SOFTWARE ENGINEERING

CSE 470 - Software Architecture

BRAC University

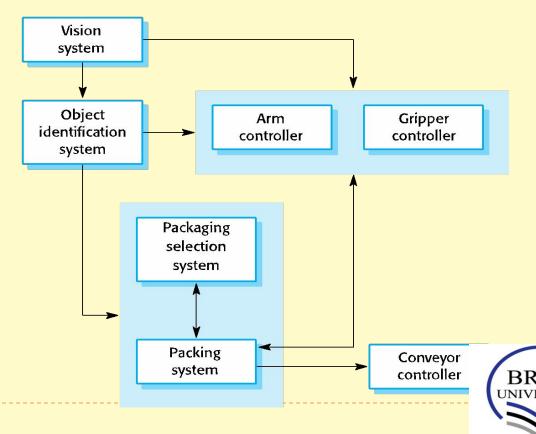


Software Architecture

- Architectural design is concerned with understanding how a software system should be organized and designing the overall structure of that system.
- Software Architecture is how the defining components of a software system are organized and assembled. How they communicate each other. And how the constraints of the whole system is ruled by.
- The architectural mod the development phase

Architectural Representation

Simple, informal block diagrams showing entities and relationships are the most frequently used method for documenting software architectures.



Inspiring Excellence

Advantages of explicit architecture

Stakeholder communication

Architecture may be used as a focus of discussion by system stakeholders.

System analysis

Means that analysis of whether the system can meet its non-functional requirements is possible.

Large-scale reuse

- The architecture may be reusable across a range of systems
- Product-line architectures may be developed. (Softwares with common features like e-commerce)





Architecture Design Decisions

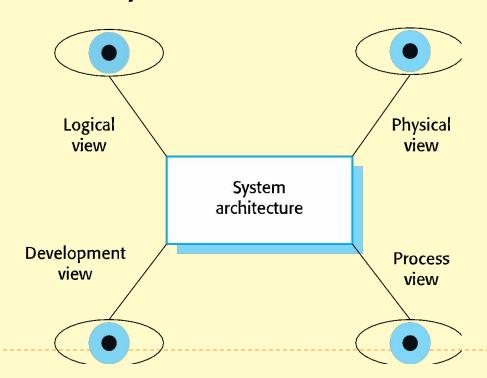
Is there a generic application How will the system be architecture that can act as a What architectural patterns or distributed across hardware template for the system that is styles might be used? cores or processors? being designed? What strategy will be used to What will be the fundamental control the operation of the approach used to structure components in the system? the system? How will the structural What architectural organization How should the architecture components in the system be is best for delivering the of the system be decomposed into non-functional requirements documented?

of the system?

sub-components?

Architectural View

- There are four views from which the architecture of a software can be observed
- Each architectural diagram only shows one view or perspective of the system.

