

# Analysis Model Document

## **Bird Sung Gulley: An Online Platform for Art lovers**



Bird Sung Gulley (鸟鸣涧)

- Group Number: 11
- Group Members (Ascending by student number) :
  - 2051278 Fengming Tong
  - 2052635 Ze Sun
  - 2052637 Wenchao Liu
- Instructor: Yan Liu

### **1. Introduction**

#### **1.1 Background Introduction**

We're back at this topic again. This time we'll get started from 2 following aspects.

##### **Why this?**

Previously I tried to blame the recession of traditional art's influence on the development of Internet, which I now think is not that accurate. No such guarantee can be made that people can pay more attention to traditional arts if they were not that attached to the Internet. However, maybe we cannot let these precious cultural heritage to be tossed away that easily let alone that some of us will always reminisce them.

Considering the situation we're facing, the concept of traditional arts and some other cultural essences passed down from our ancestors may fade away in the years to come. Although there would be a lot of people who cannot figure out why this art form is fascinating anyway, some convenient platforms probably will inspire people to try to learn something hence to find out where his/her interest lies in. Not only will this platform preserve people's love of traditional Chinese painting, but also can play a positive role in cultural inheritance. Although it's not realistic to lit everyone's passion on them, to build such a platform is still of necessity.

## **What for?**

Our aim is to build a so called "digital museum" or "e-gallery", which will be able to offer both amateurs and pros an easy-to use platform to communicate and exchange their ideas freely.

The potential scenarios of this system mainly include are as follows: searching for a specific work or artist, writing comments for a topic or a specific work, browsing brief introduction of traditional Chinese art's history or something else that worth a look at, posting your own work and interacting with others who wrote comments for your work, sharing your thoughts and then "lead to" a friendly debate, etc.

To find such a way to put what we've learnt into practice can be a challenging but also meaningful.

## **1.2 Refinements & Progress**

We've discussed the potential use cases for most kinds of users last time by creating activity diagrams along with use case diagrams. Detailed description and explanations were made as well.

This time we mainly focus on the system level. It's of importance that we figure out what subsystems shall we have and how we can divide them among all the services we're about to offer.

This document will give a introduction about system architecture, analysis model and user interfaces. We mainly used class diagrams and sequence diagrams to illustrate all these aspects. In the following chapters, you can see more detailed description and diagrams.

