Software Modeling Introduction

Software Modeling

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Outline

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Basics of Software Development I

- The main idea is **solve real-world** problems based on **software solutions**. One of the main problems is the *complexity* of the systems, and to learn with fine boundaried systems.
- It is **not just to write code**, it is to have full **software life-cycle** in mind, it means, to think in *design*, *tests*, *deploys*, *maintenance*, a lot of tasks.

Figure: Prompt: Draw a python developer.

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Figure: Prompt: Draw a python developer.

Basics of Software Development II

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- However to **write code** is the most **important task**, and it is the main skill to have. You could write code to **automate** tests, deployments, integrations,. . . .
- It is also vital to know a lot about software design, to propose good solutions, to **read every day** in order to choose and use the best tools, *this is a crazy world*.

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Nowadays Agile Software Development

DataOps *Vs.* DevOps *Vs.* MLOps

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Basics of Software Architecture I

- It is important to **develop** innovative and sophisticated **software** to provide a nice **solution** for **end users needs**.
- Software architecture brings **innovation** and **robust** structure.
- The goal of software architecture is to **minimize the human efforts** required to build and maintain the expected system.

Figure: Prompt: A python developer watching a building architecture draws.

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Basics of Software Architecture II

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- A software architecture is the **skeleton** for a complete **software system**. It leads the system to be **scalable, reliable, and maintainable**. Also it helps to take better **technical decisions**.
- There are some **software architecture styles**, each one with pros/cons, and specific use cases. However, they try to provide a **reference solution** for a high-level structure of a software system.

