SOFE 3650U Software Design and Architecture

Iteration 1 of Art Gallery Project

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Project Use Cases :

Use Case	***Description***
UC-1: Information Page	A user can access the information about the art gallery website, history of art gallery website, and the events of the upcoming art gallery and its location Administrator can update this information, upload new information, new events description.
UC-2: Buy or Sell Arts	A user can buy art pieces from the sales page and can select the quantity required to buy. Administrator has the access the to update the art pieces for selling. Administrator can also buy the art pieces from the artists.
UC-3: Make Payment	A user can use the different payment methods to buy the desired art pieces. Administrator can buy art from the users that are selling the art pieces by making payment through this method.
UC-4: Contact Art Gallery	A user can provide feedback, express concerns, make a complaint regarding the services provided at art gallery website through Art Gallery contact page. A customer service representative can see the complaints and concerns of the users through art gallery contact page and can access them accordingly.
UC-5: Collection Page	A user can see the different art pieces listed on the collection page. Collection Page is only meant to display the art pieces. Users can access this page free of cost. Administrator can remove, add or modify the art pieces on this page.
UC-6: Manage Users	The administrator removes or adds the users. Administrator can modify the permissions of the users. User can be removed for a limited period or permanently by the administrator .
UC-7: Login and Logout	A user login into the system through a password /login page will be promoted when the user clicks on sign in. Once the user has been authorized the access to the art gallery, user can navigate the art gallery website according to the roles. Administrator have access to the login and passwords of every user of the art gallery website.
UC-8: Manage Art Gallery	Administrator have access to the art gallery and manages the amount of art pieces displayed, any information or issues related to the art gallery. Technician manages the art gallery by fixing the concerns related to the art gallery functioning. Technician is responsible for the overall maintenance of the art gallery website.

Quality Attributes :

Quality Attribute	Description	Associate Use Case(s)
QA-1: Performance	The User should not experience delays of more than 5 seconds in retrieving information from the site.	All UC
QA-2: Usability	The User has many methods of paying for the art they desire. The system should reflect this and offer many payment methods (bank transfer, e-transfer, cash by mail etc…)	UC-3
QA-3: Testability	The system may sometimes receive invalid inputs. The system should be able to process these inputs within 10 seconds per invalid input.	All UC
QA-4: Security	User's will store private financial information on thesite to buy and sell art. Therefore, the system should encrypt the private information of its users like login and financial info.	All UC
QA-5: Modifiability Usability	The system administrator should be able to modify theart gallery.	UC-1, UC- 2, UC-5, UC-8
QA-6: Testability	The system must be able to complete art transactions	All UC
QA-7: Availability	The system must continue to operate and be available all the time. For UC-4 availability must be predefined	All UC
QA-8: Interoperability	The system must exchange data with external systems such as banking services and online payment providers	UC-3
QA-9: Performance	The users can see new art pieces withing thirty minutes from an update by the administrator.	UC-5
QA-10: Security	The management can easily find out the different modes of payments and which users have made the payments	UC-3
QA-11: Security	The administrator can decide which users can be added or removed from the art gallery due to any security concerns which might be temporary or	UC-6

Constraints:

Constraint	Description
CON-1	The system must be accessible and run smoothly by all popular web browsers (mozilla, chrome, edge etc...) and all popular operating systems (Windows, mac os x). Additionally, the system must also support mobile devices.
CON-2	All user data including financial and transactional records must be stored indefinitely.
CON-3	The system must have a mobile-friendly design.
CON-4	The system must work properly when viewed with different resolution monitors. The system must work when the view is stretched or shrunk.
CON-5	All art uploaded to the system must have the authors permission.