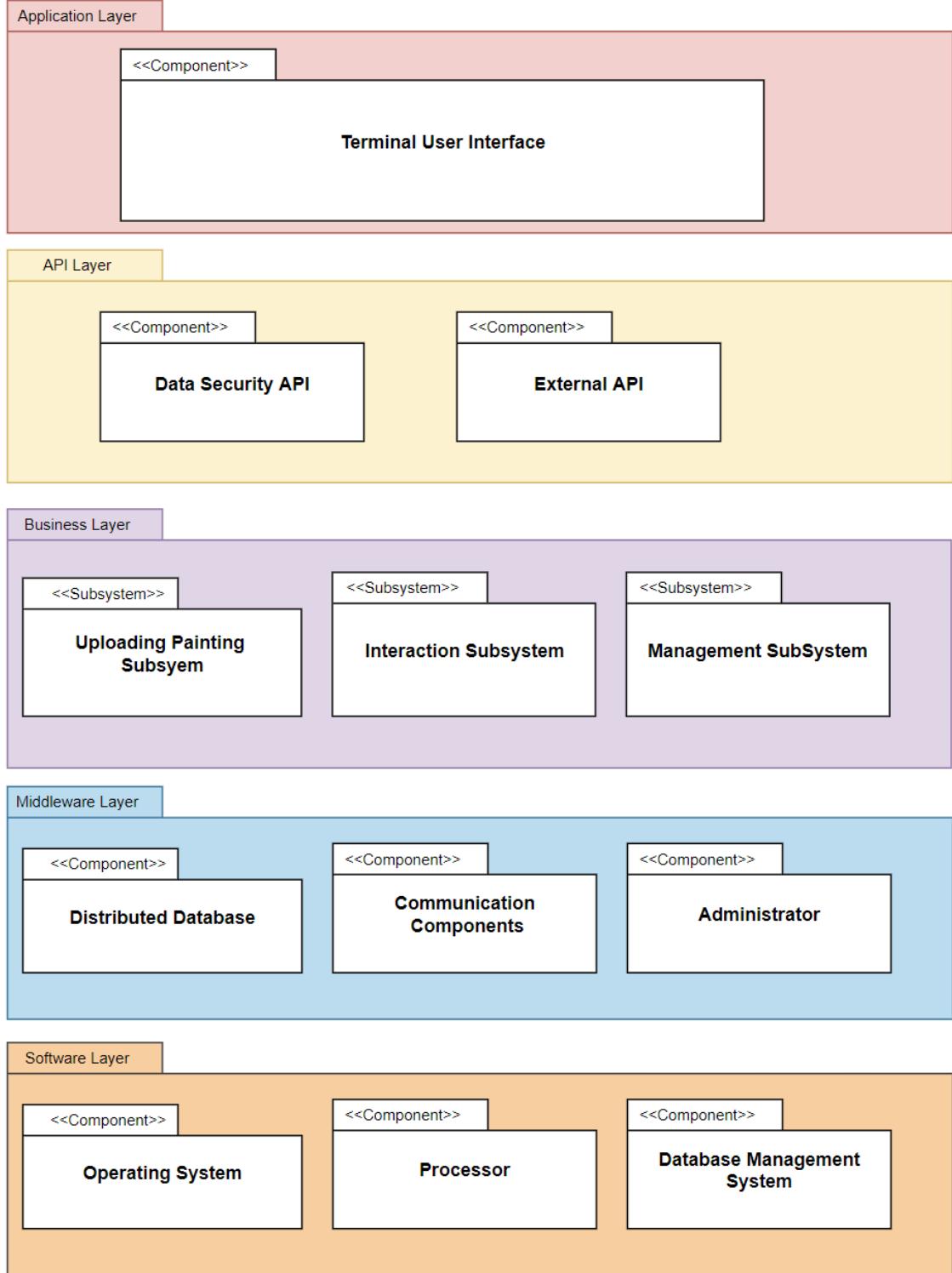
# **2. System Structure Design**

## **2.1 Overview of the System Structure**

As an online forum, we necessarily have to consider information transfer, data processing, data security and so on with the official database. Apart from that, in order to provide a smooth using experience and secure running of the forum, high-performance distributed cloud servers are required as well.

Considering all these aspects, our system-level architecture design is further refined on the basis of the classic three-tier architecture, using a presentation layer, an interface layer, a business layer, a middleware layer and a system software layer to compose a five-tier architecture, which can improve the system stability and performance along with the management and reusability of our system.

The five-tier architecture is shown in the figure below.



in the figure above, you can see that we've listed some of the subsystems and essential components. Further discussion will be carried out in the later chapters.

## 2.2 Presentation Layer

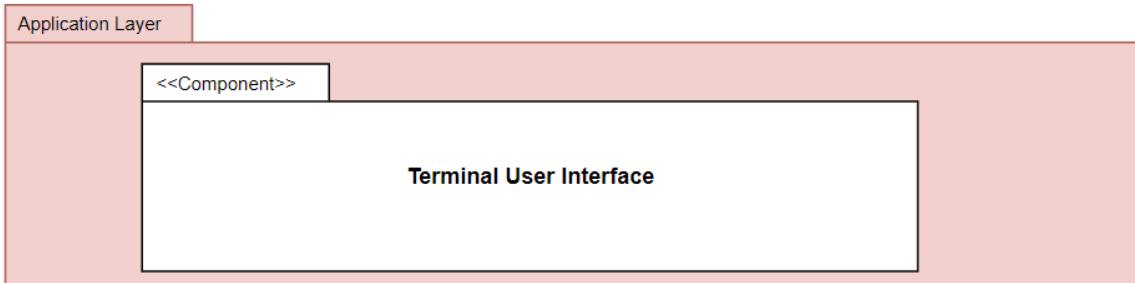
Generally speaking, presentation layer mainly covers the functions of interacting with users, displaying info for users and deal with what users have input.

In our design, we chose an usual pattern: MVC. MVC is short for Model, View, Controller,

- Model represents business domain objects
- View represents the information presented to the user, i.e. the information of the model.

- Controller receives input from the user and coordinates the changes to the model and the view. That is, Model is relayed and changed according to the input.

This figure demonstrated what the presentation layer covers: the presentation layer mainly covers the system's interface and necessary components to interact with users.