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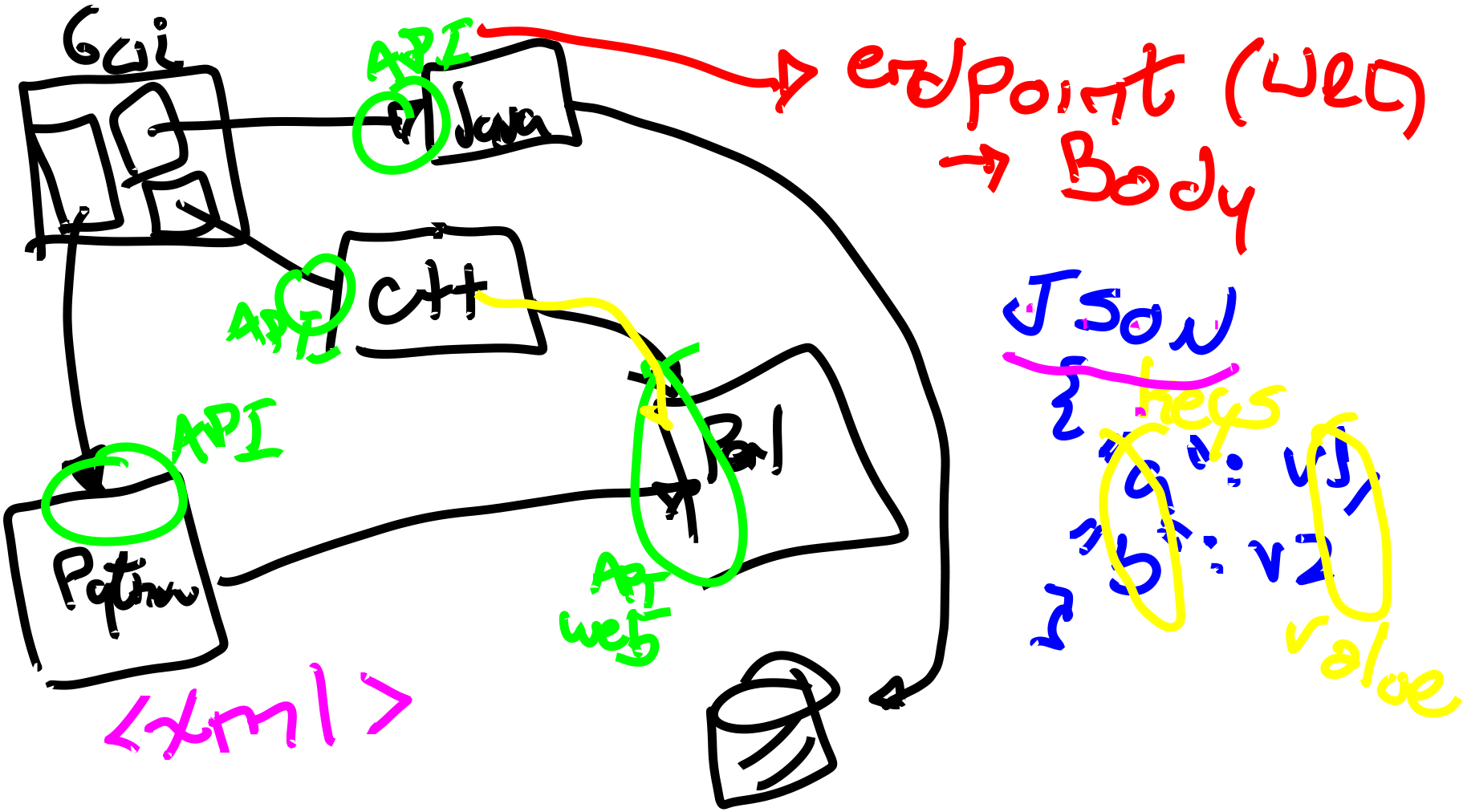
