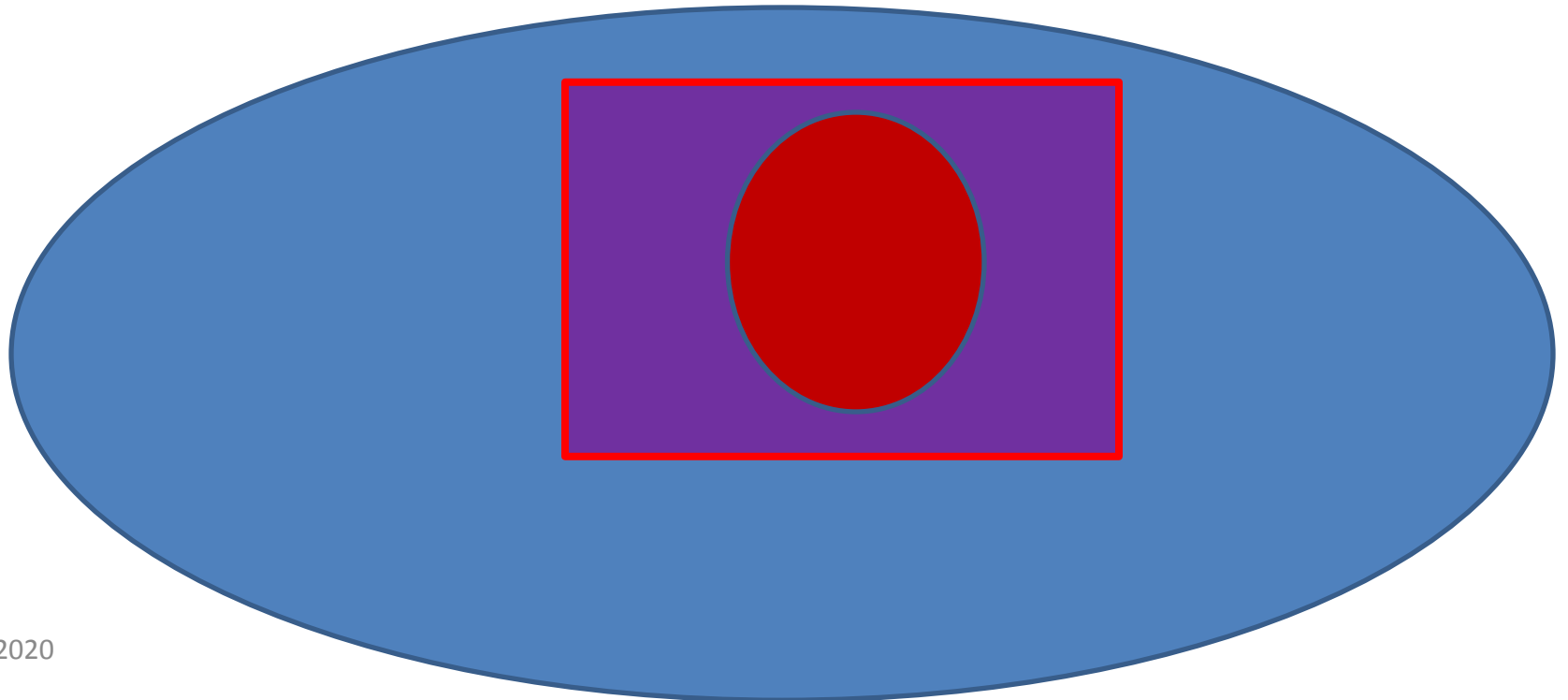
Any fool can write code that a computer can understand. Good programmers write code that humans can understand.

- **Philosophy** of architecture design: what is basis to define, determine software architecture?
- View?? **Software-intensive systems**
- Static/dynamic, inside/outside?
- Stakeholders?

Questions ?????

