

Project Report

Introduction to our Project and Team

Our Project

Our project is named as **Linkage**. Linkage is a combination of **Wechat** and **Weibo**. Wechat part is a private community, you can chat online and share moments with your close friends. But the Weibo part is a global community, you can post articles for everyone to browse, and browse trending posts.

Our Team

Name	Matriculation Numbers	Contact Numbers	Email Address
Luo Hao	1752547	15216815391	3099916791@qq.com
Zhang Zijian	1752894	18280096128	zzj1999@outlook.com
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System Functionalities

1. Account Management

- **Account**
 - Sign up, sign in, sign out & Modify or reset the password.
 - Create a global account.
- **Personal info**
 - View and modify personal account info & global account info.
- **Friends**
 - View friend list.
 - Add or delete a friend.
 - Subscription & Follower
 - View subscription list or follower list.
 - Add or delete a subscription.

2. Moment Management

- **Create Moment**
 - Create a moment with text and pictures.

- **View Moment**
 - View our own moments.
 - View our friends' moments.
- **Operation**
 - Like a moment & cancel the like of a moment.
 - Make comments of a moment.

3. Post Management

- **Create Post**
 - Create a post with text and pictures.
- **View Post**
 - View our own posts.
 - View our subscriptions' posts.
- **Operation**
 - Like a post & cancel the like of a post.
 - Create a comment of a post.

4. Chat System

- **Common Chat**
 - Send messages with text and expression to friends.
 - Receive the prompt of the message.
 - Check the message sent to us.
- **Emergency**
 - Send emergency messages to our friends.
 - Check the emergency messages sent to us in our e-mail boxes.

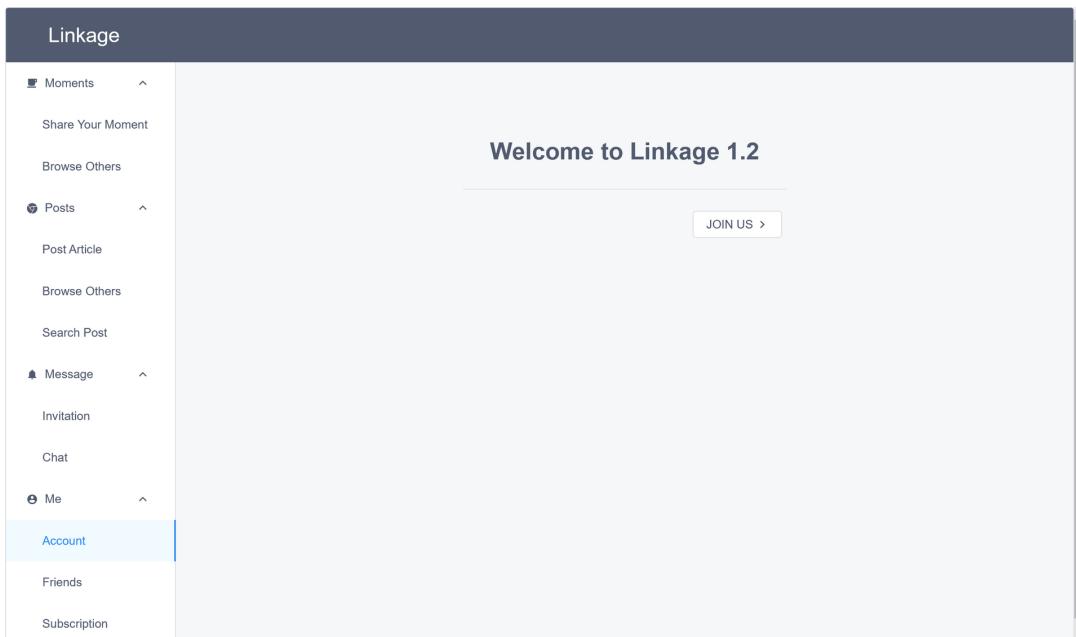
5. Trend Management

- **Check visitor volume**
 - Check the visitor volume of a post in a certain period of time.
 - Compare the visitor volume of several posts.
- **Set trend**
 - Set the trend list from several candidate posts with high visitor volume.

User Manual

Home Page

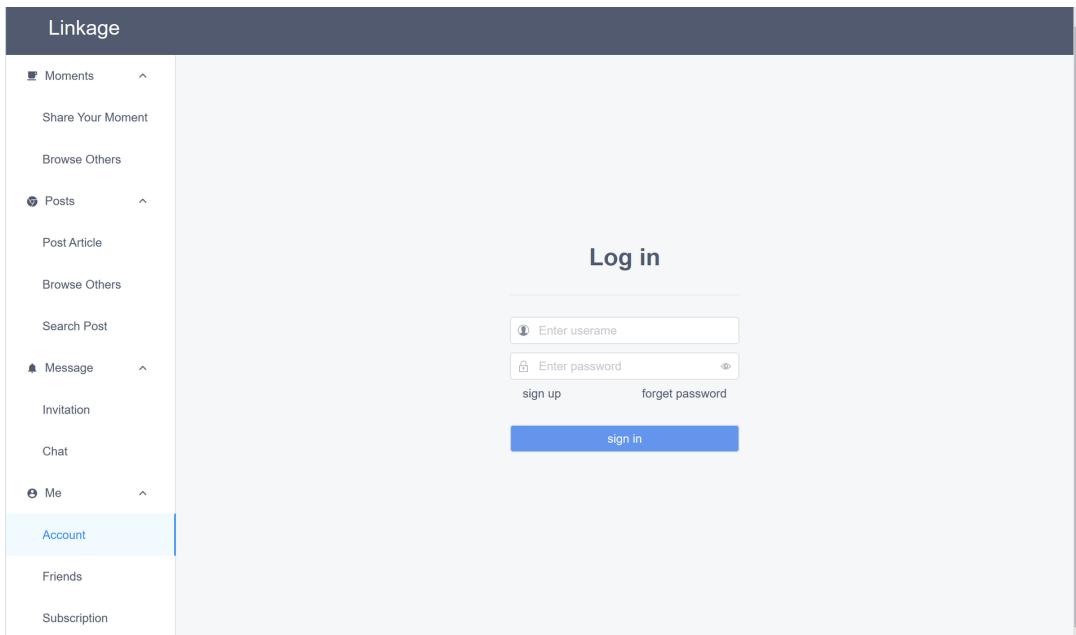
When we search the url "linkage.ink", this home page will show firstly. You can click "join us" to start using our system.