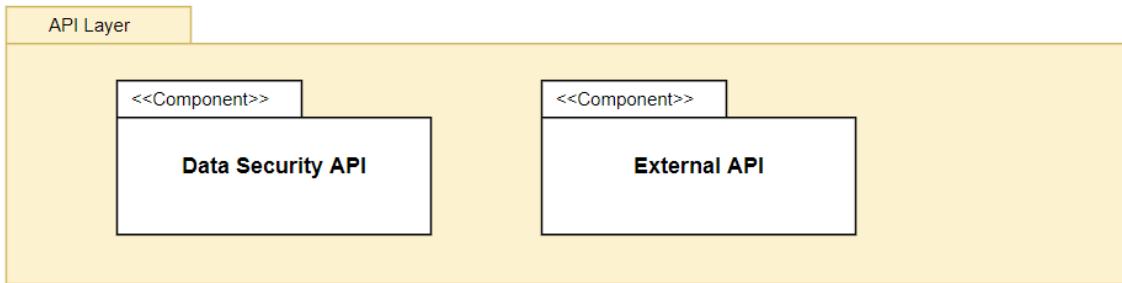


## 2.3 API layer

API is short for Application Programming Interface. In the construction of a system, designing appropriate API to offer useful services to other piece of software is of vital importance.

By abstracting the underlying implementation and only exposing objects or actions the developer needs can greatly improved user-friendliness. However, API security is also very critical when developing a public facing API. Common threats include SQL injection, Denial-of-Service attack(Dos),broken authentication and so on shall be avoided to ensure the security and integrity of Users' info and the system data.

In our design, our API layer contains some built-in system interfaces, in the meanwhile further decoupling the system UI and business logic. In the figure below you'll be able to see them.

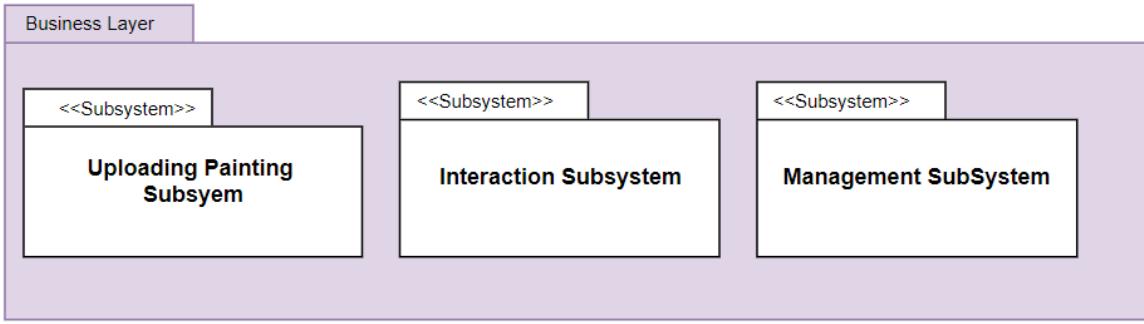


The Data Security API mainly deal with the security problem we discussed in the former paragraph.

The External API will get the corresponding data from the external database or allocate the external interface and return it to the business layer subsystem for use.

## 2.4 Business Layer

The Business Layer will be the core layer of the whole system. All the business logic exists in this layer, so attention must be paid to this layer. The services provided by this system are implemented by logically processing varied kinds of data to achieve different business functions.



As you can see from the figure above, we generally divided the whole system into three subsystems, the functions they covered are listed below.

### 2.4.1 Upload Painting Subsystem

- In this subsystem, the major function is to allow users to upload paintings in our "e-gallery". By uploading their paintings, users will be able to receive others' comments and leave comments for others' paintings.
- We deliberately separated this function from the Interaction(Forum) Subsystem for the reason that we deem this not only as one of our innovations but also a core function to our system as well.
- Hence, we refined the process and made some adjustments to improve the usability. You'll see that in the upcoming chapters through the class diagrams and sequence diagrams.

### 2.4.2 Interaction Subsystem

- This subsystem is extremely critical to our system for the reason that we actually designed most of other functions with the goal to collaborate with it, what we wanted to present is an mature online forum which is fully equipped with auxiliary functions as many as possible.
- For an online forum, post something is the core component. To achieve both convenience and security, we set the position of Administrator to check all new posts to ensure that no inappropriate comments were made public. Apart from that, the Moderator will possess the power to stick any valuable posts to inspire more positive and friendly debates along with seeking advice from the experienced.
- Maybe sometimes users will need to communicate with others personally, we also provided corresponding functions to make it possible. However, we will warn any users who tried to have a private conversation with others with some tips like do not leak out any personal information to some one you don't actually know. Although this kind of private conversation may bring some risks to users' privacy, we did believe that this feature has more positive effects.
- More details will be shown in the upcoming chapters through the class diagrams and sequence diagrams.

