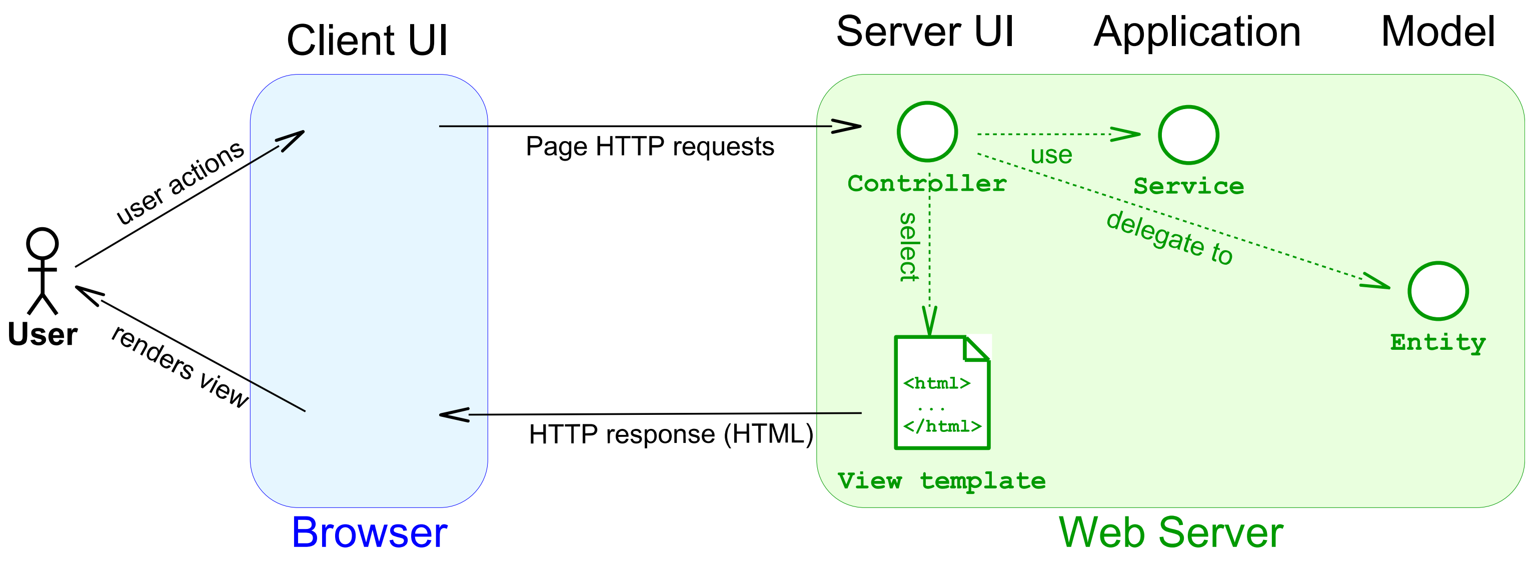
Domain-Driven Design



SWEN-261
Introduction to Software Engineering

Department of Software Engineering