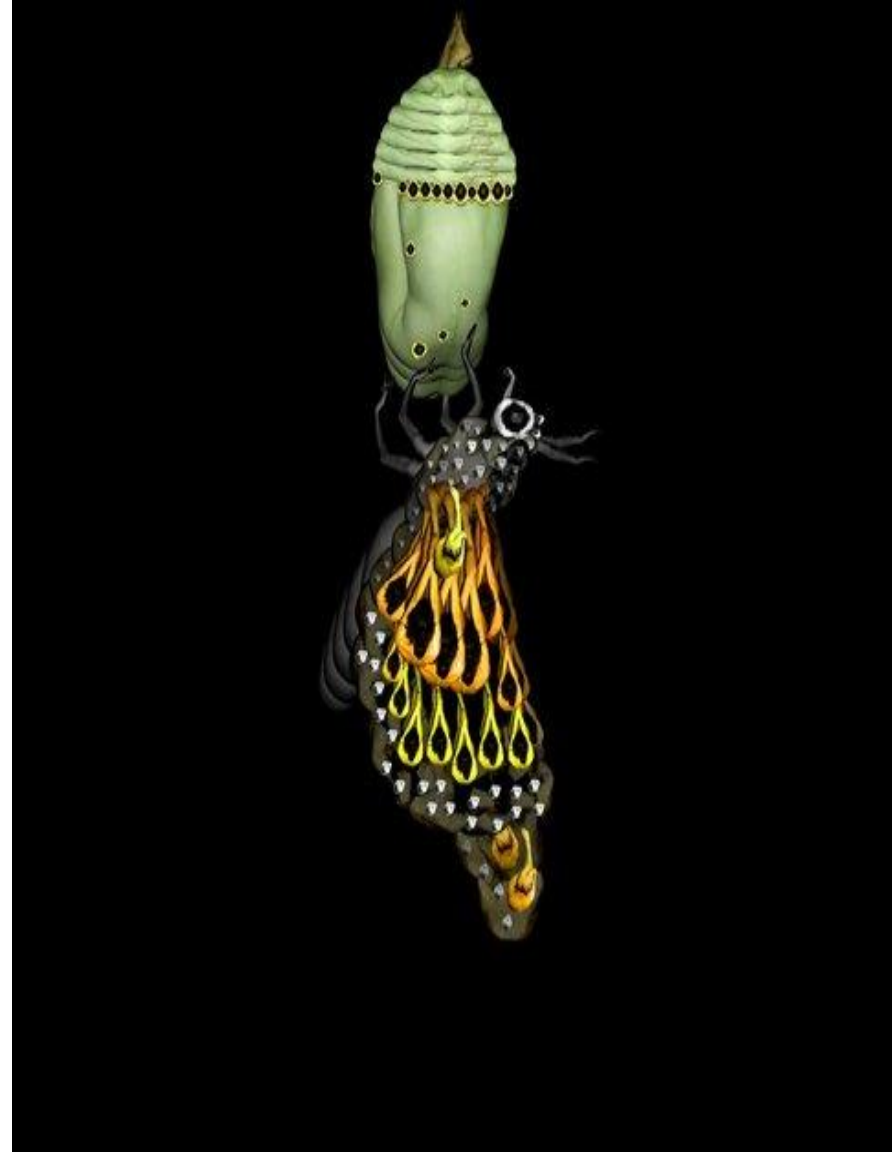
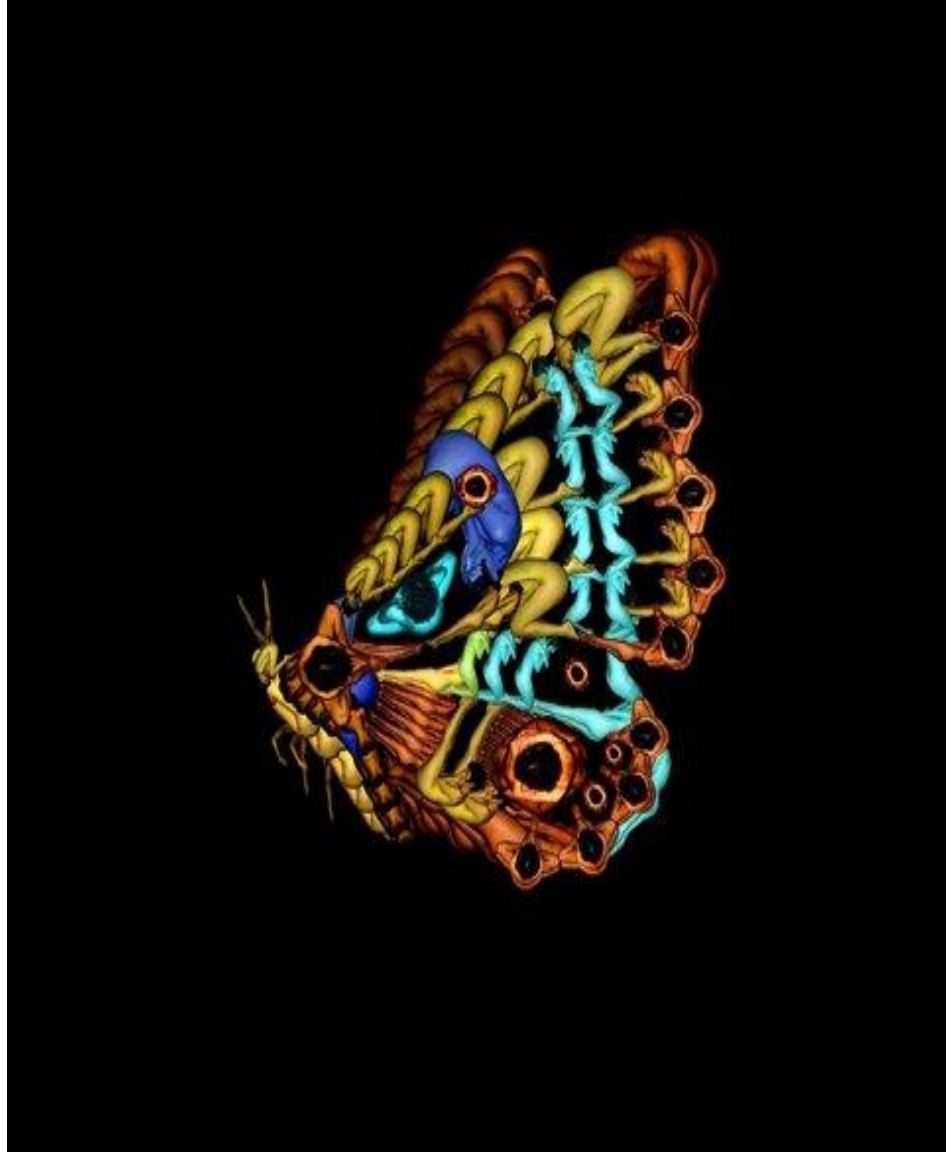
- The more you know, the more you realize you don't know