The screenshot shows the 'Linkage' application's interface. On the left is a vertical navigation sidebar with sections: Moments, Posts, Message, Me, and Account. 'Account' is currently selected and highlighted in blue. The main content area has a dark header bar with the 'Linkage' logo. Below the header, the text 'Welcome to Linkage 1.2' is displayed. A 'JOIN US >' button is located in the top right corner of the main content area.

Log in

You can enter your username and password to log in. But if you don't have an account, you can click "sign up" to create one.



This screenshot shows the 'Linkage' application's login screen. The left sidebar remains the same as the previous screenshot. The main content area features a large 'Log in' heading centered at the top. Below it are two input fields: 'Enter username' and 'Enter password'. To the right of the password field are links for 'sign up' and 'forget password'. A prominent blue 'sign in' button is located below the password field.

Sign up

To create an account, you should enter your username, password, phone number, validation code(click "get code") and e-mail address.

Linkage

- Moments ^
- Share Your Moment
- Browse Others
- Posts ^
- Post Article
- Browse Others
- Search Post
- Message ^
- Invitation
- Chat
- Me ^
- Account**
- Friends
- Subscription

Register

Username

PassWord (@)

Ensure password (@)

Phone

Get code

E-mail

Submit
Cancel

Initial account page

When you first log in your account, you should set your personal information. Click the pen button to set your gender, description and address. You can also click "change" button to upload your portrait.

Linkage

- Moments ^
- Share Your Moment
- Browse Others
- Posts ^
- Post Article
- Browse Others
- Search Post
- Message ^
- Invitation
- Chat
- Me ^
- Account**
- Friends
- Subscription

Account

Private

Change

Lord ♂

phone: 15828060670

Description

Address

My Moments

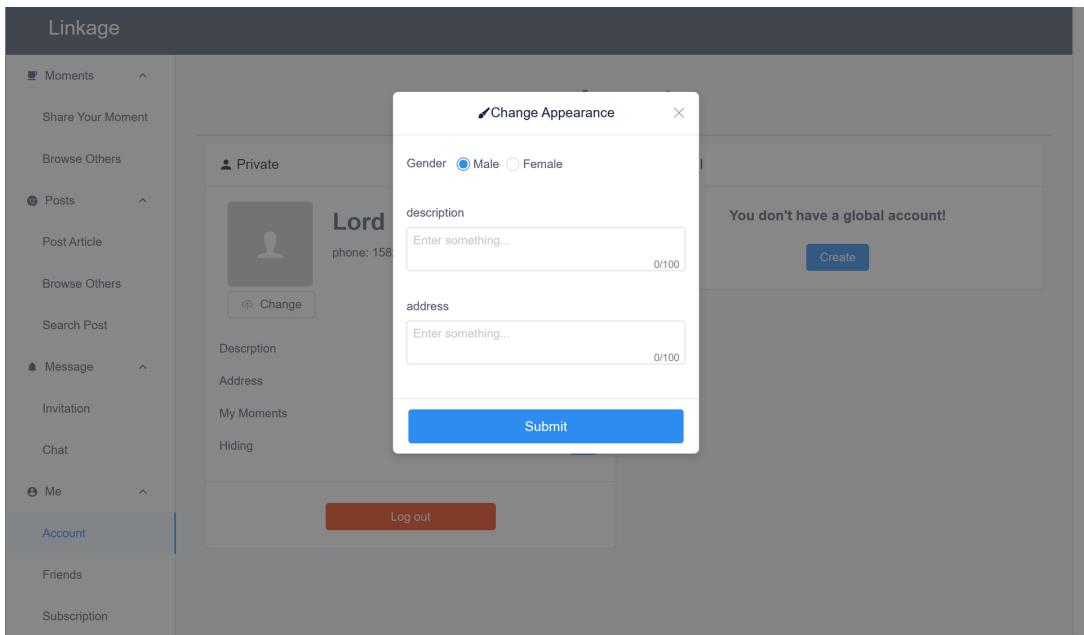
Hiding
Toggle

Log out

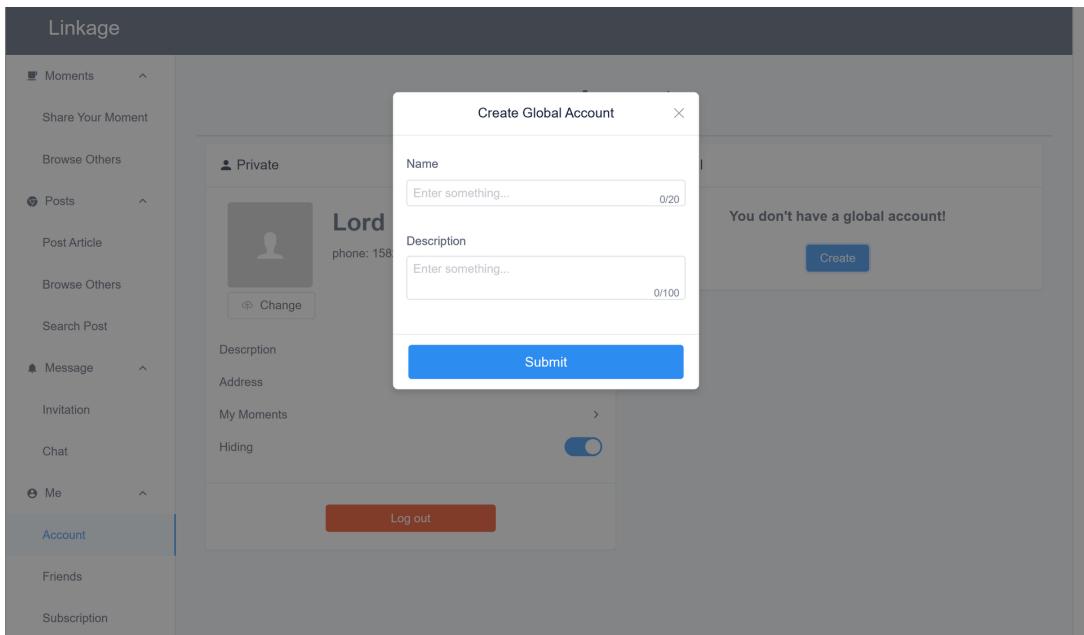
Global

You don't have a global account!

Create



You can create a global account (click "create" button), only by which you can post your article.



Improved account page

Now this is your improved account page, and here are some links you need to know:

- My Moments: check all the moments you have created.
- My Posts: check all the posts you have created.
- Log out: there is no need to explain.

