Welcome to this CoGrammar Tutorial: Software Design

The session will start shortly...

Questions? Drop them in the chat.
We'll have dedicated moderators answering questions.

Software Engineering Session Housekeeping

- The use of disrespectful language is prohibited in the questions, this is a supportive, learning environment for all - please engage accordingly. **(Fundamental British Values: Mutual Respect and Tolerance)**
- No question is daft or silly - **ask them!**
- There are **Q&A sessions** throughout this session, should you wish to ask any follow-up questions.
- If you have any questions outside of this lecture, or that are not answered during this lecture, please do submit these for upcoming Academic Sessions. You can submit these questions here: **Questions**

Software Engineering Session Housekeeping cont.

- For all **non-academic questions**, please submit a query: www.hyperiondev.com/support
- Report a **safeguarding** incident: www.hyperiondev.com/safeguardreporting
- We would love your **feedback** on lectures: **Feedback on Lectures**
- If you are hearing impaired, please kindly use your computer's function through Google chrome to enable captions.

Safeguarding & Welfare

We are committed to all our students and staff feeling safe and happy; we want to make sure there is always someone you can turn to if you are worried about anything.

If you are feeling upset or unsafe, are worried about a friend, student or family member, or you feel like something isn't right, speak to our safeguarding team:

Ian Wyles
Designated Safeguarding Lead

Simone Botes

Nurhaan Snyman

Rafiq Manan

Ronald Munodawafa

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Scan to report a safeguarding concern

or email the Designated Safeguarding Lead:
Ian Wyles
safeguarding@hyperiondev.com

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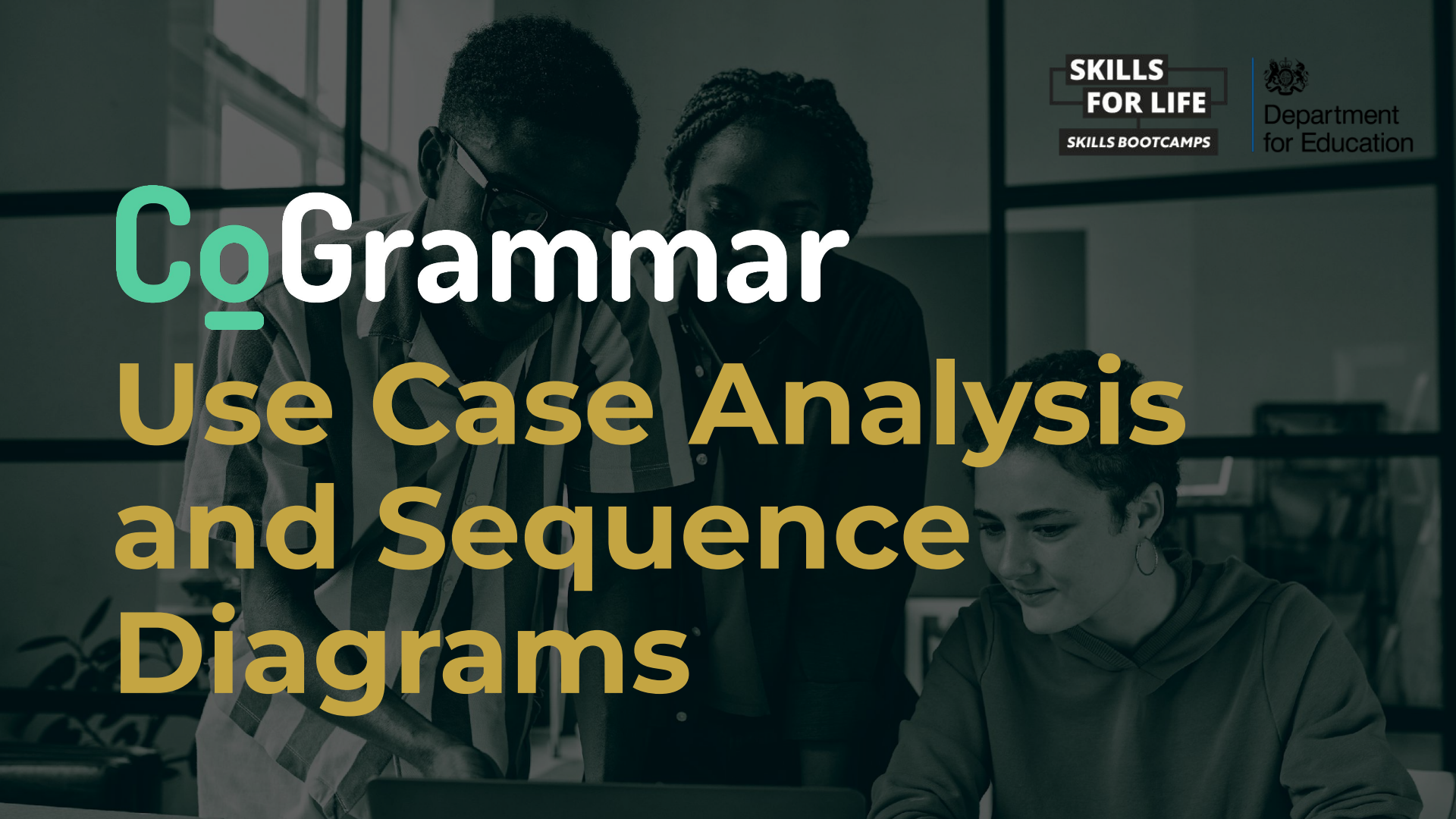
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Use Case Analysis and Sequence Diagrams