ADD Step 1: Review Inputs

<table>
<tr><th>Category</th><th>Details</th></tr>
<tr><td>Design Purpose</td><td>Art Gallery is a website that allows users to create accounts to browse and buy art pieces. The system features a login/account system with a payment system for ordering art. The system administrator manages the website by adding/removing art pieces, changing prices, and editing accounts, among other privileges.</td></tr>
<tr><td>Primary Functional requirements</td><td>UC-2: Buy or Sell arts: This directly supports the core of the project through the purchasing of art pieces and the ability to add to the database by the administrator
UC-5: Collection Page: This directly supports the core of the project through the ability to modify the art piece collections page
UC-8: Manage Art Gallery: This directly supports the core of the project through the ability to modify the art pieces database. It also supports modifiability of the back end with a technician</td></tr>
<tr><td>Quality attribute scenarios</td><td>
<table>
<tr><th>Quality Attribute Scenario</th><th>Importance to the Customer</th><th>Difficulty of Implementation According to the Architect</th></tr>
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</td></tr>
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	QA-1	low	low
	QA-2	high	medium
	QA-3	low	low
	QA-4	high	medium
	QA-5	medium	low
	QA-6	high	low
	QA-7	high	low
	QA-8	high	medium
	QA-9	low	low
	QA-10	low	medium
	QA-11	medium	low
Constraints	All the concerns discussed in initially are included as drivers		
Architectural concerns	All the architectural concerns discussed initially are included as drivers:		

Step 2: Establish Iteration Goal by Selecting Drivers

The goal of this iteration is to achieve the architectural concern CNR-1 of establishing an overall system structure. Keeping this in mind, there are several drivers that we as the architects must account for;

1. QA-2: The User has many methods of paying for the art they desire. The system should reflect this and offer many payment methods (bank transfer, e-transfer, cash by mail etc…)
2. QA-4: User's will store private financial information on the site to buy and sell art. Therefore, the system should encrypt the private information of its users like login and financial info.
3. QA-6: The system must be able to complete art transactions
4. QA-7: The system must continue to operate and be available all the time. For UC-4 availability must be predefined
5. QA-8: The system must exchange data with external systems such as banking services and online payment providers

6. CON-1: The system must be accessible and run smoothly by all popular web browsers (mozilla, chrome, edge etc…) and all popular operating systems (Windows, mac os x). Additionally, the system must also support mobile devices.
7. CON-2: All user data including financial and transactional records must be stored indefinitely.
8. CON-3: The system must have a mobile-friendly design.
9. CON-4: The system must work properly when viewed with different resolution monitors. The system must work when the view is stretched or shrunk.
10. CON-5: All art uploaded to the system must have the author's permission.
11. CRN-1: Establishing an overall system structure.

Step 3: Choose One or More Elements of the System to Refine

This is a greenfield project for a mature domain, so the entire art gallery system is to be refined.

All components should be revised so the overall performance and functionality can be improved. refinement is performed through decomposition.