The screenshot shows the 'Account' section of the Linkage app. On the left, a sidebar menu includes 'Moments', 'Posts', 'Message', 'Me', and 'Friends'. Under 'Me', 'Account' is selected. The main area displays a 'Private' account for 'zzj' with a profile picture of a coffee cup and the name 'zzj'. It also shows a 'Global' account for 'PythonTutorial' with a Python logo, a description 'hhh i also have a big account', and statistics 'Subscription: 0' and 'Follower: 2'. A red 'Log out' button is at the bottom.

Friend List

You can click "Friends" in the navigation bar to check your friend list. There are three buttons beside each friend card: the first one is used to send message, the second one is used to check his/her account page, and the third one is used to delete this friend. In this page you can click "add" button in the top to search new friends.

The screenshot shows the 'Friends List' page. The sidebar menu is identical to the previous screen. The main area displays four friend cards: 'admin' (with a hammer and sickle profile picture), 'zzj_1' (with a placeholder profile picture), 'skr' (with a cartoon character profile picture), and 'lym' (with a dragon profile picture). Each card has three small icons to its right: a blue arrow, a person icon, and a delete icon.

Friend's account page

In the account page of one of your friends, you can see his/her personal account information. You can also click "His/Her Moments" to browse all the moments shared by him/her.

Linkage

- Moments
- Share Your Moment
- Browse Others

- Posts
- Post Article
- Browse Others
- Search Post

- Message
- Invitation
- Chat

- Me
- Account
- Friends**
- Subscription

Friend Detail

Private



ylq要减肥 ♂

Description
数据库救不了ylq

Address
Chengdu, China

His/Her Moments >

Shielding

Add friend

Enter a user's name and click search button, the result will show below. You can click "+" button to send an invitation, which requires validation info.