### 2.4.3 Management Subsystem

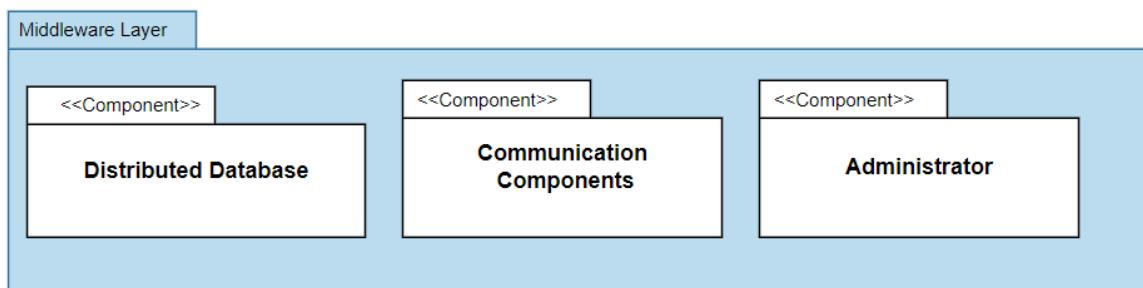
- This subsystem primarily focuses on the work of Administrators. These work are of vital importance to maintain a harmonious community and motivate users to participate in all kinds of activities. Considering the amount of different scenarios Administrators will run into, we constructed a subsystem for these work.
- Two major problems that Administrators will face are auditing users' posts and comments along with review the activity plans by the Moderators. In both scenarios, the Administrators will be authorized to make judgements individually. However, that doesn't mean that they can make any decisions casually. Certain standards have to be met when they decided to decline any request or stop some comments being exposed to public.
- More details will be shown in the upcoming chapters through the class diagrams and sequence diagrams.

## 2.5 Middleware Layer

The middleware layer acts as a bridge between the application software layer and the system software layer. It shields the underlying differences of heterogeneous platforms, provides a unified interface for upper layer applications, and bridges the various parts of the application system using the basic services provided by the system software to achieve the purpose of resource sharing.

The components listed in the figure below are:

- Distributed Databases: The use of distributed databases eliminates potential single point of failure issues and provides reliable access to data. At the same time, it also offers excellent performance in the face of highly concurrent tasks, improving efficiency for handling similar situations.
- Communication Components: The communication components enabled robust, efficient and secure data transfer between different platforms and can well support distributed systems development.
- Transaction Monitor: The transaction monitor checks events within the system to ensure atomicity and consistency.



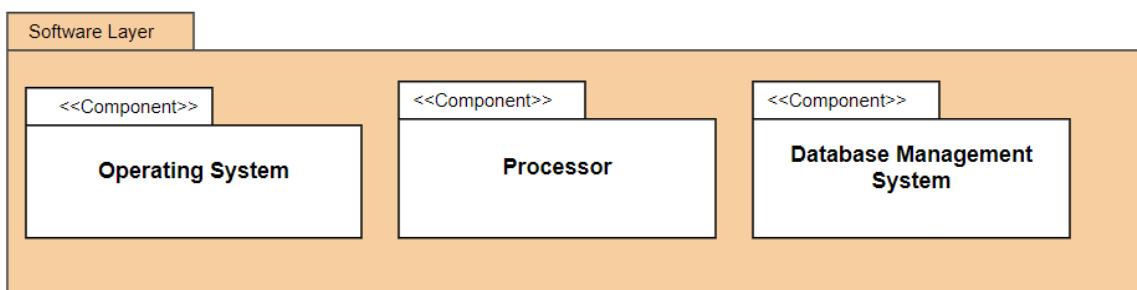
## 2.6 Software Layer

Although the various subsystems handle different tasks, they all require some common underlying operations. For example, they all need to obtain data from input devices, send data to output devices, manage data routinely, and so on. Therefore, the system software needs to automatically schedule, monitor and maintain the computer system as well as

manage the various independent hardware in the computer system so that they can collaborate with together. System software allows our upper-level applications to view the computer as a whole without regard to the underlying hardware logic.