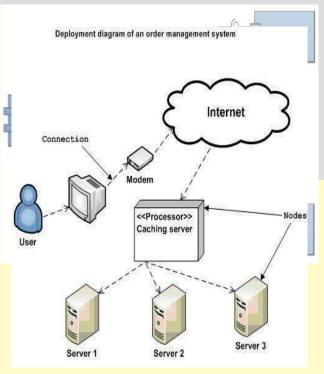




4 + 1 view model of software architecture

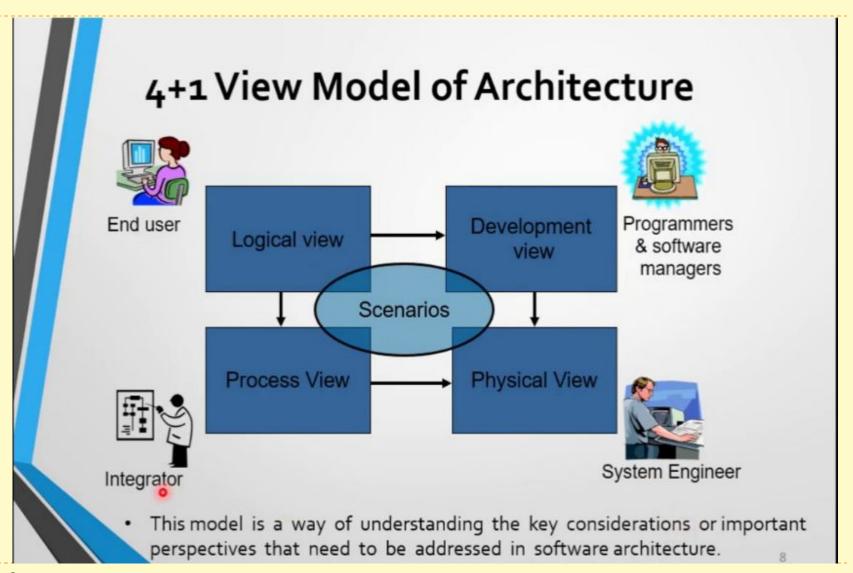
- A logical view, which shows the key abstractions in the system as objects or object classes. (class/state diagrams)
- A process view, which shows how, at run-time, the system is composed of interacting processes. (activity diagram)
- A development view, which shows how the software is decomposed for development. (Component/package diagram)
- A physical view, which shows the system hardware and how software components are distributed across the processors in the system. (Deployment diagram.)
- □ Related using use cases or scenarios (+1)







4 + 1 view model of software architecture



Architectural Pattern

Let's think of some problems -







Architectural Pattern

- An architectural pattern is a stylized description of good design practice, which has been tried and tested in different environments.
- It's a solution to a existing and commonly occurring problem.
- Patterns include information about when they are and when the are not useful.



MVC Pattern

- MVC goes for Model-View-Controller Pattern
- Separates presentation and interaction from the data handling logic.
- The system is structured into three logical components that interact with each other- Model, View and Controller





Controller

- Handles all the user inputs through url
- The interaction to an application starts here by the user interactions mouse click, key press etc
- Process http url requests (GET, POST, PUT, DELETE)
 - GET: for getting a data
 - POST: for posting / inserting a data
 - PUT: for updating a data
 - DELETE: for removing a data
- Communicates with both Model and View
- Contains all server side logic
- In the example ProductController, UserController, AccountController etc.

Model

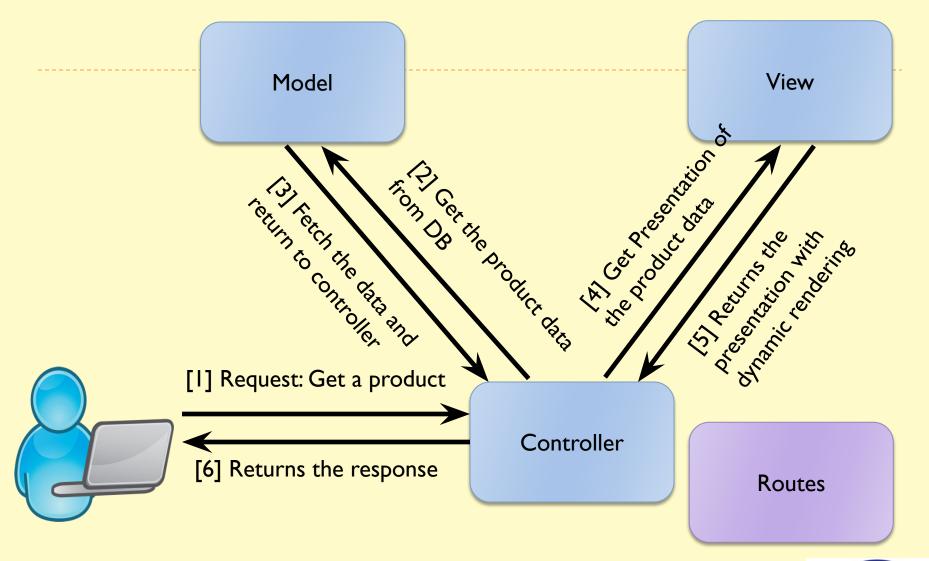
- It refers to the Data Related Logic
- Interaction with database (such as SELECT, INSERT, UPDATE, DELETE)
- It communicates with the controllers
- Can sometimes update or collaborate with the view (Depends on framework)
- In the example Product, User, Transaction, Cart etc are model classes.