//the more you learn, the more you are stupid

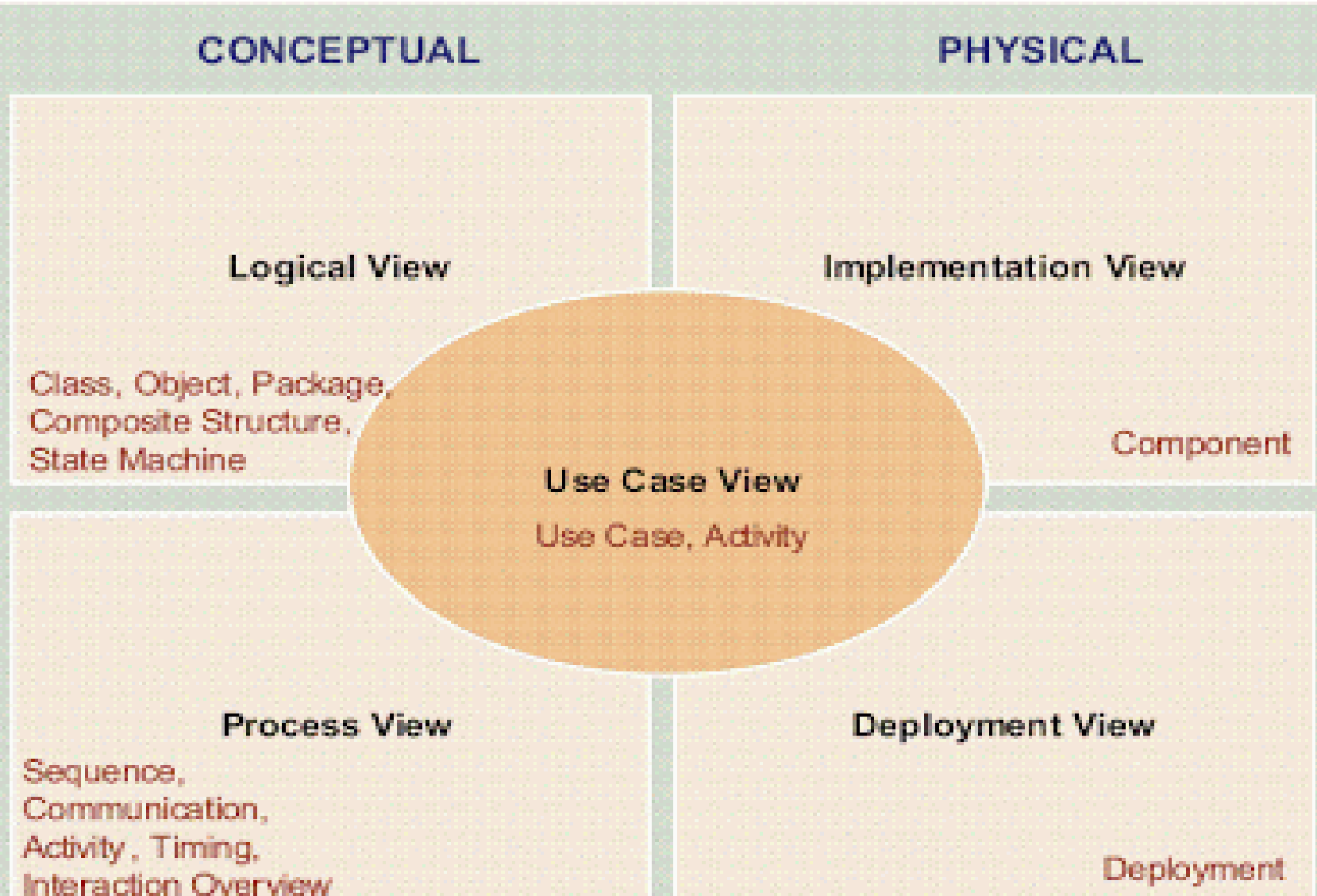




4/13/2020



4+1 View



4+1 view

- **4+1** is a view model used to describe the architecture of **software-intensive systems**, based on the use of multiple, concurrent views.
- The views are used to describe the system from the viewpoint of different **stakeholders**, such as **end-users, developers, system engineer, and project managers**.

4+1 view

- The four views of the model are logical, development, process and physical view, scenario/use case.
- In addition, selected use cases or scenarios are used to illustrate the architecture serving as the 'plus one' view. Hence, the model contains 4+1 views

4+1 view

- **Logical view:** The logical view is concerned with the **functionality** that the system provides to end-users. UML diagrams are used to represent the logical view, and include class diagrams, and state diagrams.
- **Process view:** The process view deals with the **dynamic aspects** of the system, explains the system processes and how they communicate, and focuses on the run time behavior of the system. The process view addresses **concurrency, distribution, integrator, performance, and scale + ability**, etc. UML diagrams to represent process view include the sequence diagram, communication diagram, activity diagram.

4+1 view

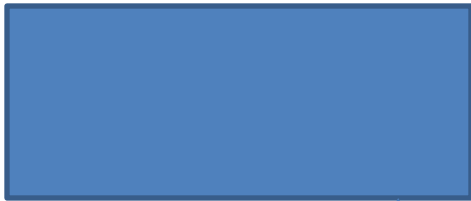
- ***Development /implementation view:*** This view illustrates a system from a **programmer's perspective** and is concerned with **software management**. It also is named **view**. It uses the Component diagram to describe system components and the Package diagram to represent the development view.
- ***Physical /Deployment view:*** The physical view depicts the system from a **system engineer's** point of view. It is concerned with the topology of software components on the physical layer as well as the physical connections between these components. UML diagrams used to represent this view include the deployment diagram.

4+1 view

- ***Scenarios/Use cases***: a small set of use cases or scenarios, which become a fifth view, is used to illustrate the description of an architecture .
- The scenarios describe sequences of interactions between objects and between processes. They are used to identify architectural elements and to illustrate and validate the architecture design. They also serve as a starting point for tests of an architecture prototype. This view is also known as the **use case view**.