The components listed in the figure below are:

- Operating System: operating system is the basic software for managing computer hardware and software resources.
- Processor: The compiler performs instruction-level optimizations for our business logic.
- Database Management System: database management system controls the database to ensure the security and integrity of the database.



## 5. User Interfaces

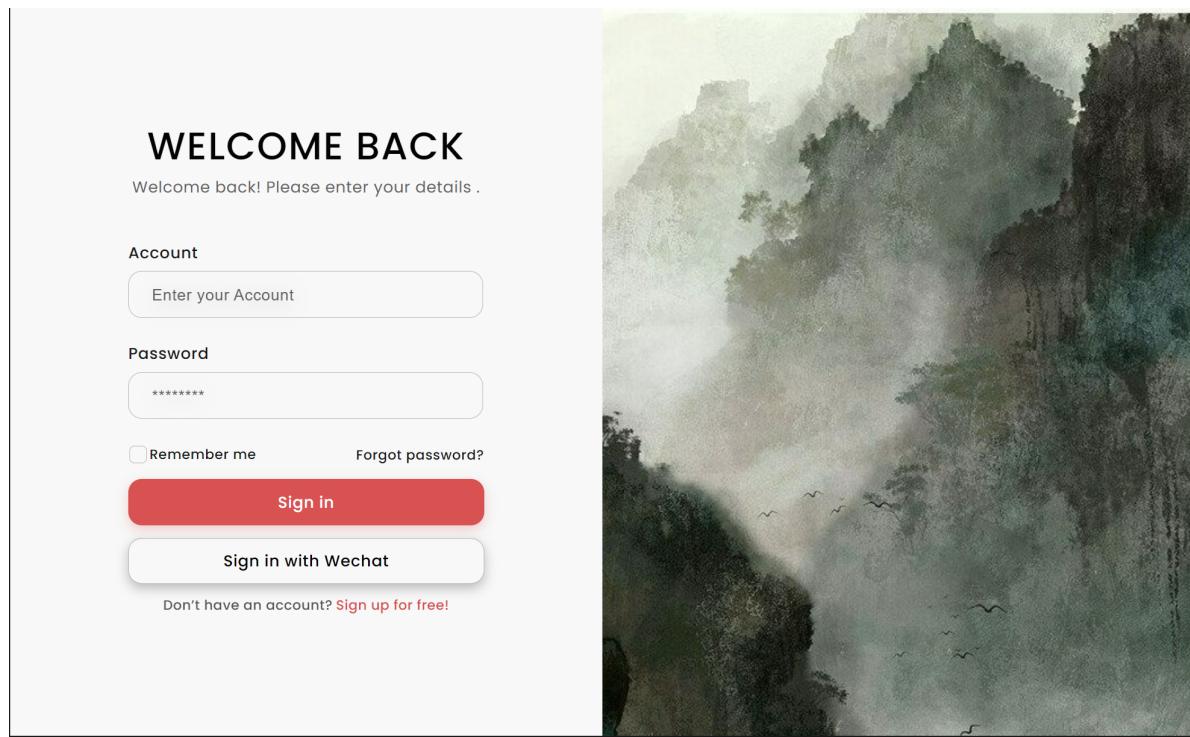
### 5.1 Register& Login

The image shows a user interface for a registration/login system. On the left, there is a form with the following fields:

- WELCOME TO BIRD SUNG GULLEY!**
- Please enter your info to complete it.**
- Account**: An input field with placeholder text "Enter your Account".
- Password**: An input field with placeholder text "Enter your passwd".
- Re-enter Password**: An input field with placeholder text "Please enter your passwd again".
- Any problems?**: A link in blue text.
- Register**: A red button with white text.

On the right side of the image is a traditional Chinese landscape painting depicting misty mountains and a river.

- As shown above, Users who are new to this system can fill in these essential info to create their own account. After that, they can login the system and participate in all kinds of activities available here.
- For more detailed info, users can choose to complete them in their personal pages.



- This is the Login page, we also intend to provide users who wants to save the trouble giving themselves a new name an alternative, that is to sign in with WeChat.
- If users forgot their password, they can set a new one after succeeded in passing certain tests.