Learning Objectives & Outcomes

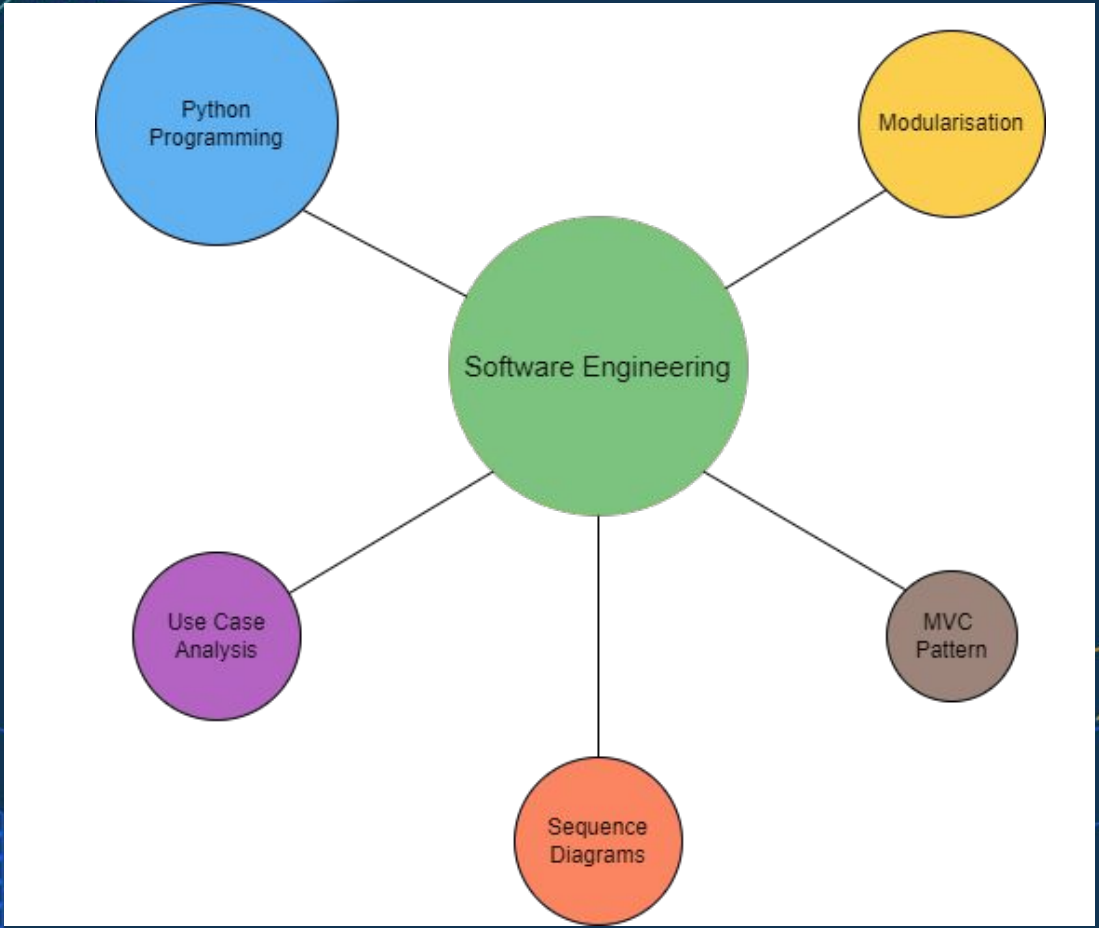
- Analyse use cases to capture user requirements, identifying actors and scenarios.
- Design sequence and class diagrams to illustrate object interactions and their relationships within programs.
- Apply CRUD matrices to represent entity permissions and operations.
- Develop Python programs that implement the MVC pattern