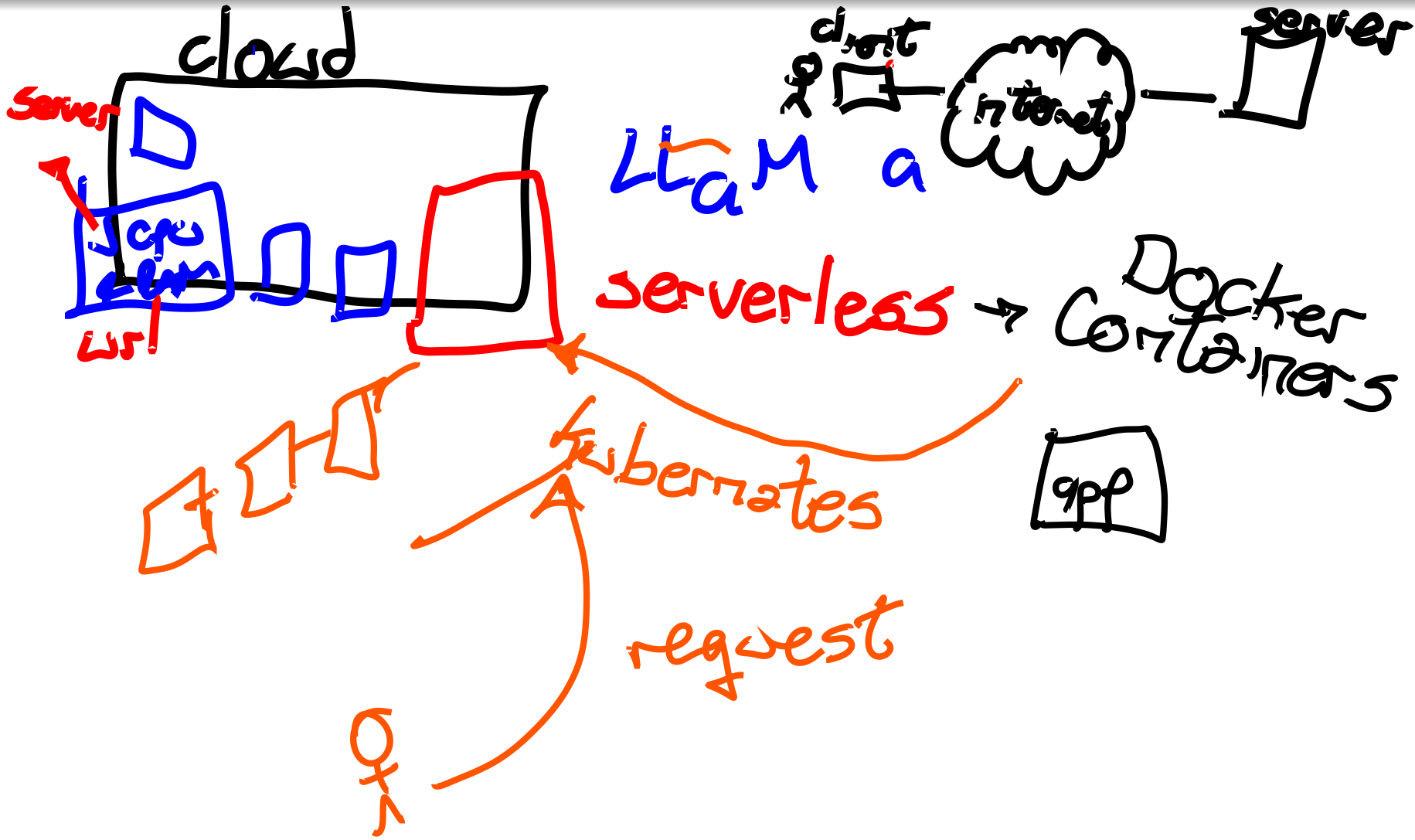
Layered Architecture Pattern