Linkage

- Moments
- Share Your Moment
- Browse Others

- Posts
- Post Article
- Browse Others
- Search Post

- Message
- Invitation
- Chat

- Me
- Account
- Friends**
- Subscription

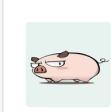
Add Friends



lym ♂
? why i am here

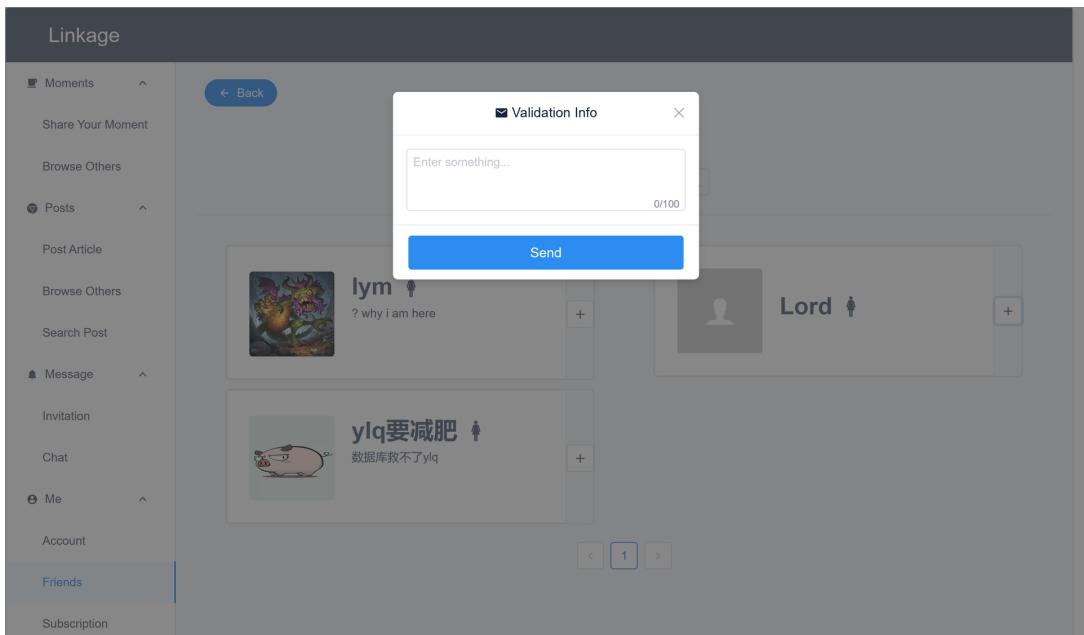


Lord ♂



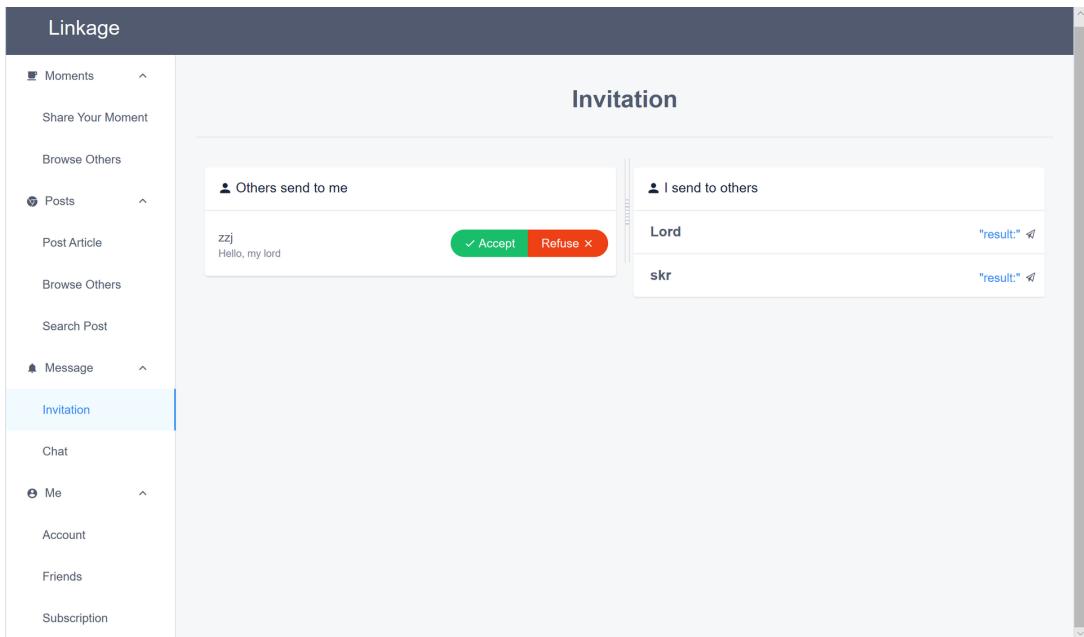
ylq要减肥 ♂
数据库救不了ylq

< 1 >



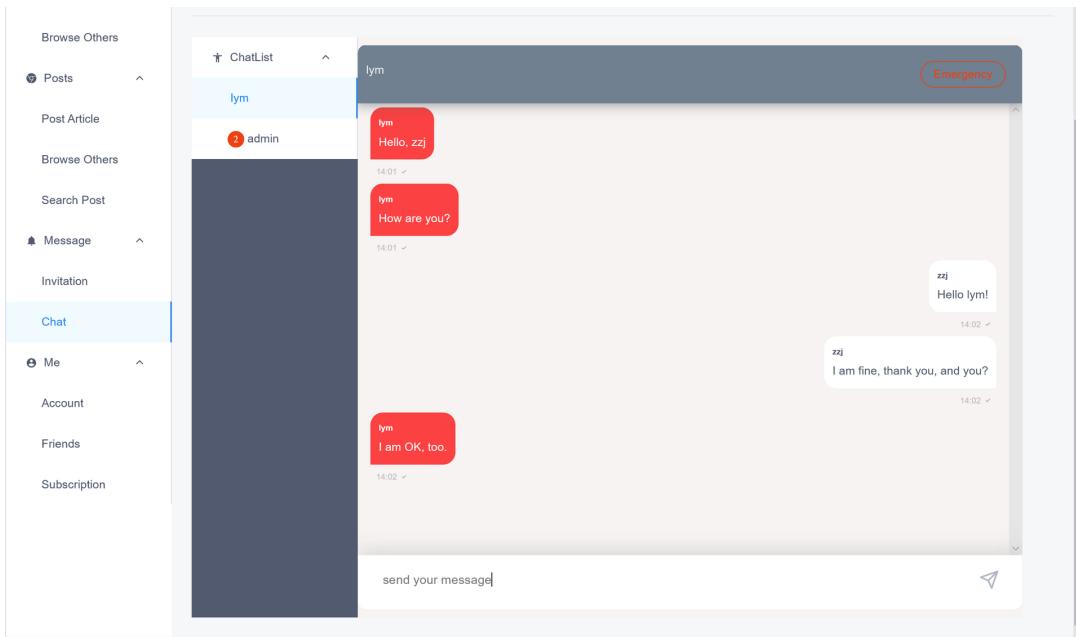
Accept invitation

You can click "Invitation" in the navigation bar to check the invitations you send and receive.



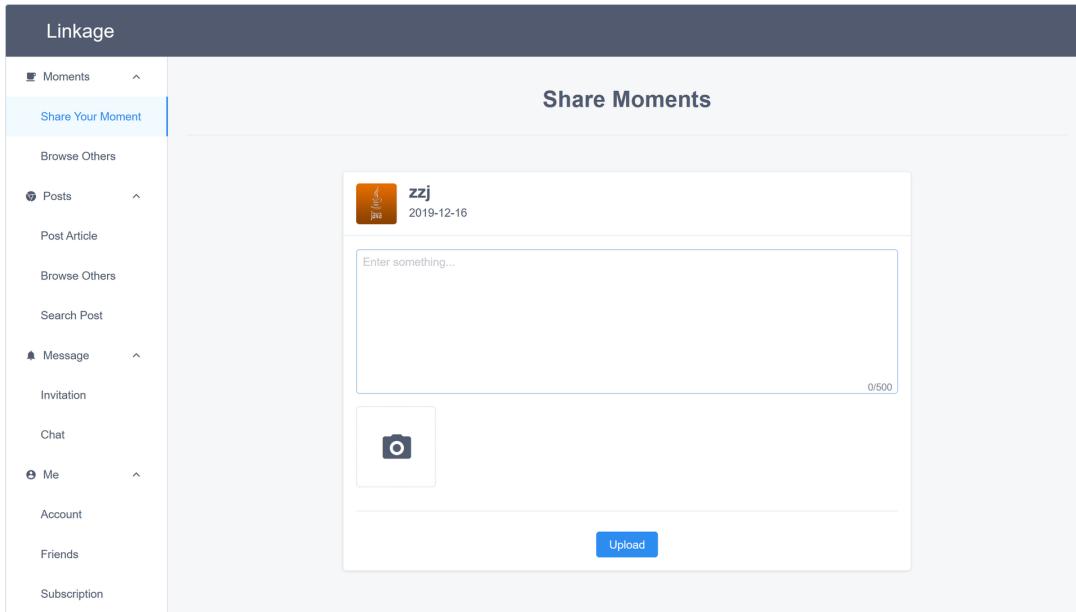
Chat

You can chat with several friends at the same time, just like QQ and wechat.
Click the "Emergency" button in the right top, then you can send emergency message.



Share moments

Click "Share your moment" in the navigation bar, then you can share your moment. In this page you can enter text and upload pictures, and when you finish your edition you can click "Upload" button.



My moments

You can check all the moments you share in the "my moment" page, which you can enter from account page.

Moments

Share Your Moment

Browse Others

Posts

Post Article

Browse Others

Search Post

Message

Invitation

Chat

Me

Account

Friends

Subscription

My Moments

zzj 2019-12-15 23:23:30

Welcome my new friends!

Dionysos, zzj

zzj 2019-12-15 22:01:08

I had hot pot with my friend yesterday, but I am having stomachache today. 😊

Friends' moments

Click "Browse Others" in the navigation bar, you can browse all your friends' moments. You can click the heart button to like it, or click the bubble button to make comments.