## 5.2 Forum

The screenshot shows the front page of a forum system. At the top, there is a navigation bar with a logo, the site name 'Bird Sung Gulley', a search bar, and buttons for 'Register' and 'Login'. On the left, there is a sidebar with a 'Search' field and a 'MENU' section containing 'Posts' (which is highlighted), 'Columns', and 'Ranking'. The main content area displays three posts:

- TongXiaoJi** posted 5 min ago: **Which of the paintings do you like the most?** XXXXXXXXXX. 520 views, 115 likes, 11 comments.
- John Doe** posted 25 min ago: **How to use the brush to draw? It's way to difficult for me lol** XXXXXXXXXXXX. 99 views, 99 likes, 99 comments.
- Heishi Qi** posted 2 days ago: **How do you guys think of this painting?** XXXXXXXXXX. 88 views, 42 likes, 131 comments.

Below the posts, there is a sidebar with two sections: 'Must-read posts' and 'Featured links'. The 'Must-read posts' section lists tips like 'Posting notes for every column! Must read before you post!' and 'Why Baishi Qi was regarded as goat ?'. The 'Featured links' section lists links to 'Wikipedia', 'Pixabay', and 'Tongji University'.

- This is what users will see in the front page of our forum system. As you can see, a lot of posts with varied topics are shown here. If you are interested in any of them, it's convenient to view more details by a simple click on the blocks.
- We also listed some Must-read posts and Featured links. Some of the must-read posts are tips or something to mention, while some of them may be a certain debate ongoing which draws people's attention.

## 5.3 Detailed View Posts

The screenshot shows a user interface for a social media or forum-like platform. At the top, there is a header with a logo, the name "Bird Sung Gully", a search bar, and a "New Post" button. On the right side of the header, there are icons for notifications and a user profile.

On the left, a sidebar titled "PERSONAL NAVIGATOR" contains links: "Your Posts" (which is highlighted in orange), "Your Replies", and "Your likes".

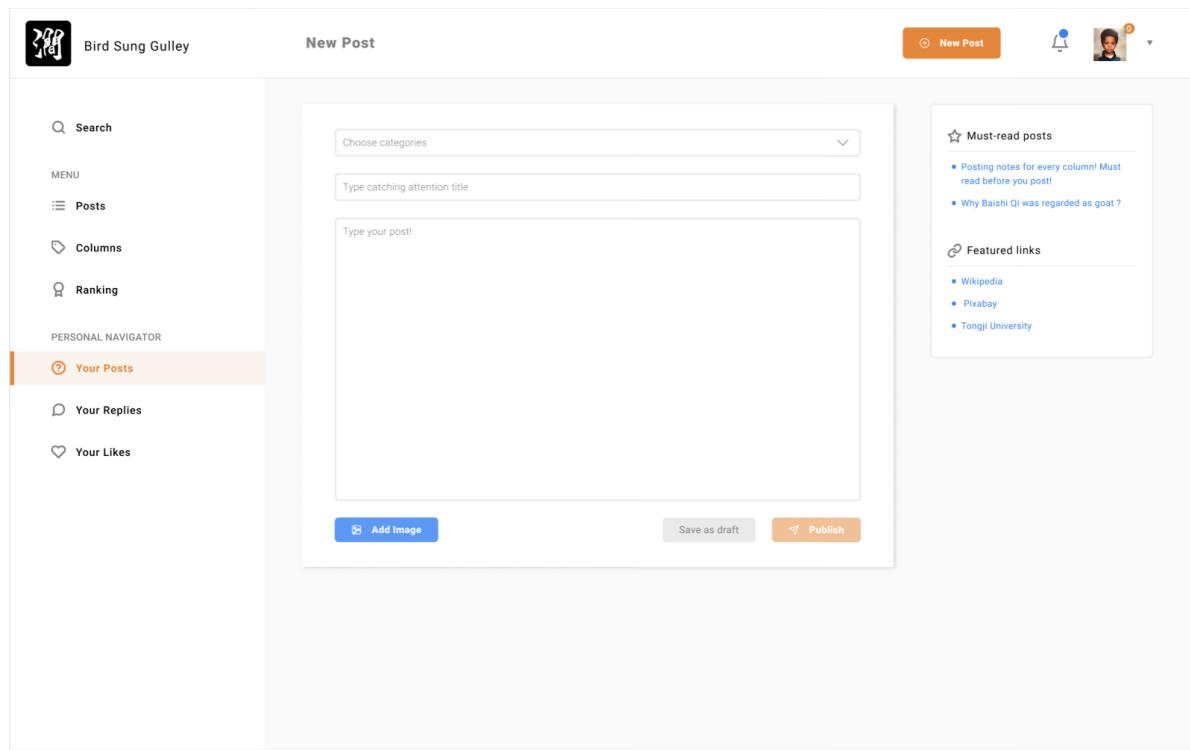
The main content area displays a post by user "@J. Cole" from May 15, 2022, at 12:05. The post content is "How to find some tutorials for learning how to paint? XXXXXXXXX XXXXXXXXX (pics are allowed here)". Below the post is a blue "Post" button. To the right of the post is a large red square icon featuring a white swan, with the text "@J. Cole" and "101" below it, indicating 101 likes.