Rochester Institute of Technology

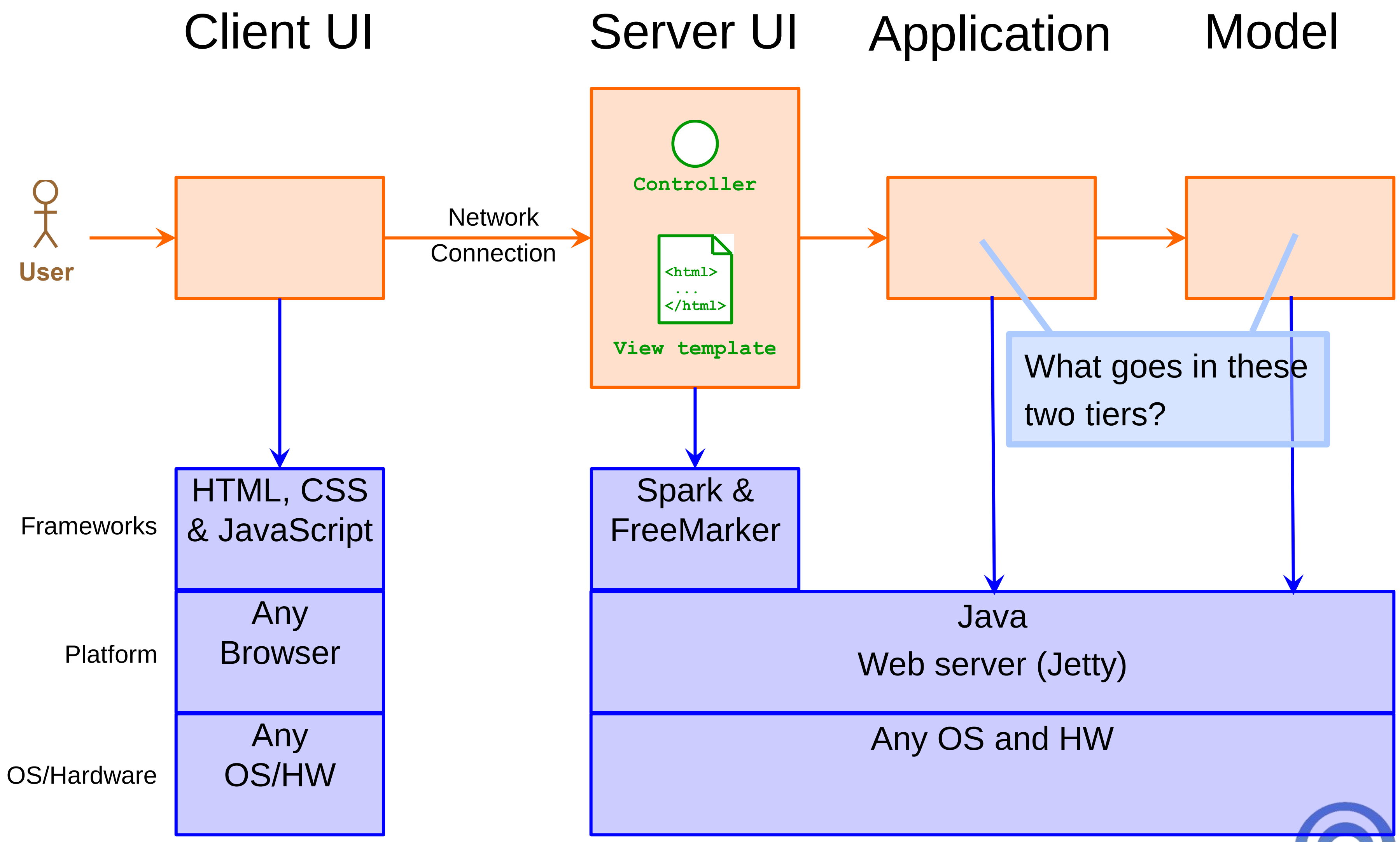
Domain driven design centers the architecture on the problem domain.

- Quote from the DDD Community:

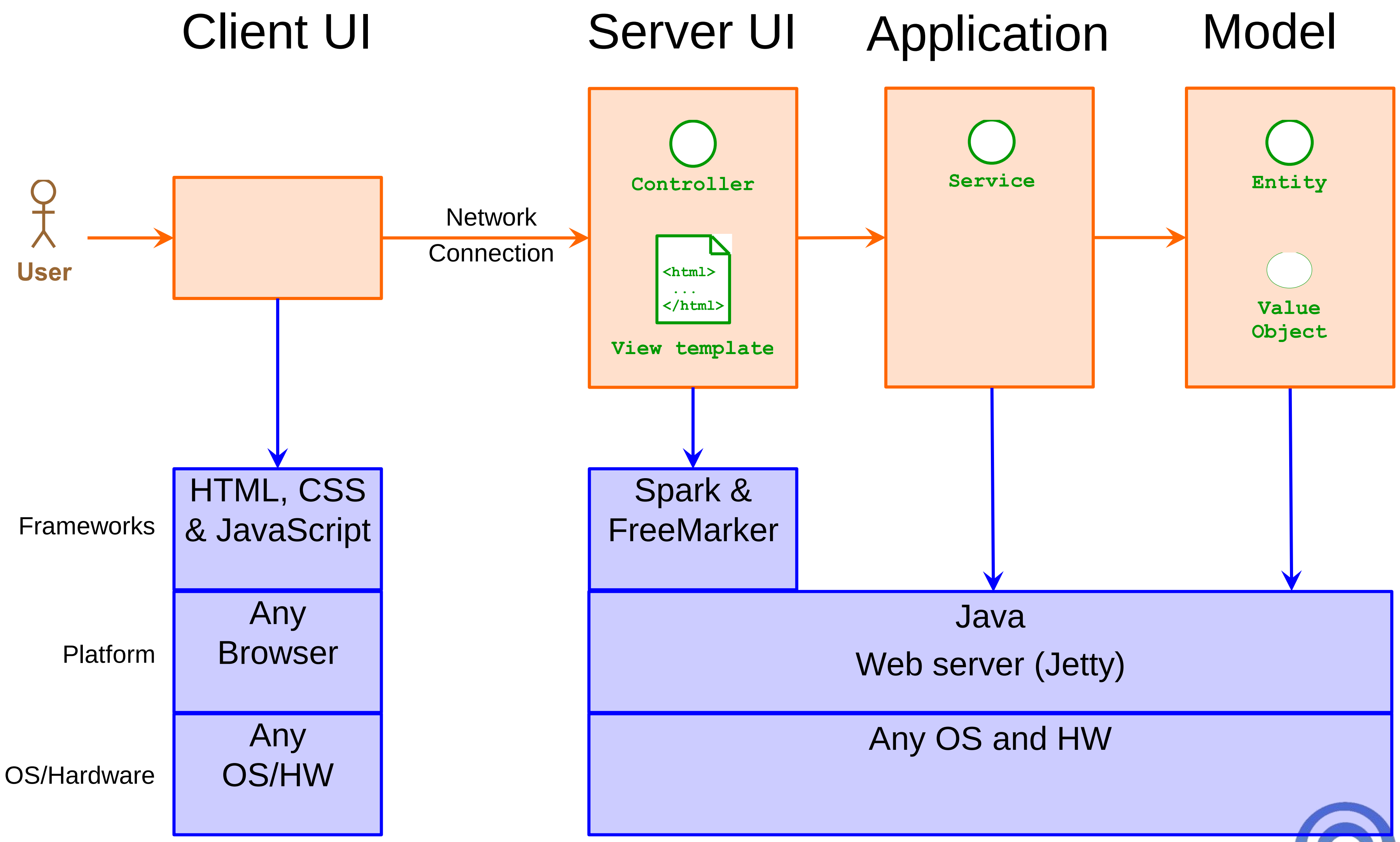
  Domain-driven design (DDD) is an approach to developing software for complex needs by deeply connecting the implementation to an evolving model of the core business concepts

- The premise:
  - *Place the project's primary focus on the core domain and domain logic*
  - *Base complex designs on a model*
  - *Initiate a creative collaboration between technical and domain experts to iteratively cut ever closer to the conceptual heart of the problem*

Let's review our project architecture.



DDD provides guidance for the remaining tiers.



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Services provide application logic.

- The Application tier is responsible for managing the user's interaction with the application.
- It is **not** responsible for domain logic which is in the Model layer.
- Application tier elements provide services to each client connection.
    - ***Manage application-wide logic and information***
    - ***Provide client-specific services for the UI tier***

Entities provide domain logic.

- The Model tier is responsible for managing domain entities and domain logic.
- Entity responsibilities are:
  - ***Process user requests/commands***
  - ***Effect changes based on user requests/commands***
  - ***Validate Model-tier rules***
  - ***Maintain the state of the Model***
- Entities often represent information about the world, and are inspired by domain model entities
  - ***Customers, products and orders in e-commerce***
  - ***Shapes in a drawing app***

Value objects provide values for an entity's "complex" attributes.

- A value object class encapsulates the data that represents an entity's attribute.
  - ***Measurements, dates, credit card numbers, money, colors, (x,y) coordinates are some examples.***
  - ***Two value objects are equal based on equality of the data in the object not object identity.***
- Value objects must be immutable.
  - ***An address of 15 N. Main St cannot be changed into 352 2nd Ave.***
  - ***You create a new address object of 352 2nd Ave.***
- A value object class is **not** just a data holder class.
  - ***Value Object = "value semantics" + immutability + GRASP Information Expert, ref. Flight class in OOD I***