Building the Foundation: Essential Software Engineering Concepts

You've already learned essential concepts like Modularization, Use Case Analysis, Sequence Diagrams, and the MVC pattern. Those concepts come together to form the backbone of real-world software development. In the field, software engineering isn't just about writing code; it's about creating systems that are **scalable**, **maintainable**, and **adaptable to changing requirements**. Whether you're building a small application or a large-scale system, these principles guide how you **design**, **implement**, and **manage your software**.

By understanding how to structure your code and system architecture thoughtfully, you ensure your projects can evolve over time, handle complexity, and meet both business and user needs. This knowledge is what separates a developer from a software engineer, and mastering these skills will set you up for long-term success in your careers.

Building the Foundation: Essential Software Engineering Concepts



Modularization and Separation of Concerns

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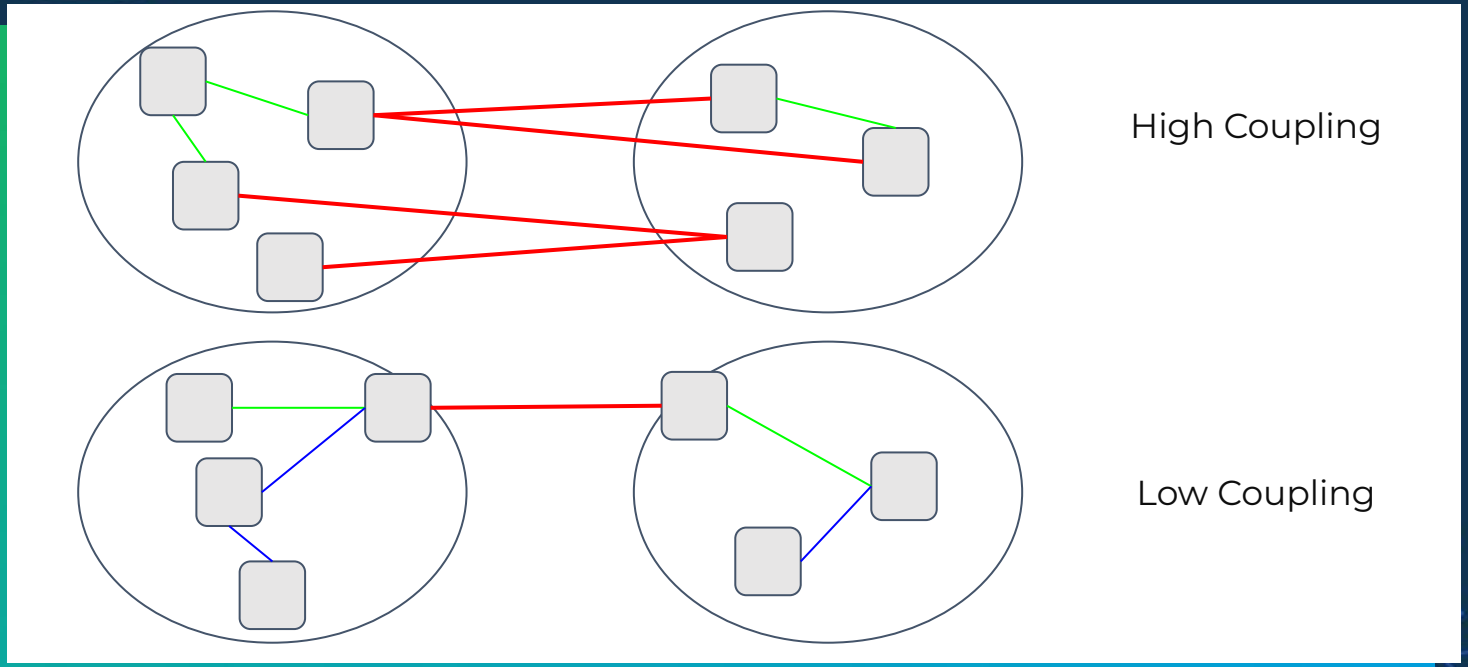
Modularization & Separation of Concerns