Microkernel Architecture Pattern

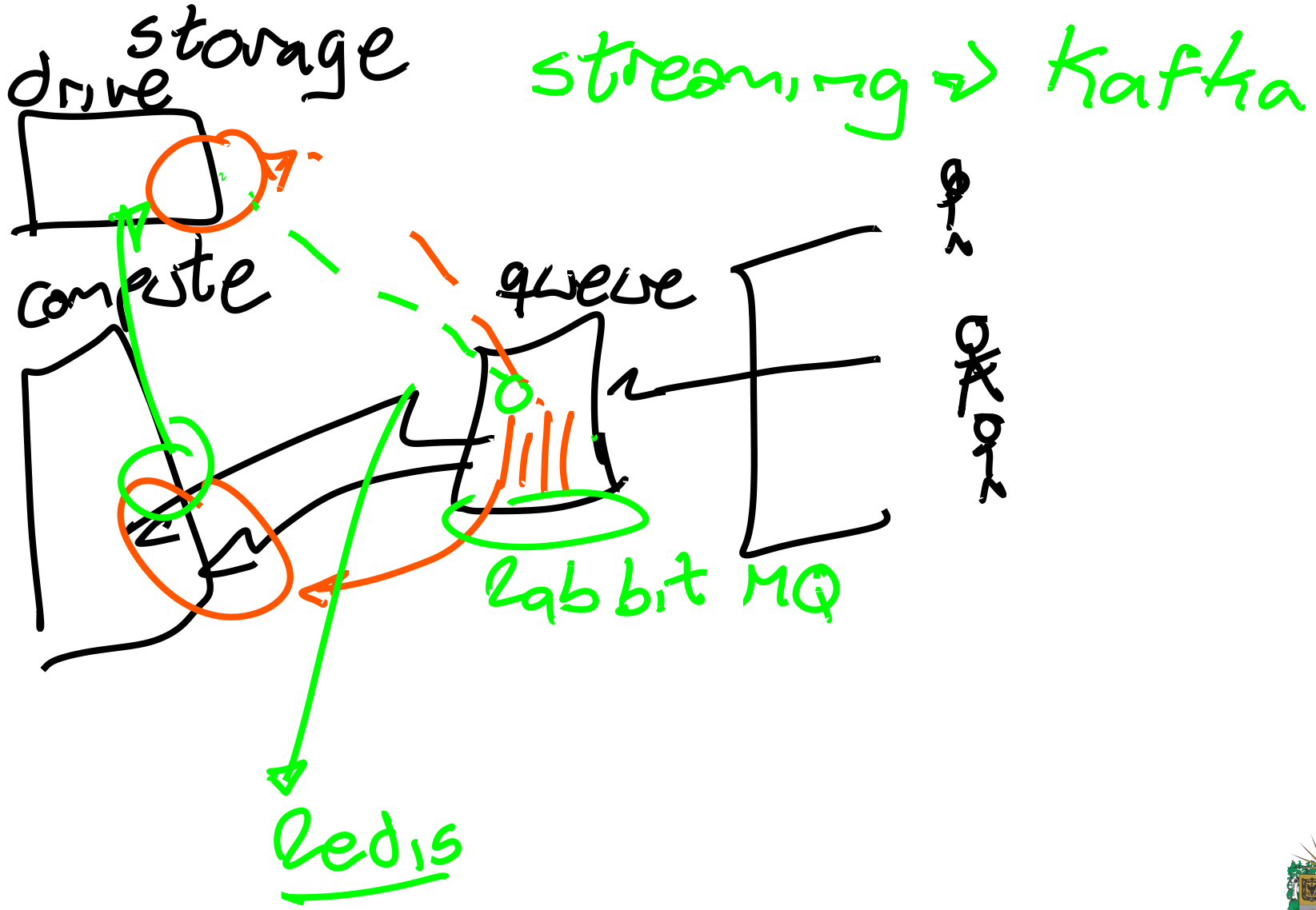
Microservices Architecture Pattern



Event-based Architecture Pattern



Space-based Architecture Pattern



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Basics of Object-Oriented Design I

- **Object-oriented** has become one of the most traditional and popular **paradigms** in software development.
- It is based on the concept of **objects**, which can contain data, in the form of **fields** (often known as *attributes* or *properties*), and code, in the form of **procedures** (often known as *methods*).

Figure: Prompt: Draw several objects sorted by size.

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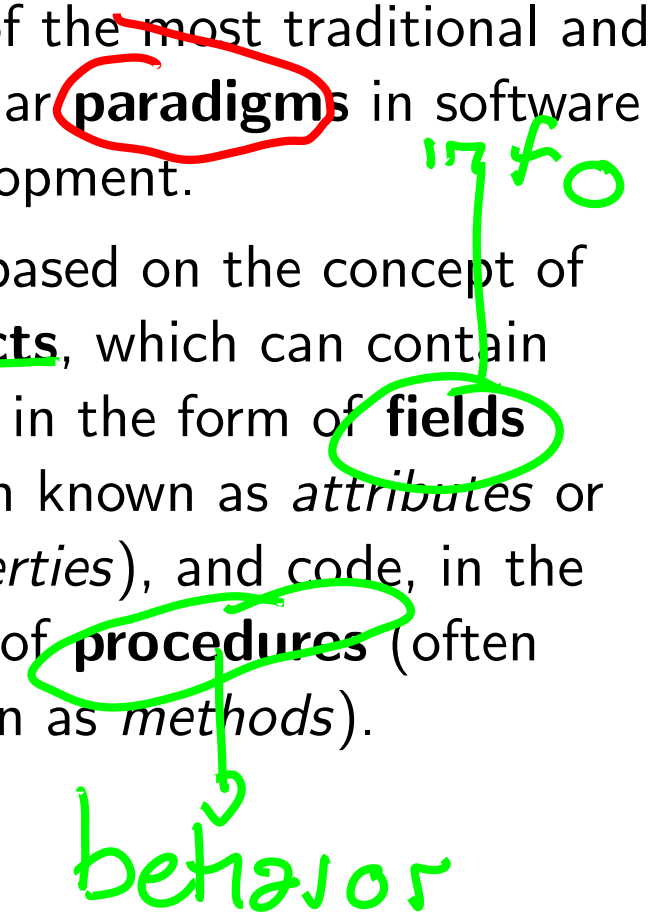

Figure: Prompt: Draw several objects sorted by size.

Basics of Object-Oriented Design II

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- The idea is to design a **system modularly**, and to make it easier to maintain, and to understand. Also the idea is emphasize the **reuse of code**.
- The main principles of OOD are:
  - Encapsulation
  - Abstraction
  - Inheritance
  - Polymorphism