Moments

Share Your Moment

Browse Others

Posts

Post Article

Browse Others

Search Post

Message

Invitation

Chat

Me

Account

Friends

Subscription

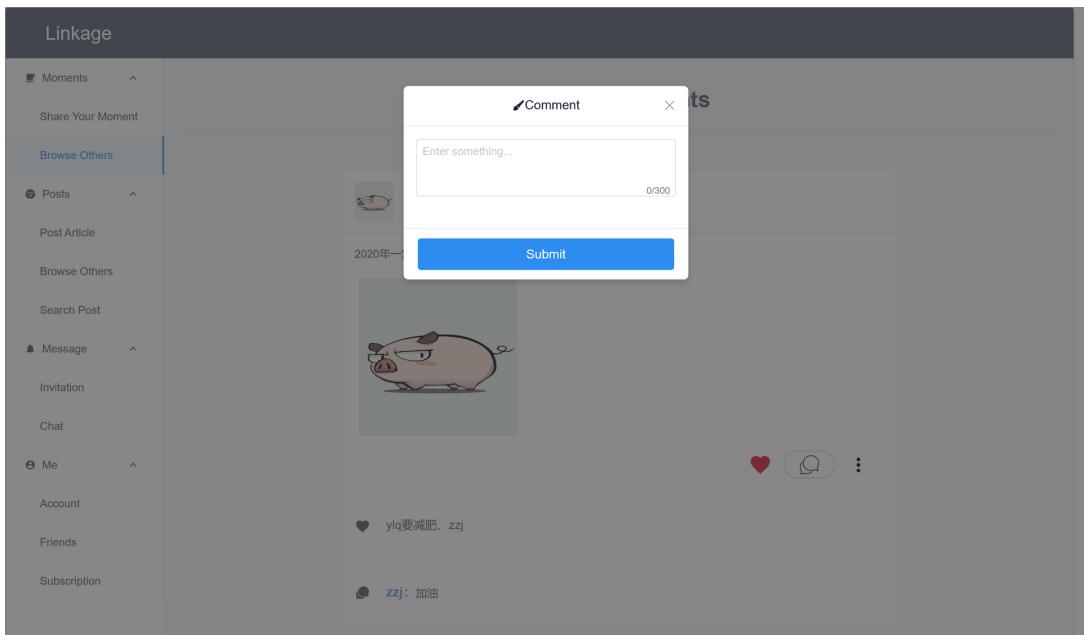
Browse Moments

yldq要减肥 2019-12-15 22:43:12

2020年一定能瘦!

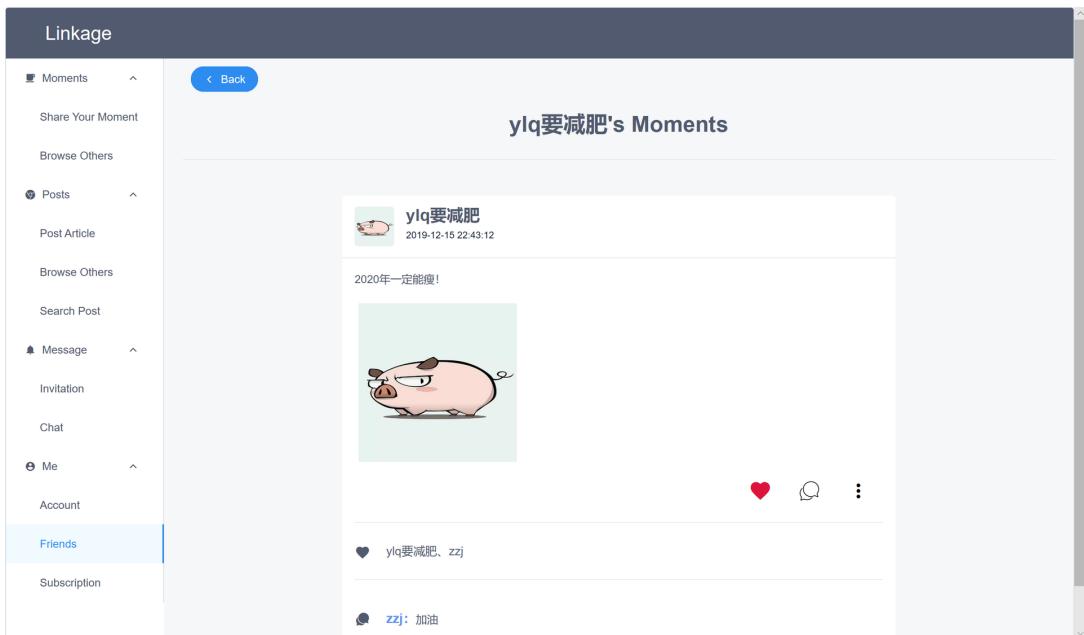
ylcq要减肥, zzj

zzj: 加油



One friend's moments

If you want to browse all the moments shared by a certain one of your friends, you can enter his account page and click "His/Her Moments".



Subscription list

Click "Subscription" in the navigation bar, you can see all the global account you have subscribed. Here are two buttons beside each card, the first one is used to check the home page of the global account, the second one is used to cancel the subscription. You can also click the "add" button in the left top to search other global accounts.

Linkage

Moments ^

Share Your Moment

Browse Others

Posts ^

Post Article

Browse Others

Search Post

Message ^

Invitation

Chat

Me ^

Account

Friends

Subscription

+ Add

Subscription List



Blizzard Official



Tongji University



Network Study

< 1 >

Subscription's home page

In the home page of one of your subscriptions, you can see its description. You can also click "Its Posts" to browse all the posts it creates.

Linkage

Moments ^

Share Your Moment

Browse Others

Posts ^

Post Article

Browse Others

Search Post

Message ^

Invitation

Chat

Me ^

Account

Friends

Subscription

< Back

Subscription Detail

Global



Network Study

Subscription: 0 Follower: 2

Description
Do you want to know how is network connected?

Its Posts

Shielding

Add subscription

In the add subscription page, you can enter a subscription's name and click search button, then the resul will be shown below. You can click "+" button to add a global account to your subscription list.

Linkage

Moments Share Your Moment
Browse Others
Posts Post Article
Browse Others Search Post
Message Invitation Chat
Me Account Friends Subscription

Add Subscription

PythonTutorial hhh i also have a big account +

Blizzard Official

Tuan Tuan We are here for communist, country and people. +

1

Browse trending

Click "Browse Others" in the navigation bar of "Posts", our system will show trending by default. You can unfold the posts to see all the content. In addition, you can like the post and make comments.

Linkage

Moments Share Your Moment
Browse Others
Posts Post Article
Browse Others Trending My Subscription
Search Post
Message Invitation Chat
Me Account Friends Subscription

Browse Others

Tongji University 2019-12-15 23:09:17

Title: OH, How Great Zhang Zijian Is!

Dionysos, ylq要减肥

zzj: ? too exaggerate

ylq要减肥: I agree it.

zzj: agree with my friend

Browse my subscription

Click "My Subscription" in the "Browse Others" Page, you can see the posts created by the global account which you have subscribed.

Linkage

Moments

Share Your Moment

Browse Others

Posts

Post Article

Browse Others

Search Post

Message

Invitation

Chat

Me

Account

Friends

Subscription

Browse Others

Trending My Subscription

Tongji University
2019-12-15 23:27:25

> Title:A Love Song for Yu Lingq

Dionysos, zzj

Dionysos: And she's slim.

zzj: Great work

Tongji University
2019-12-15 23:09:17

> Title:OH How Great Zhang Zilian Is!

One subscription's posts

You can click "Its Posts" in the global account home page of one of your subscriptions, then you can see all the posts created by this global account.