- What is ...
  - **Modularization**: Breaking a system into manageable, independent modules.
  - **Separation of Concerns**: Ensuring that different parts of a system are responsible for distinct concerns.
- Why does it matter?
  - Promotes maintainability, reduces complexity.
  - Makes code reusable and testable.
  - Enhances scalability of the code

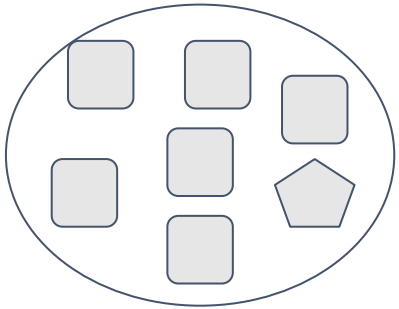
Best Practices for Modularization

- **Design Techniques**:
  - Object-Oriented Programming (OOP)
  - Functional Programming
  - Microservices
- **Key Principles**:
  - High cohesion, low coupling.
  - Encapsulation.

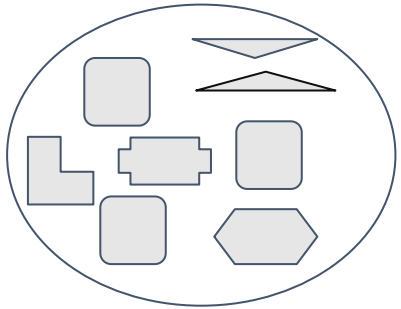
Modularization & Separation of Concerns
Coupling