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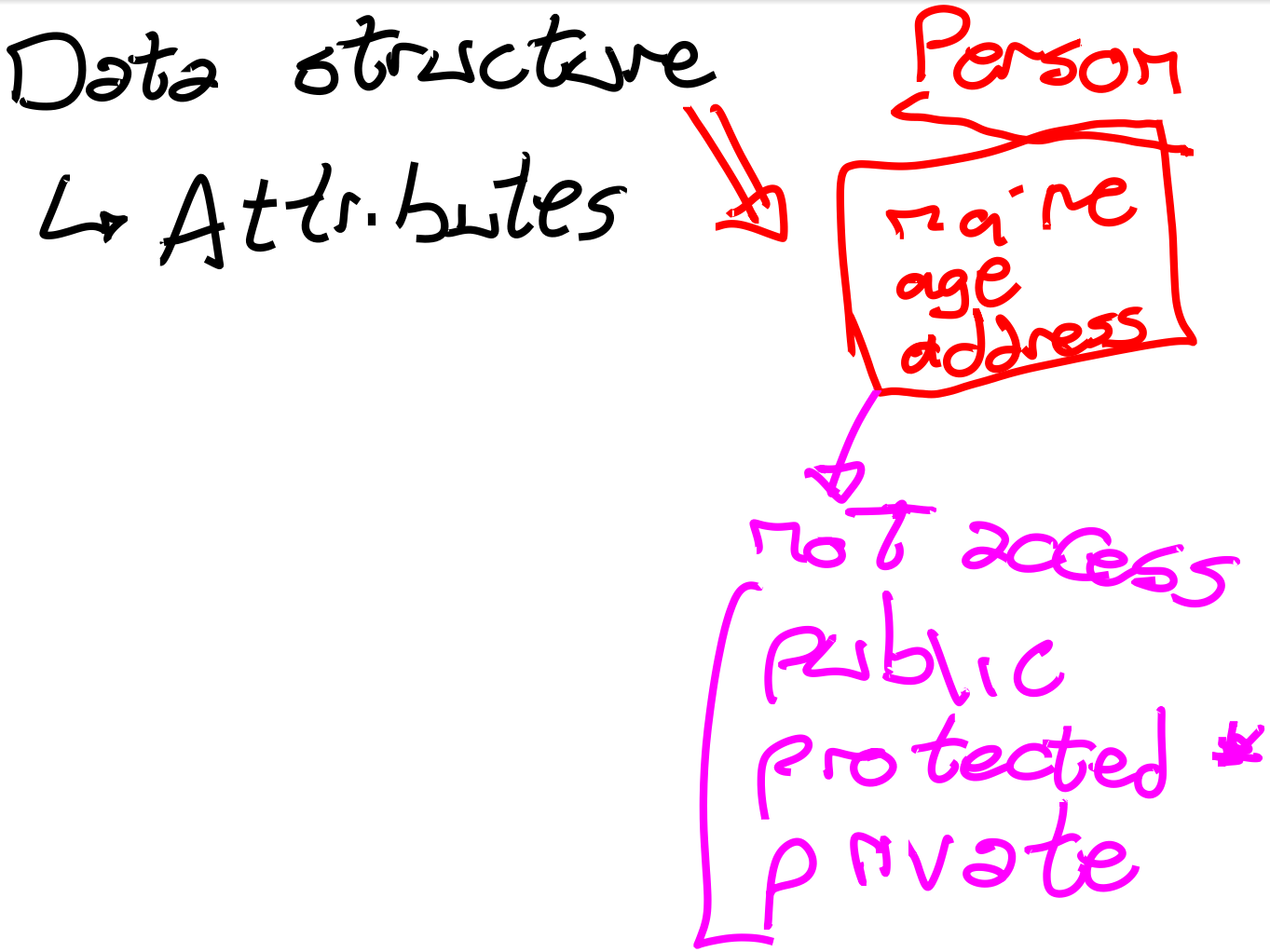
Encapsulation in OOD