Moments

Share Your Moment

Browse Others

Posts

Post Article

Browse Others

Search Post

Message

Invitation

Chat

Me

Account

Friends

Subscription

Blizzard Official's Posts

Back

Blizzard Official
2019-12-15 22:07:21

> Title:Welcome to HearthStone

lym, ylq要减肥, zzj, zzj

lym: That's a good game

zzj: This game is too complex

Search Posts

You can click "Search Post" in the navigation bar, then you can search posts you want. Just enter some key words and click the search button, then the result will show below.

Linkage

- Moments
 - Share Your Moment
 - Browse Others
- Posts
 - Post Article
 - Browse Others
 - Search Post**
- Message
 - Invitation
 - Chat
- Me
 - Account
 - Friends
 - Subscription

Search Post

Network Study
2019-12-15 21:31:01

▼ Title:Protocol Software, Parameters, And Configuration
Computer network - 1

Our discussion of Internet protocols has described their operation once a host or router has been powered on, the operating system has started, and the protocol software has been initialized. The question arises: how does the protocol software in a host or router begin operation? For a router, the answer is mundane: a manager must specify initial values for items such as the IP address for each network connection, the protocol software to run, and initial values for a forwarding table. The configuration is saved on disk, and a router loads the values during startup.

Create Post

Click "Post Article" in the navigation bar, you can edit an article and submit it. There is an edit box below and you can create the format you like.

Linkage

- Moments
 - Share Your Moment
 - Browse Others
- Posts
 - Post Article**
 - Browse Others
 - Search Post
- Message
 - Invitation
 - Chat
- Me
 - Account
 - Friends
 - Subscription

Title

0/100

Content

H B T_I F I U S D I O : = < > []

Submit

Set trending

Only the administrator can set the trend. Admin can click the "admin" button in his account page, and in the "Manage Trend" Page, he can set several posts with high visitor volume to become trends.

The screenshot shows a user interface titled "Manage Trend". On the left, there is a sidebar with a tree-like navigation menu:

- Moments
- Share Your Moment
- Browse Others
- Posts
 - Post Article
 - Browse Others
 - Search Post
- Message
 - Invitation
 - Chat
- Me
 - Account
 - Friends
 - Subscription

The "Account" option under "Me" is highlighted with a blue background.

The main area is titled "Manage Trend" and contains two search boxes:

- Candidate** (Count: 2)
 - "OH, How Great Zhang Zijian Is!" -- 3 -- "Tongji University"
 - "Welcome to HearthStone" -- 3 -- "Blizzard Official"
- Trend** (Count: 1)
 - "Welcome to C++ Class" -- 2 -- "CppLesson"

Below the search boxes are buttons for "To left" and "To right". At the bottom right is a blue "Submit" button.

System Architecture and Component Design

Our system can be introduced from the perspective of logical structure and physical structure.

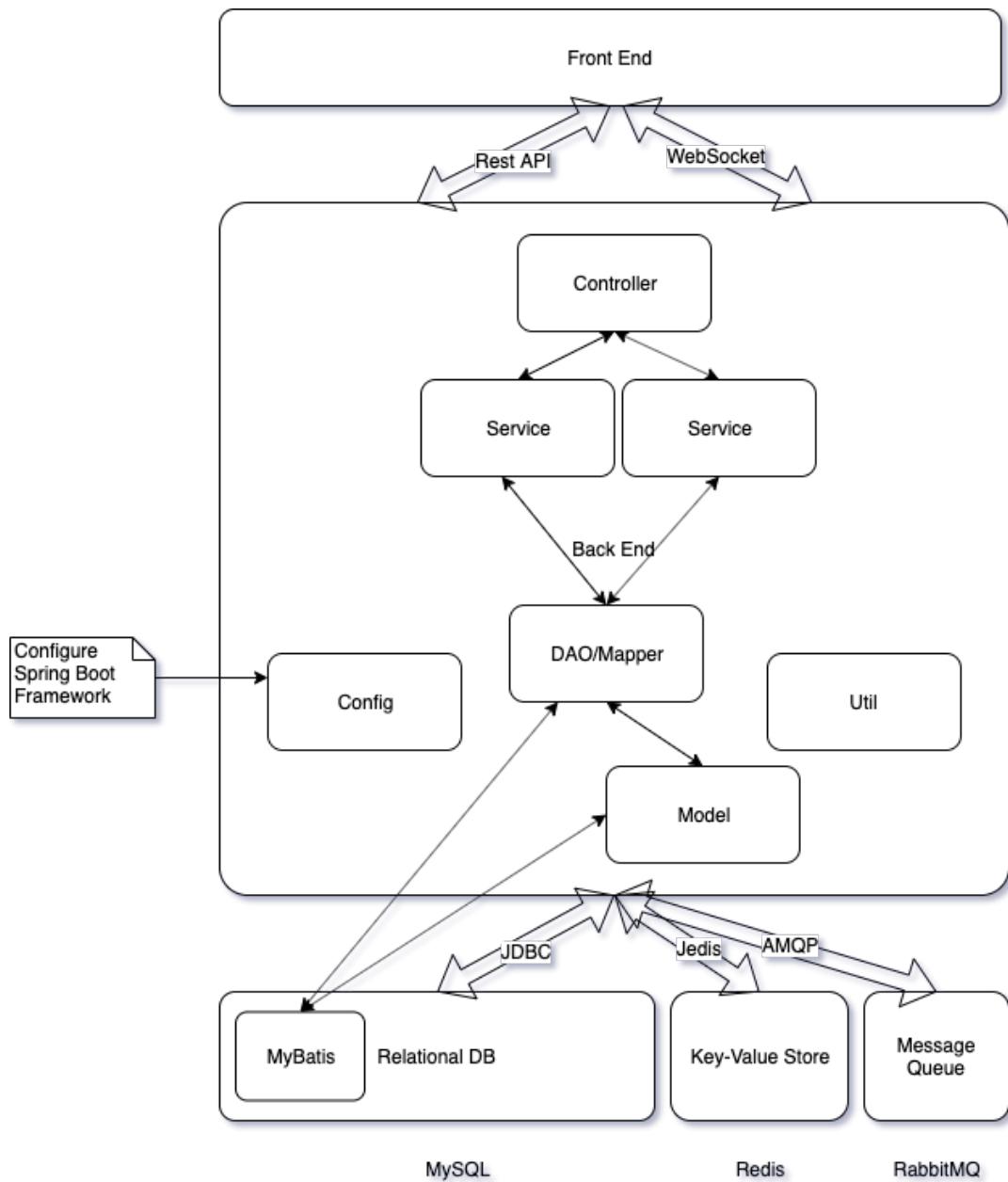
Logical Structure

Our system is composed of a front end web application and a back end server application. Front end and back end communicate via Rest API and WebSocket API. WebSocket is used to achieve real time functions such as online chatting and adding friends.