Modularization & Separation of Concerns
Cohesion



High Cohesion

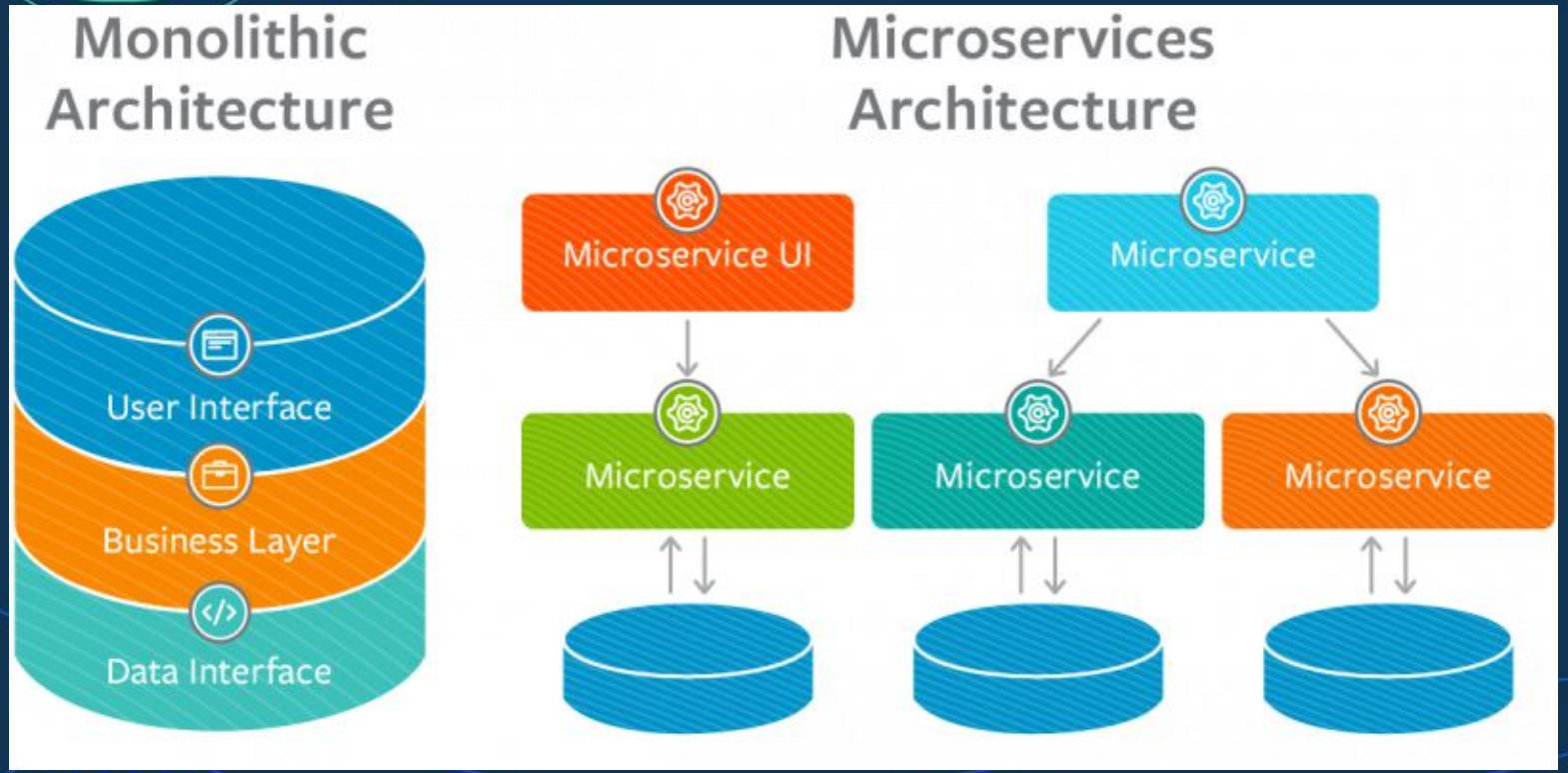


Low Cohesion

Real-World Example of Modularization: A Cafe

- **Example**: Modularized Cafe Operations
  - **Modules**:
    - **Cashier:** Handles customer interactions, orders, and payments.
    - **Barista:** Prepares drinks.
    - **Kitchen:** Prepares food.
  - **Benefits**:
    - **Scalability:** Easily add more staff.
    - **Maintainability:** Fix issues without affecting the whole cafe.
    - **Reusability:** Use payment module in other parts of the business.

Monolithic vs. Microservices Architecture



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Sequence Diagrams and Use Case Analysis