Below the post, there is a "Comments" section with a text input field labeled "Type here your comments..." and a "Comments" button. A comment by user "@Elizabeth" from May 14, 2022, at 19:35 is shown, reading "XXXXXXX XXXXXXXX". This comment has 12 likes and 3 replies. The first reply is from "@Robot\_01" (@Elizabeth) saying "@Elizabeth, XXXXXX" and "by @Robot\_01". The second reply is from "@Robot\_01" (@Elizabeth) saying "@Robot\_01, Thanks!" and "by @Elizabeth".

At the bottom of the comments section, there is a post by user "@A. Mohamed" from May 14, 2022, at 19:58, with the content "XXXXXXXXXXXXXX". This post has 256 likes and 43 replies. A link "Show All Replies (21)" is visible.

- As illustrated above, you can see who posted this, what are the contents of this post. Of course you can write your comments below to offer your kind advice. Or you can view others' comments to enrich your perspectives on something you may or my not be very familiar with.
- On the left side, you can choose to view the comments your wrote, the replies you appreciate, etc. .

## 5.4 Write your own post



- In this page, users will be able to edit their own posts by adding some words or pics right here. However, before you post it, you will have to decide where this post will go to and try to name it with an attracting title.
- By clicking the "New Post" on the top right corner, users can be able to create a new post.

## 6. References

- System Analysis and Design Kenneth E. Kendall

The book makes a relatively balanced presentation and explanation in practice and theory, and the combination of examples and UML diagrams gives us a better understanding of subsystems, object layering and architectural patterns. We studied the basics of system design and chose a hierarchical architecture after a thorough consideration of the system we were aiming to design. Through the user interface design, we learned about the principles of GUI design and designed part of the user interface for this project from the perspective of user needs and experience. The theoretical knowledge in the book is vivid and solid, which provides us with great help and support in our design.

- Applying UML and Patterns Craig Larman

This book introduces the basic concepts of domain model and timing diagram to guide our modeling process. Besides, the logical architecture of the system and package diagrams are explained. Package diagrams are usually used to describe the logical architecture of a system, which is the macro-organizational structure of the software, while using layer design allows the large logical structure of a system to be organized into independent discrete layers with a clear separation of concerns. In a strict layered architecture, each layer can only invoke the services of the lower layer adjacent to it. In our design, we refer to the idea of layering to draw clear boundaries between the user interface layer, the business layer, and the system software layer to facilitate subsequent reuse, update, and replacement.

Through a certain understanding and study of this book, we have gained a deeper understanding of how UML is used and what it means, which has been a great support for some of our designs.

- Thinking in UML Tan Yunjie

By using UML as the carrier, this book ingeniously integrates object-oriented analysis and design ideas into the modeling process, and organically combines all aspects of the software system development process via examples throughout the book, from which we learned concept and drawing method of sequence diagram, collaboration diagram, class diagram as well as how to apply them to our system analysis.

In chapter 4, we learned how to draw class diagram, sequence diagram and collaboration diagram. UML uses class diagrams to represent classes, interfaces, and their associations. Classes have Attributes and methods. There is also a relationship between classes, such as association, aggregation, generalization, and so on. We have designed class diagrams as shown in chapter4 based on these knowledge.

The sequence diagram describes the events which occur in the objects participating in the interaction, and how these objects communicate by sending messages to each other.

Based on these concepts, we have drawn some sequence diagrams for the main use cases in JIYU club management system, as shown in chapter 4.

Since the collaboration diagram presents almost the same information as the sequence diagram, we directly converted it into a collaboration diagram based on the above sequence diagram.