In the back end, our server application is constructed under the guidance of MVC principle. Model–view–controller is a software design pattern commonly used for developing user interfaces which divides the related program logic into three interconnected elements. This is done to separate internal representations of information from the ways information is presented to and accepted from the user, where DAO or Mapper classes deal with getting and storing Model class from or into database and controllers utilize them with the help of Service class.

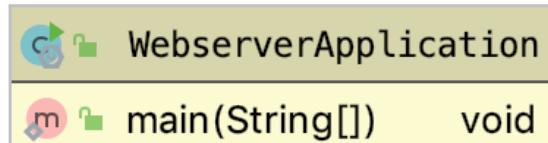
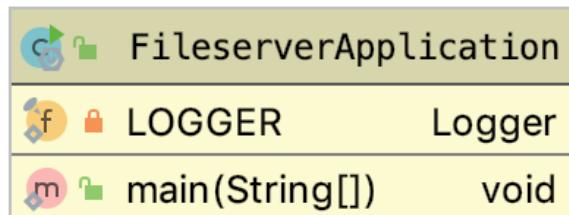
In terms of database, we use relational DB to store structured data. We use Key–Value store to help with keeping track of user sessions. Message Queue is here to act as a message broker to deal with chatting.

In order to connect to these databases, our application uses JDBC, Jedis and AMQP respectively.



Our project is divided into 2 modules named web server and file server because we want to decouple the project to ease the development.

Web Server is mainly responsible for services such as account management and chatting. File Server mainly deals with functions like Moment and Post. They are both Spring Boot applications, and their general class diagram is shown bellow



Package controller

Package mapper

Package config

Package model

Package util

Powered by yFiles

As we can easily see from this diagram, our code is strictly structure in a layered way, almost every class is put into one of the 5 following packages

- controller
- mapper
- model
- config
- util

Due to our usage of Vue framework at the front end, there is not specific "view" package in our backend application. But if we view the json data passed to the front end as the "view" part of our backend system, we can say that our system is structured under the guidance of MVC design pattern.

Physical Structure

Because Tencent cloud has an discount for students, we rent 4 servers to run our back end application. Our application is devided into 4 parts.

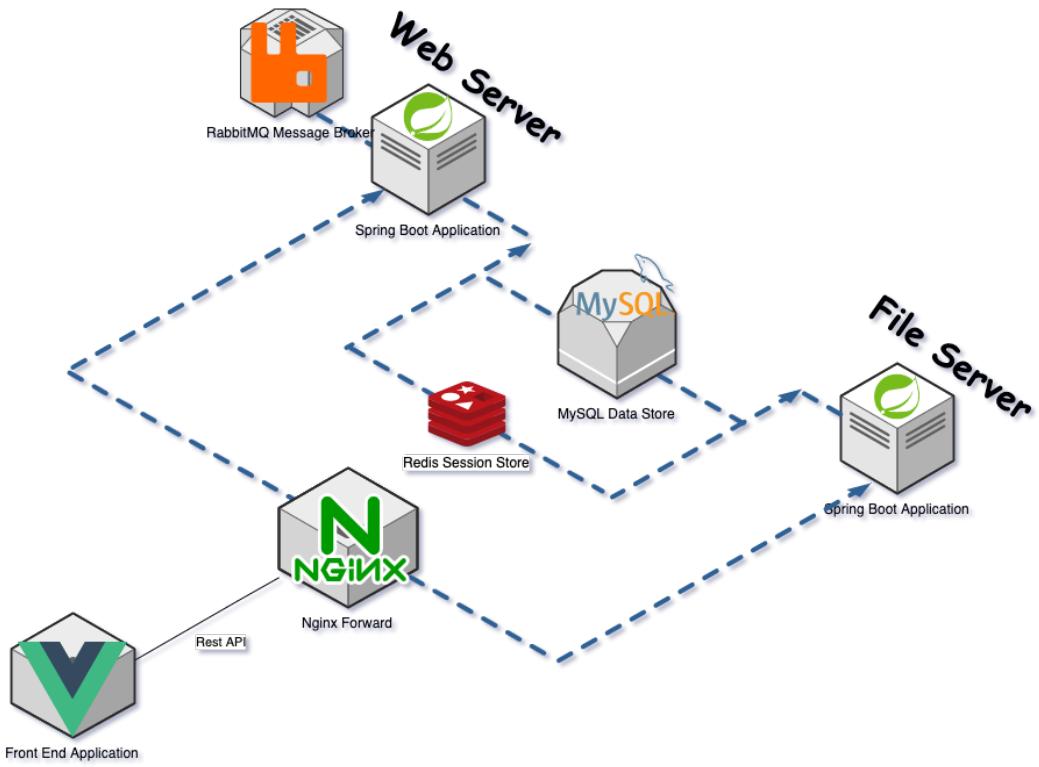
One server with Nginx stands at the front and forward the requests to whether web server or file server. Nginx is a web server which can also be used as a reverse proxy, load balancer, mail proxy and HTTP cache. The software was created by Igor Sysoev and first publicly released in 2004. A company of the same name was founded in 2011 to provide support and Nginx plus paid software. Web server and File server are actually 2 modules in one project but packaged into 2 standalone jar runnables in order to decouple the work in the back end development.

Web Server, MySQL DB and Redis is installed on one machine. Web Server is mainly responsible for services such as account management and chatting. Many of the world's largest and fastest-growing organizations including Facebook, Google, Adobe, Alcatel Lucent and Zappos rely on MySQL to save time and money powering their high-volume Web sites, business-critical systems and packaged software. We also user MySQL to store the most important and structured data.

Redis is an in-memory data structure project implementing a distributed, in-memory key-value database with optional durability. Redis supports different kinds of abstract data structures, such as strings, lists, maps, sets, sorted sets, HyperLogLogs, bitmaps, streams, and spatial indexes. The reason why we are trying to use redis as one of our databases is that we have to keep some data that is queried very often. For example, users' session data has to kept in Redis because every time the user send back a request the session will automatically send back to our server and our server applications have to tell who is this user and what is his or role. To achieve this, the session number has to kept as an key and the user's personal infomation has to kept as data. Only then can we trace the user when a request comes. Because this happens every time a request comes, we have to user something fast, so redis is our choice. Exept for this, we have to user redis to achieve the function of verification code. A verification code is sent to the user by his or her request and being kept in the database for 5 minites until expire or used by the user. With the help of redis database, we can make it very simple to finish this task.