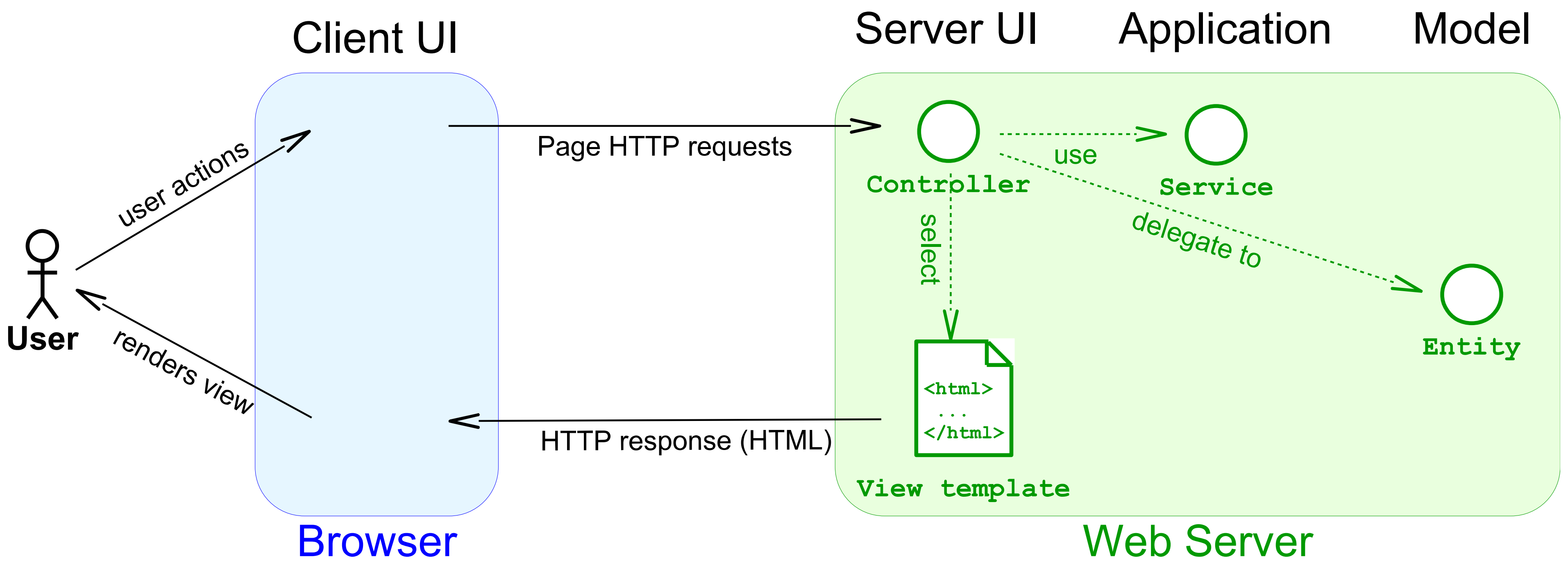
Model objects are frequently used in collections.

- Many of the algorithms used in Model and Application components require using Entities and Value Objects in hash-based collections.
- Normal Java equality semantics are not adequate when dealing with Entities and VOs
  - *An Entity must have a distinct id such that two objects with the same id must be considered equal.*
  - *Two Value Objects with the same data must be equal.*
  - *These semantic requirements imply specialized `equals` and `hashCode` methods.*
- The after-class exercise provides instructions on how to create these methods.

A semantically correct value object can be used as a key in a map collection.

- Rather than extracting attributes from the value object to create a key, use the value object directly.
- This will work correctly because
  - ***The value object is immutable → other code with a reference to the object can not change the object's value while it is in the map as a key***
  - ***The `equals` and `hashCode` methods ensure that two objects with the same value will be considered equal and generate the same hash code.***

Let's review the architecture again.



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This is the list of component responsibilities.

UI Tier	Application Tier	Model Tier
UI Controller: • Control the views based on the state of the application • Query the Model and Application tier as necessary to get information to present to the user • Perform simple input validation and data conversion based on input modality, e.g. String to integer • Initiate processing of user requests/commands possibly providing data the user input • Perform data conversion for display by views UI View: • Provide an interface to the user • Present information to the user in a variety of ways • Provide a mechanism for user to input data and requests	Service: • Manage application-wide logic and information • Provide client-specific services to the UI tier	Entity: • Process user requests/commands • Effect changes to the Model based on user requests/commands • Validate model rules • Maintain the state of the model Value Object: • Provide immutable value semantics • Provide value-based logic