Step 4: Choose One or More Design Concepts That Satisfy the Selected Drivers

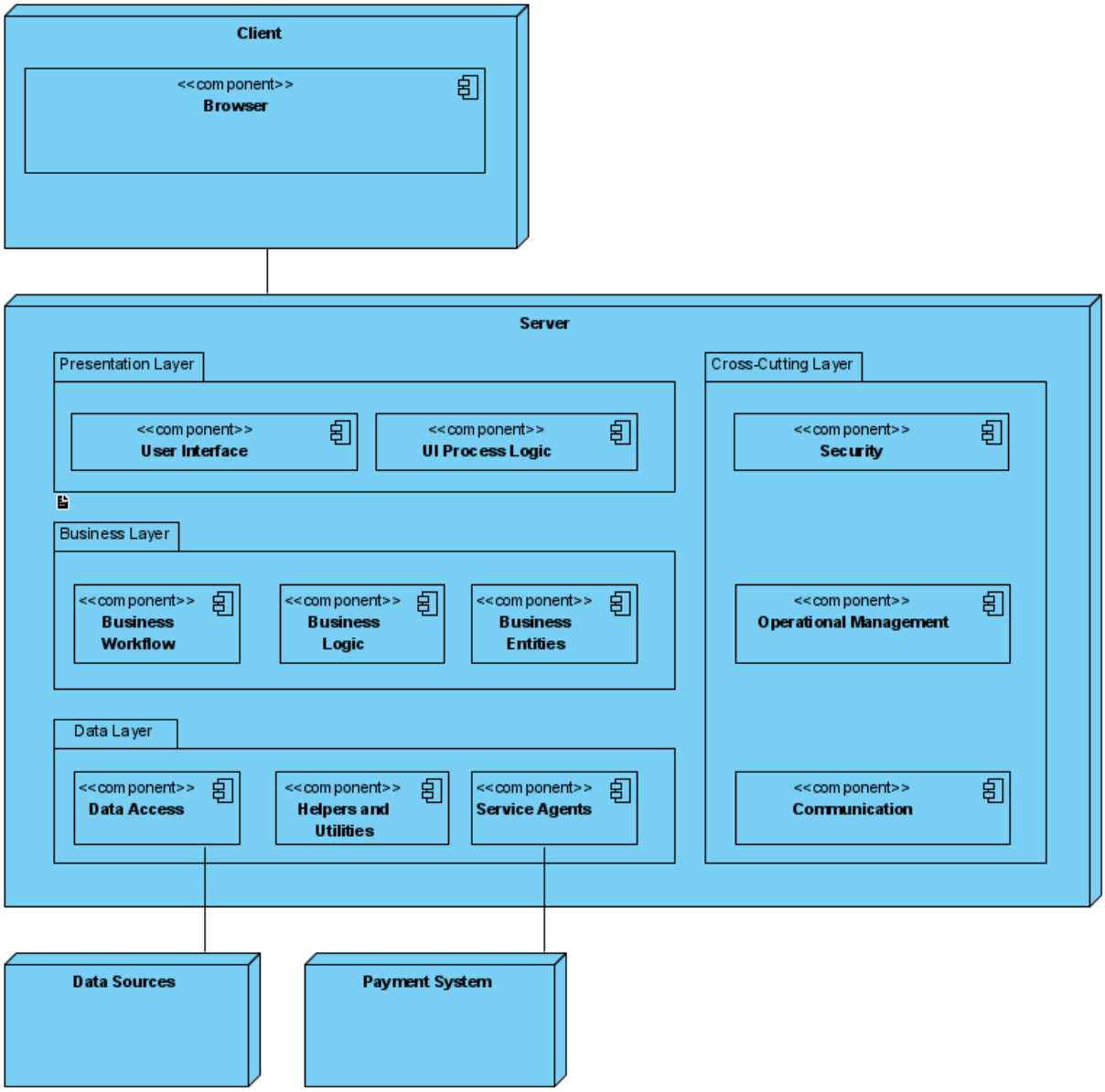
Design Decisions and Locations	**Rationale**
Logically structure the client and server part of the system using the **Web Application** reference architecture	The Web Applications reference architecture is selected for its overall usability to construct non-rich web applications. This is because our system does not require a rich user interface, it does not need to install anything on the client machine, and it must be accessible over the internet by web browsers (CON-1). This design decision partially affects all of the other drivers, but does not directly impact any other as substantially as the first concern.
Physically structure the application using the **three-tier deployment pattern**	This system needs to be accessed through a web browser (CON-1) and there should be an existing database that should be used . Hence the three-tier layer deployment is appropriate .

Step 5: Instantiate Architectural Elements, Allocate Responsibilities, and Define Interfaces

Design Decisions and Location	**Rationale**
Remove Application Facade for the business layer of the server	The Application facade component is unnecessary to fulfill the requirements of the project overall.
Add Payment System as a external system that communicates with the service agents	The Payment System will be an external system to process payments for the Users. Adding the payment module ensures that many payment methods can be used (UC-3, QA-2), the system can complete art transactions (QA-6), and the system uses an external payment module (QA-8).

Step 6: Sketch Views and Record Design Decision

Module View of the system after initial design decisions:

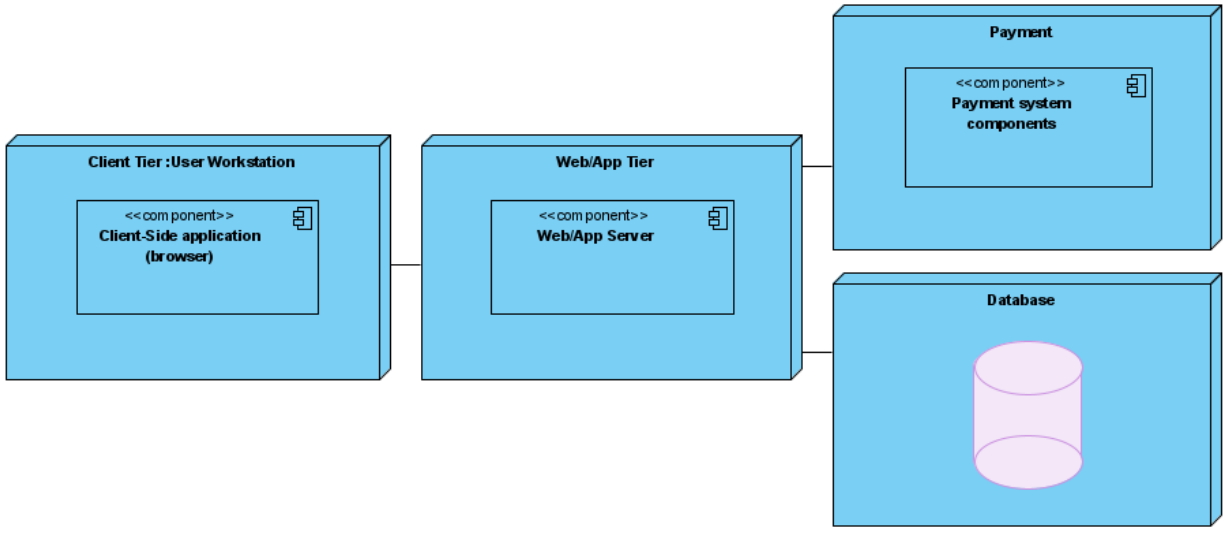


Layer	Component	Responsibility
Client		The presentation layer that communicates with the client service modules
	Browser	Application module that is used by the client to interact with the server applications to provide or display information. Runs on the client machine
Server		This layer exposes the modules and components that

		users will interact with
Presentation		This layer controls user interaction with the server directly, including use case interactions
	User Interface	These components are responsible for receiving/sending information to the users through inputs like buttons, text fields, etc...
	UI process logic	These components are used to direct the flow of the applications use cases. This can include data validation, providing data from business layer to presentation layer, etc...
Business Logic		Contains modules that perform business logic operations on the server side
	Business Workflow	These components are responsible for managing the processes of the business operations, involving the execution of use cases
	Business Logic	These components retrieve and process the data with business rules.
	Business Entities	These components represent the entities of the business domain
Data		This layer contains modules for data persistence and communication with external systems
	Data access	These components encapsulate persistence mechanisms to provide basic operations like retrieving and storing data
	Helpers and Utilities	These components contain functionality common to other modules in the data layer
	Service Agents	These components are necessary for communicating and transferring data between external services and the system itself
Cross-Cutting		These modules have functionality that are designed to work across multiple layers
	Security	These components include functionality to handle security aspects such as authorization and authentication
	Operational Management	These components handle cross-cutting concerns such as exception management, logging, and instrumentation and validation
	Communication	These components handle communication across the layers and physical tiers of the system

Payment Server		This layer is an external system that will communicate with the system to provide payment methods to the users on the website (UC-3, QA-2, QA-6, QA-8)

Deployment Diagram of the system:



Element	Responsibility
User Workstation	Users PC, hosts client side application, in this case the user would only need a browser to connect to the server
Web/App Server	Hosts the server-side logic and web pages of the application
Database Server	The server that hosts the database
Payment server	The external system used to make payments on the website

Step 7: Perform Analysis of Current Design and Review Iteration Goal and Achievement of Design Purpose

Not Addressed	Partially Addressed	Fully Addressed	Rationale
	UC-2		Introduction of an external payment system

			supports the functionality of this use-case
	UC-5		Selected reference architecture establishes required modules that will support this functionality
	UC-8		Selected reference architecture establishes required modules that will support this functionality
	QA-2		Introduction of an external payment system supports the functionality of this quality attribute
	QA-4		Selected reference architecture establishes required modules that will support this functionality
	QA-6		Selected reference architecture establishes required modules that will support this functionality
	QA-7		Selected reference architecture establishes required modules that will support this functionality
		QA-8	Introduction of an external payment system
	CON-1		Selected reference architecture establishes required modules that will support this functionality
	CON-2		Selected reference architecture establishes required modules that will support this functionality
CON-3			No relevant design decisions were made
	CON-4		Selected reference architecture establishes required modules that will support this functionality
CON-5			No relevant design decisions were made
		CRN-1	Selection of reference architecture and deployment pattern