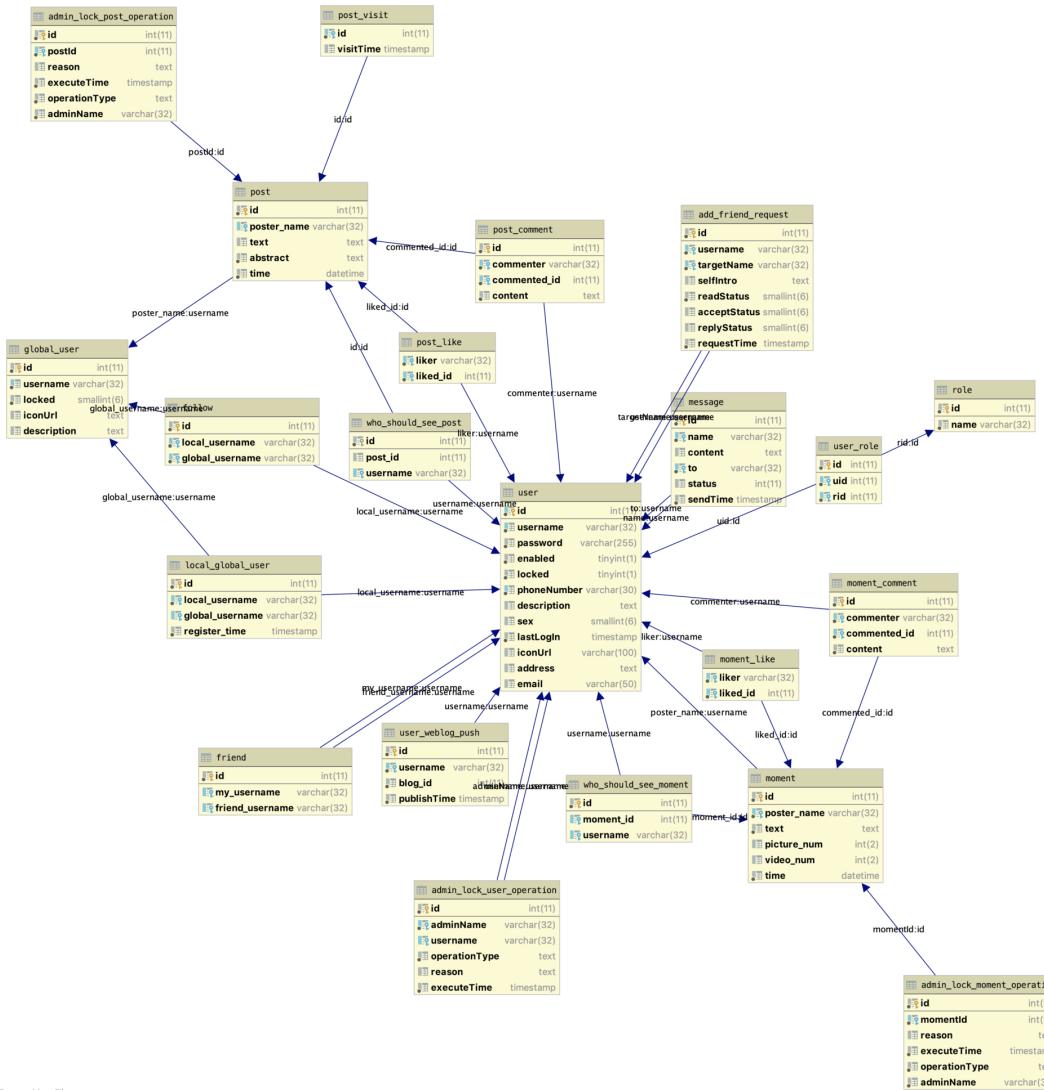
Web server is connected to another server in order to delegate the messages to its rabbitMQ.RabbitMQ is an open-source message-broker software that originally implemented the Advanced Message Queuing Protocol and has since been extended with a plug-in architecture to support Streaming Text Oriented Messaging Protocol, Message Queuing Telemetry Transport, and other protocols. We use the plugin of stomp to make RabbitMQ a message broker in our system ti help with functions like online chatting and sending add friend request.

File Server, on the other hand, mainly deals with functions like Moment and Post. Because all images are stored there, we name it file server.



Database design

Here is our database ER diagram generated from our database. There are 20 tables in our system. We can see there are 3 main Entities in this diagram, the User, the Moment and the Post. Many other Entities are connected to them through foreign keys.



Collaboration (Azure DevOps)

Iterations

As we said in proposal presentation, we choose Azure DevOps as our Collaboration platform.

We have divided our project into four iterations. In Azure Board, this means our project has four sprints.:

- The first iteration is mainly about the function of moment、account
 - The second iteration is mainly about the function of chatting and post
 - In the third iteration, we changed our architecture of deployment and enhanced chatting module with rabbitmq.
 - In the final iteration, we focused on the test of our website. During this iteration, we solved many problems.

Task Assignment

Every team member can see tasks assigned to them and they can update the progress of their task.

The screenshot shows a Kanban board with three columns: 'To Do', 'Doing', and 'Done'. In the 'To Do' column, there are two items: '24 Post' and '21 聊天'. In the 'Doing' column, there are four items: '25 实现Post功能的后端业务逻辑', '26 开发Post前端页面', '22 利用WebSocket实现聊天', and '23 开发聊天前端页面'. In the 'Done' column, there are two items: '2116726984' and '3099916791@...'. Each item has a status indicator (e.g., green dot for 'Done') and a 'State' field. A '+' button is located at the bottom center of the board.

We can see that every member works in balance, they can both join the development of back-end and front-end.

The screenshot shows a query results page titled 'Assigned to me'. It lists six work items: 'ISSUE 15 moment', 'Issue 调整部署结构', 'Task 在FileServer上接入WebServer', 'Task 实现Moment模块的后端业务逻辑', 'Task 配置服务器环境', and 'Task 开发Post前端页面'. Each item has a title, ID, type, and a detailed view on the right. The detailed view includes fields like 'Status' (Done), 'Area' (Linkage), 'Iteration' (Linkage\第一轮), 'Description' (Click to add Description), 'Planning' (Priority 2, Effort), and 'Deployment' (To track releases associated with this work item).

Build & Deploy

We use azure pipeline to build and deploy our project automatically. The development of back-end and front-end are completely separated. The member who are developing the back-end can simply update the github repository, and azure pipeline will deploy the backend. The member who are developing the front-end can simply upload the front-end resource to the nginx server to update the webpage, because we don't rely on the servlet in the spring boot application to handle the static resource request.