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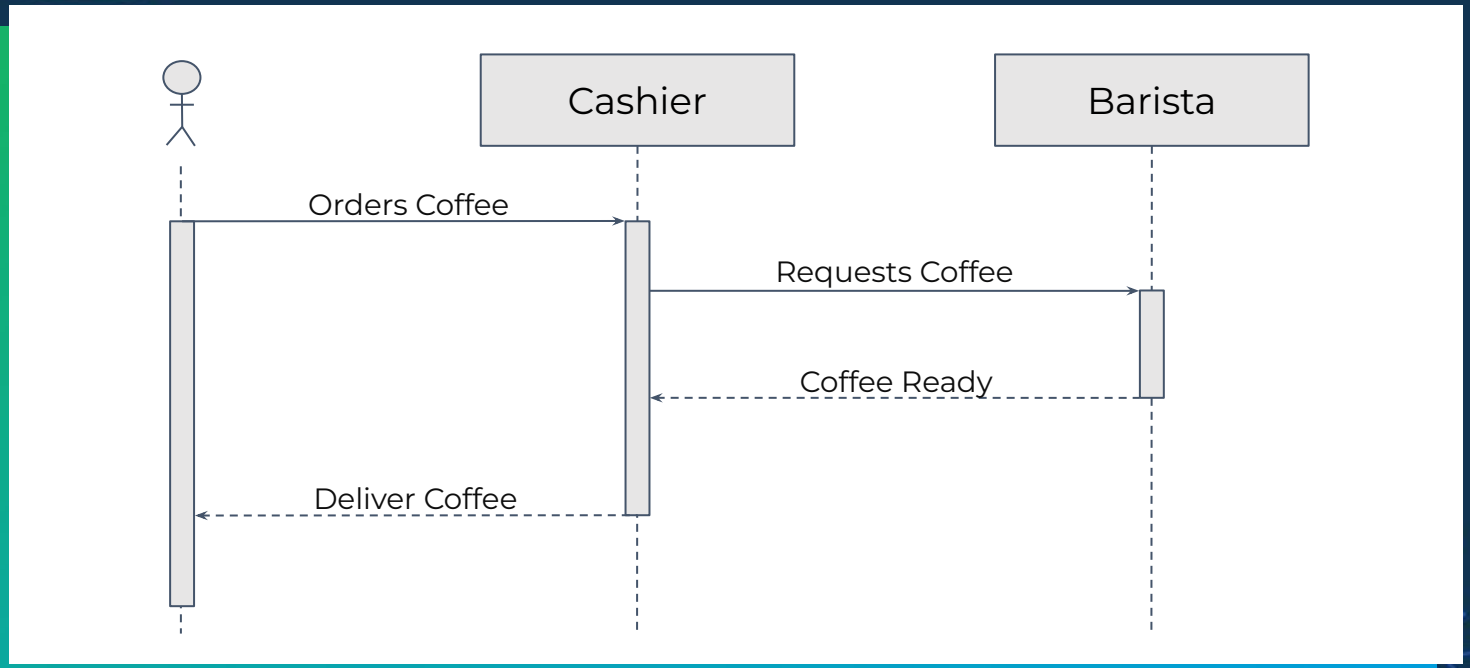
Sequence Diagrams

- What is a Sequence Diagram?
  - Visualizes **interactions** over time between objects in the system.
- Purpose:
  - Shows how the system handles specific use cases.
- Elements of Sequence Diagrams:
  - Lifelines (------), Messages , Actors

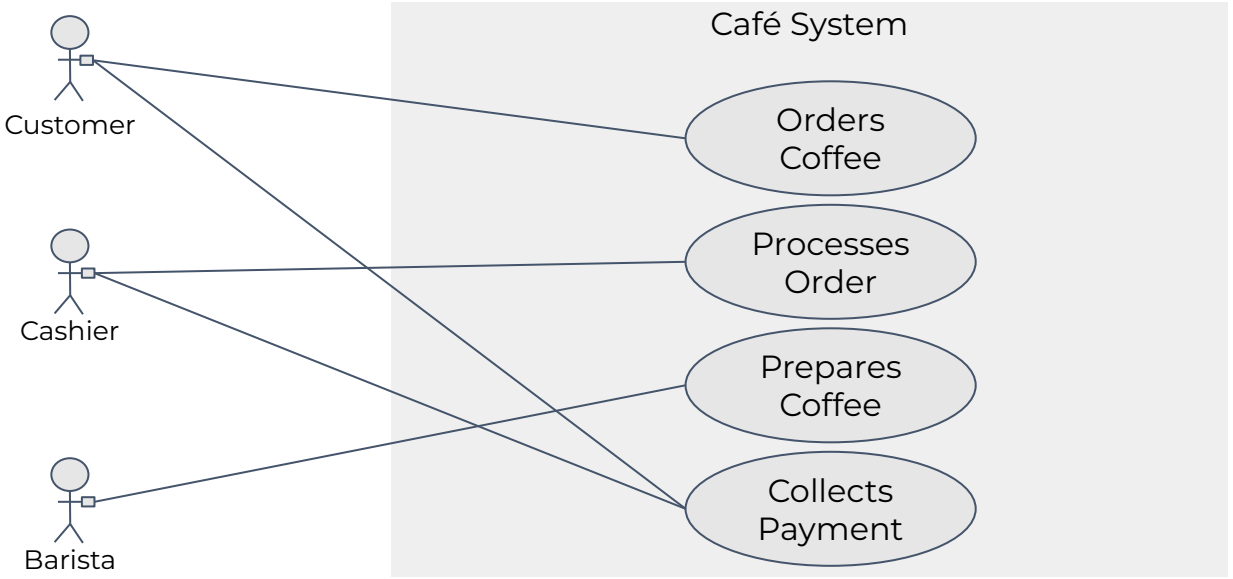
Sequence Diagrams



Use Case Analysis

- What is a Use Case?
  - Describes interactions between users and the system.
  - Provides an understanding user requirements and system interactions
- Importance:
  - Helps capture functional requirements clearly.
- Steps:
  - Identify actors and their goals
  - Create use case diagrams