Many in 1

<https://www.visual-paradigm.com/guide/>





4/13/2020

Part I: Design architecture

TRẦN ĐÌNH QUẾ

GIÁO TRÌNH

KIẾN TRÚC
VÀ THIẾT KẾ PHẦN MỀM

Software Architecture and Design Illuminated

KAI QIAN • XIANG FU • LIXIN TAO
CHONG-WEI XU • JORGE L. DÍAZ-HERRERA

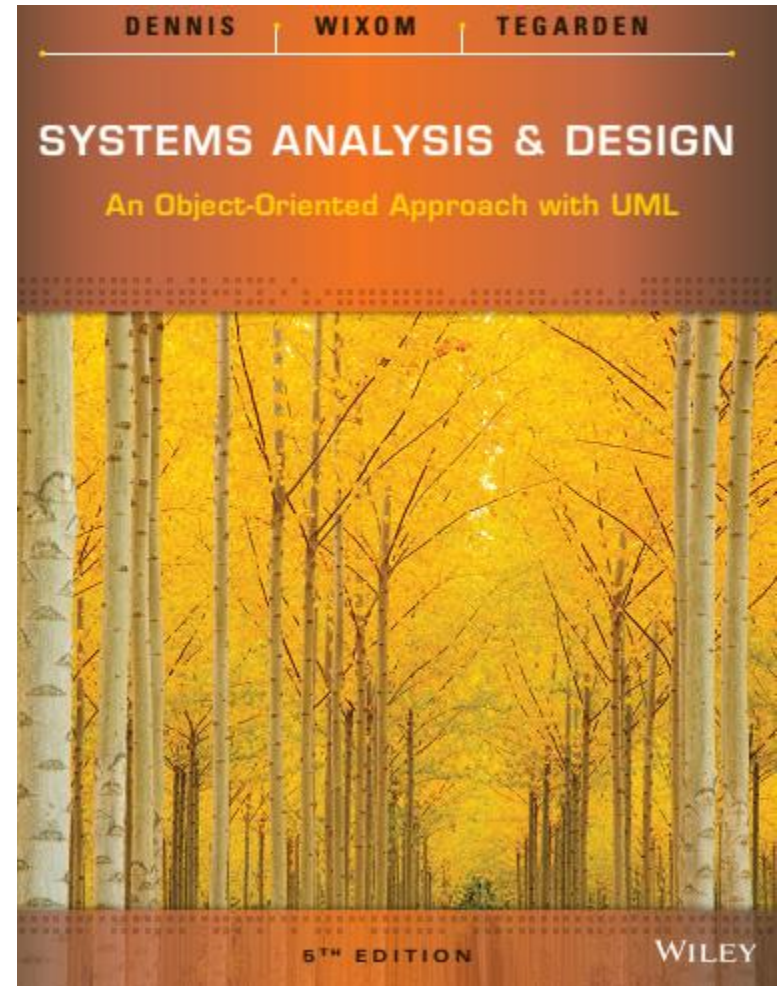
Johns and Bartlett
Illuminated Series

Software Architecture in Practice Third Edition

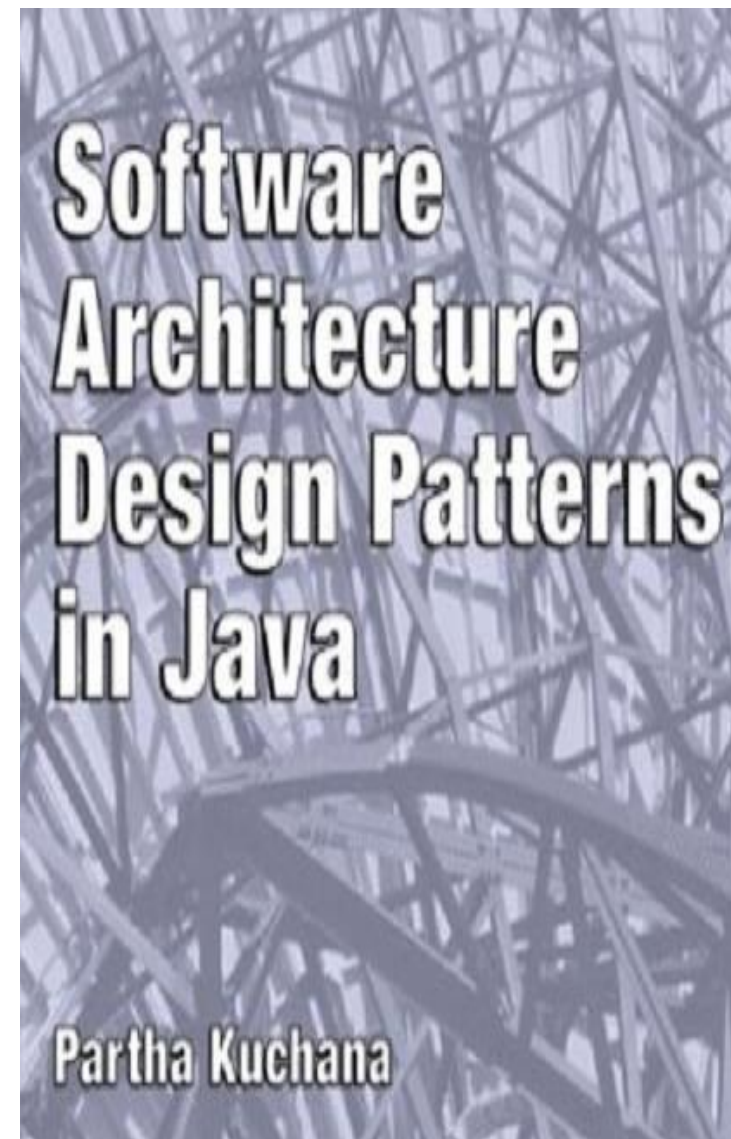