View

- What the end users see (UI)
- Usually Consists of html/css
- Communicates with the controller
- While coding are passed as dynamic values from the controller
- A controller can have multiple associated views.
- In the example product.html, user.html to view a html file







Routes

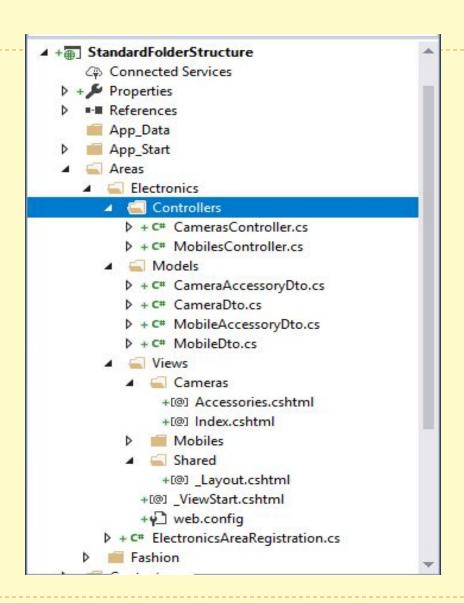
- Are urls to access a resource kept under App_Start folder
- General structure http://domainName/{controller}/{action}/{id}
- http://YourApp.com/Users/Profile/25

```
Solution 'MVC-BasicTutorials' (1 pro
public class RouteConfig
                                                                                                      MVC-BasicTutorials
                                                                                                        Properties
                                                                                                      ▶■ References
    public static void RegisterRoutes(RouteCollection routes)
                                                                                                         App Data
                              Route to ignore
                                                                                                      A G App Start
                                                                        RouteConfig.cs
        routes.IgnoreRoute("{resource}.axd/{*pathInfo}");
                                                                                                        D C* BundleConfig.cs
                                                                                                        Ca FilterConfig.cs
                                                                                                          P RouteConfig.cs
                                             Route name
        routes.MapRoute(
                                                                                                      Content |
            name: "Default"
                                                           IRL Pattern

▲ Controllers

            url: "{controller}/{action}/{id}",
                                                                                                        C* HomeController.cs
            defaults: new { controller = "Home", action = "Index", id = UrlParameter.Optional ]
                                                                                                      b fonts
                                                                                                         Models
                            Defaults for Route
                                                                                                        Views
```







```
http://yourapp.com/users/profile/1
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              View
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        Model
/routes
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       To the state of th
                                 users/profile/:id = Users.getProfile(id)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              13) Feth the data and
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            Presentation with
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  Sold in the second seco
/controllers
                                 class Users{
                                                                    function getProfile(id){
                                                                                                       profile = this.UserModel.getProfile(id)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            [1] Request: Get a product
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     Controller
                                                                                                        renderView('users/profile', profile)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  [6] Returns the response
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           Routes
 /models
                                 Class UserModel{
                                                                     function getProfile(id){
                                                                                                       data = this.db.get('SELECT * FROM users WHERE id = id')
                                                                                                        return data;
 /views
                                   /users
                                                                     /profile
                                                                     <h1>{{profile.name}}</h1>
                                                                    <l
                                                                                                        Email: {{profile.email}}
                                                                                                        Phone: {{profile.phone}}
```

When Used:

Used when there are multiple ways to view and interact with data. Also used when the future requirements for interaction and presentation of data are unknown.

Advantages:

Allows the data to change independently of its representation and vice versa. Supports presentation of the same data in different ways with changes made in one representation shown in all of them. Other advantages are: parallel working, improved testability, code reusability

Disadvantages:

Can involve additional code and code complexity when the data model and interactions are simple.



Summary

- MVC is one of the most used architectural patterns.
- It divides the system into three parts model, view and controller
- It provides a extensible separation of concern (SOC) from presentation view to data processing logic.