Use Case Analysis



Model-View-Controller Pattern

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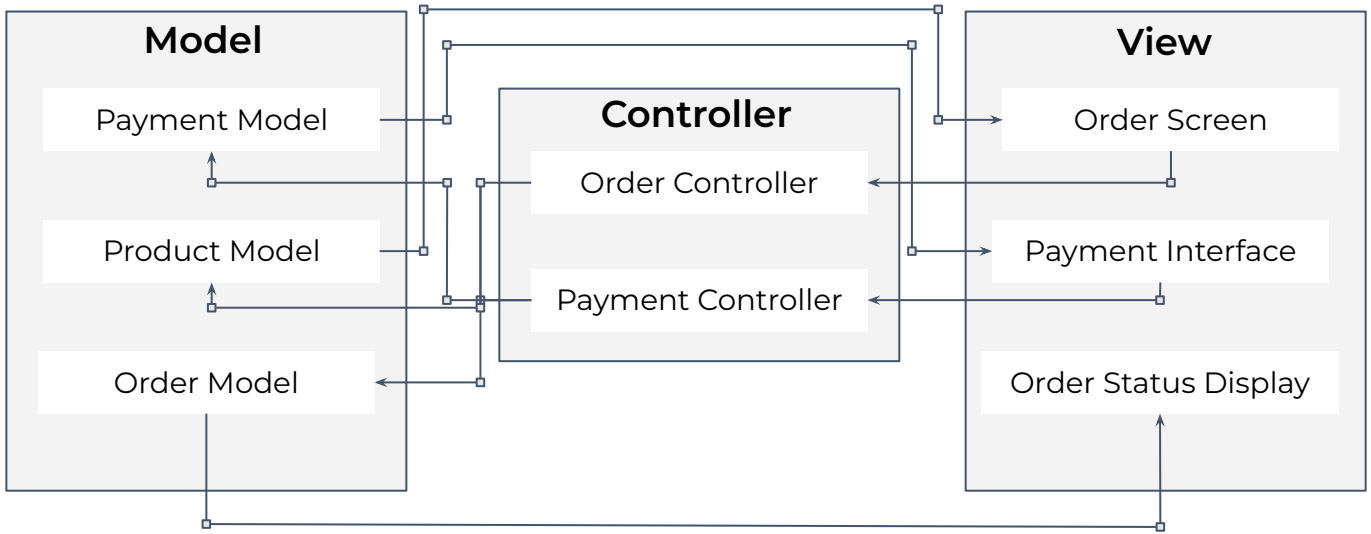
Model-View-Controller Pattern

- MVC Components:
  - Model: Represents the data and logic
  - View: Displays the user interface
  - Controller: Handles user input and updates the model and view
- Benefits:
  - Improved maintainability, testability, scalability
  - Real-world Applications:
  - Web and mobile development frameworks (e.g., Django, React)