Len Bass • Paul Clements • Rick Kazman

Part II: Design Layers

- Design layers
- Design package
- Design class
- Design method

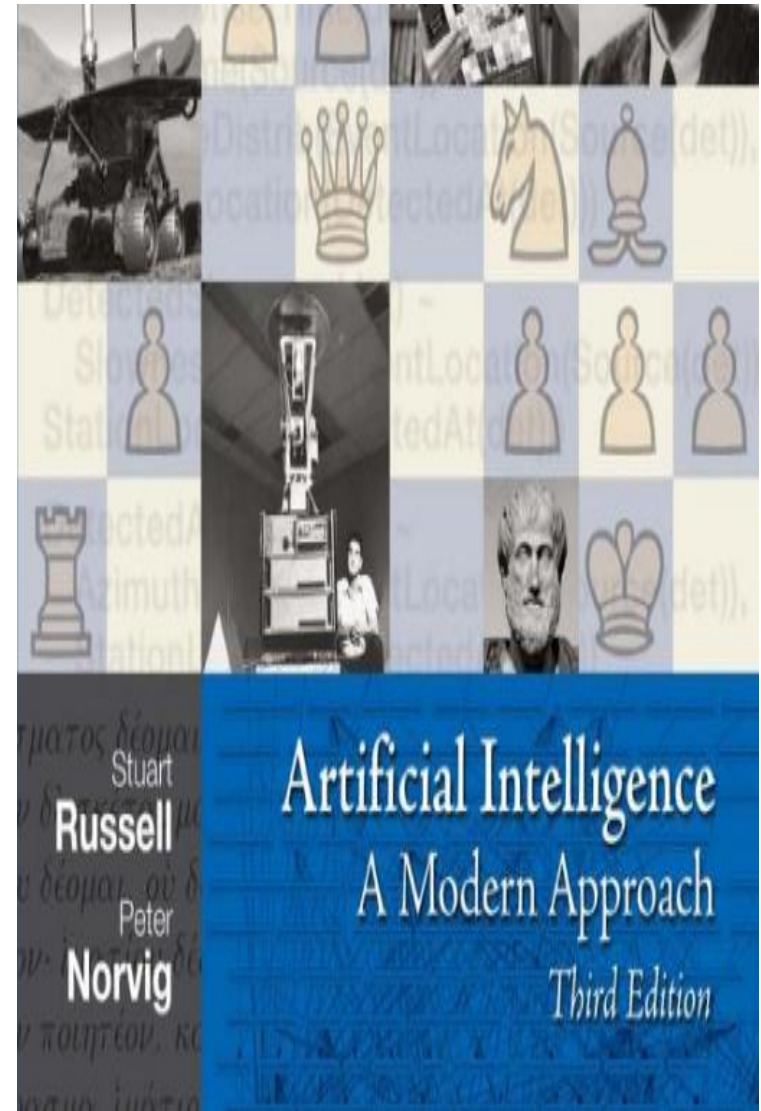


Part III: Design patterns



Part IV: Intelligent systems

- Artificial intelligence
- Machine learning
- Design intelligent systems



Assessment

- 20%: 4 Assignments
- 20%: Big Project (group working)
- 60%: Final examination (writing)