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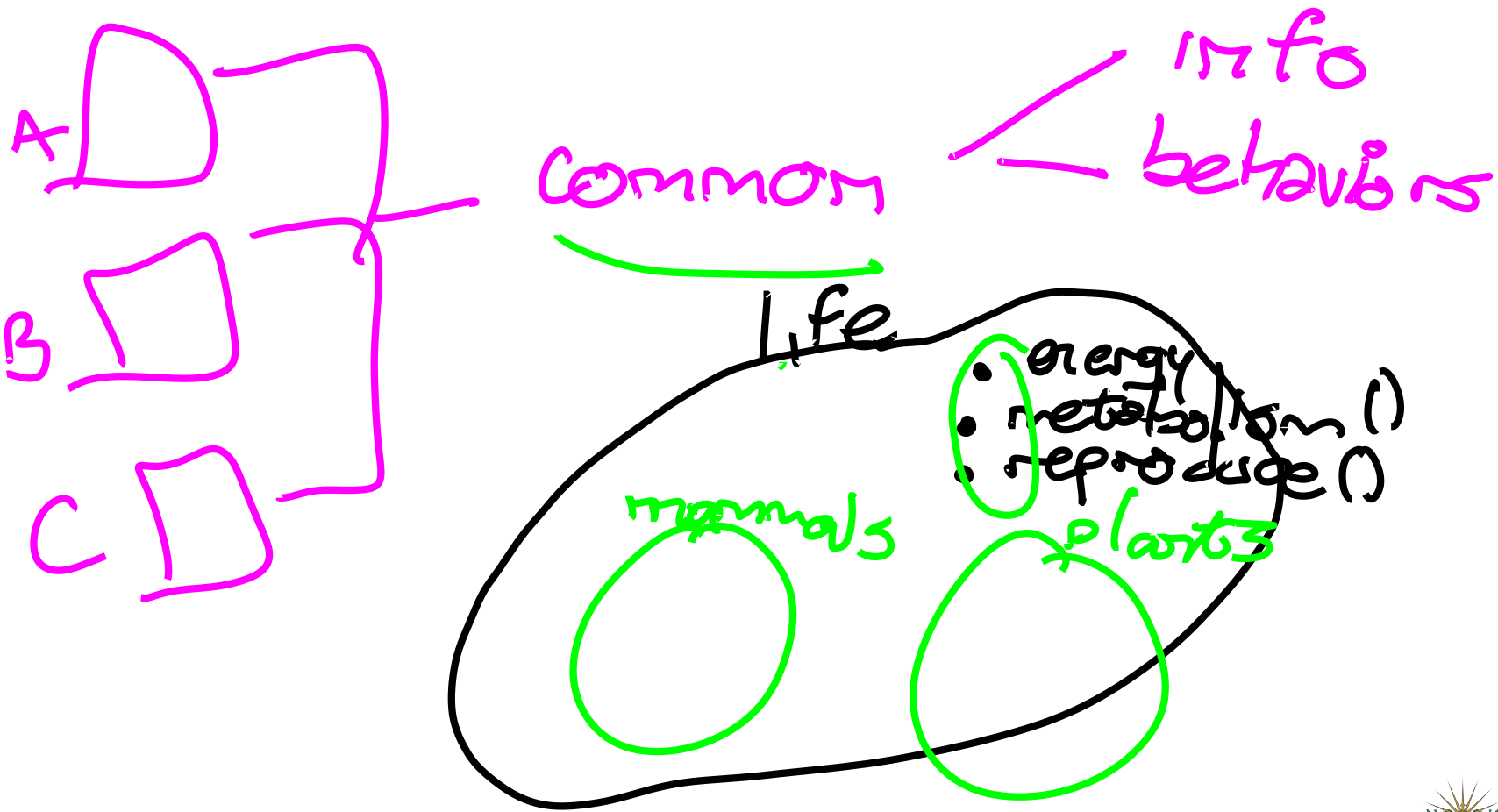
Abstraction in OOD