Model-View-Controller Pattern



Class Diagrams and CRUD Matrices

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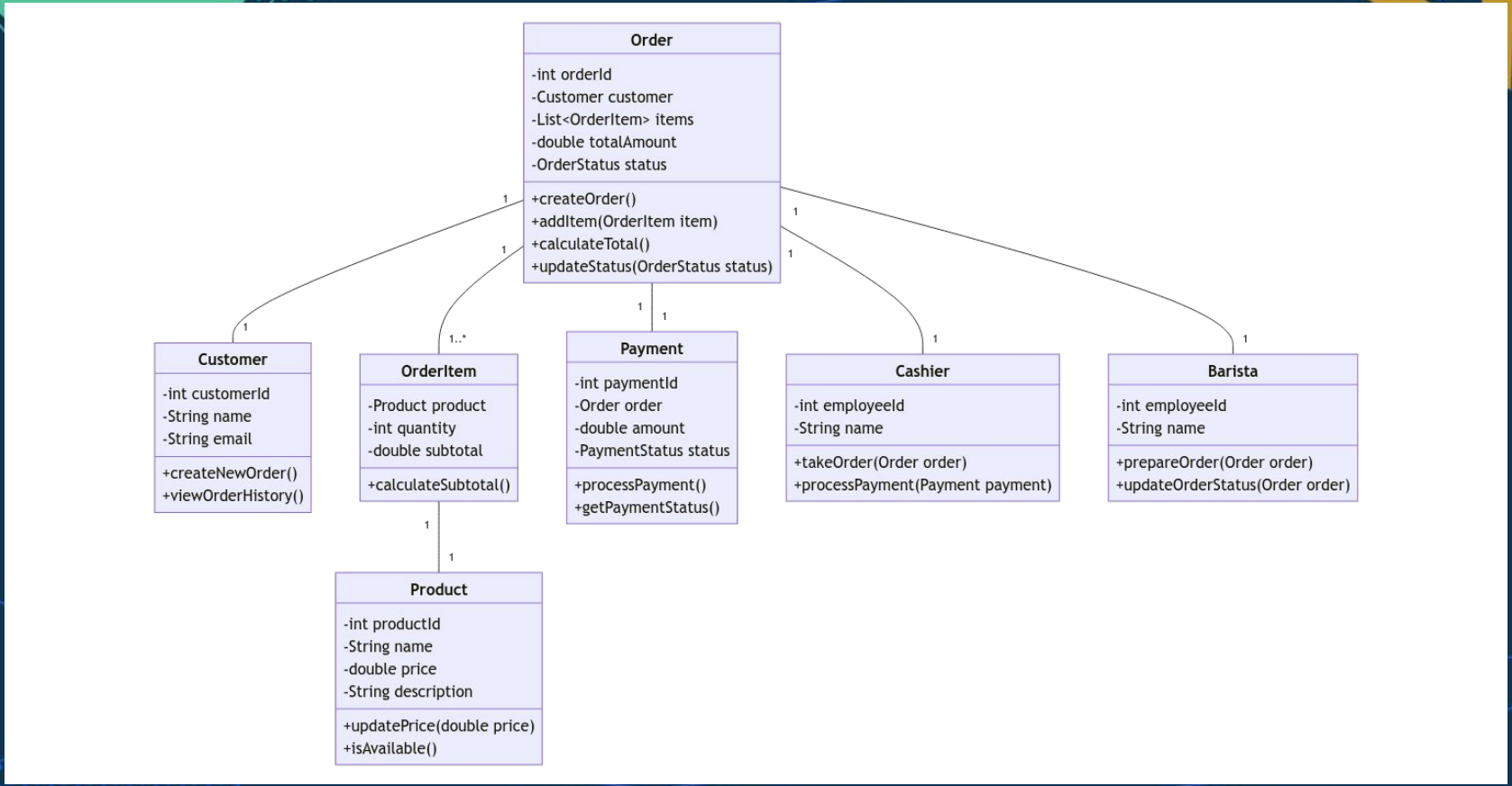
Class Diagrams and CRUD Matrices

- **Class Diagrams:**
  - **Purpose:** Representing the structure of a software system
- **Components:**
  - Classes, attributes, methods, relationships
- **CRUD Matrices:**
  - **Purpose:** Identifying the operations (Create, Read, Update, Delete) needed for each entity
- **Components:**
  - Entities, operations

Class Diagrams and CRUD Matrices



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Summary

- **Modularization:** Breaking down software into independent modules enhances maintainability, scalability, and reusability.
- **Sequence Diagrams:** Visualising component interactions elucidates system behaviour over time, aiding in comprehension and optimization.
- **Use Case Diagrams:** Representing system functionalities from user viewpoints aids in requirement analysis and stakeholder communication.
- **Separation of Concerns:** Emphasizes dividing a software system into distinct sections, each responsible for a separate concern or aspect of functionality.
- **MVC:** software architectural pattern widely used in web development. It divides an application into three interconnected components: Model (data management), View (user interface), and Controller (business logic).
- **Class diagrams:** are tools used in software development to plan and organize class functionalities.
- **CRUD matrices:** tools used in software development to plan and organize class functionalities.

Questions and Answers

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Thank you for attending

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