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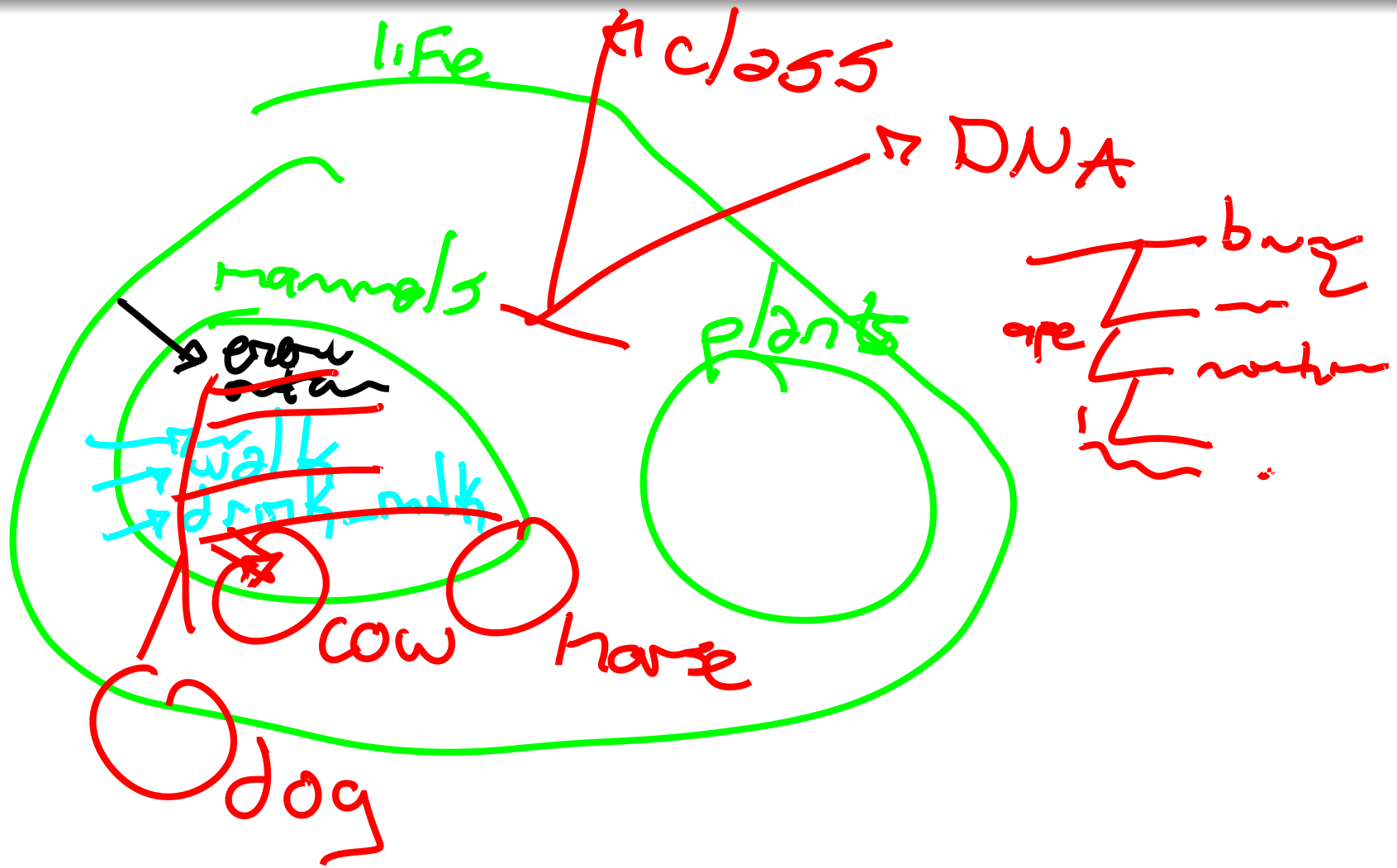
Inheritance in OOD



Polymorphism in OOD

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Basics of Domain-Driven Design I

- DDD is focusing on the **core domain** and **domain logic**, it is a way of thinking aimed at accelerating software projects that have to **deal with complicated domains**.
- The essential **terms** of DDD are *context*, *model*, *ubiquitous language*, *bounded context*, and *business logic in layers*.
- DDD is a set of **principles** and patterns that help to design a system ensuring alignment with the **real-world business needs**.

Figure: Prompt: Draw a soccer coach teaching robots soccer players.

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Basics of Domain-Driven Design II

- The main principles of DDD are:
  - Focus on the core domain.
  - Base complex designs on models of the domain.
  - Constantly collaborate with domain experts.
  - Develop a knowledge-rich model.
- The business logic in layers is showed as follows:
  - Domain Layer
  - Application Layer
  - Presentation Layer
  - Infrastructure Layer

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Business Logic in Layers

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Basics of Design Pattern I

- A design pattern is a **practical proven solution** to a recurring design problem in software engineering.
- A design pattern is not a finished design, just **flexible** or **reusable parts** of a complete solution.
- Created (or discovered) for **expert developers**, and had been matured by non-expert developers, they are like *food recipes*, or *play tik-tik-toe*.

Figure: Prompt: Draw a tik-tak-inning strategy.

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Basics of Design Pattern II

Figure: Prompt: Draw a tik-tak-toe winning strategy.

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- Reported by the **Gang of Four** (**GoF**) in 1994, in the book Design Patterns: Elements of Reusable Object-Oriented Software.

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Thanks!

Questions?

Repo: *github.com/engandres/ud-public/software-modeling*