

Relink Final Documentation

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Description

In many classes, the lectures are plain in the way that the form of the instruction is simply having the teacher render the course material. However, there has been plenty of researches conducted on instruction methodology and interactive classroom was upheld for better teaching quality. Therefore, our team come up with the idea to make a virtual classroom platform. In comparison to iClicker, a tool, the virtual classroom is a far more comprehensive platform. And in contrast to Piazza® and Blackboard®, this virtual classroom emphasizes on complementing real-life lecture and providing activities along with an on-going lecture.

Therefore, we aim at creating instant classroom session and providing chatting and quiz features. We set up two user types, instructor and students. Instructors can create classroom session (successful creation returns a valid room code). Students will join in the classroom via room code. Once join in the classroom, students can send message to ask question, discuss and communicate with classmates. They also have options to chat anonymously. We believe this option ensures participation with less pressure. Another significant part of the website is the quiz section. Instructors can create quiz that are visible by students in the classroom. After polling students' answers, the system generates statistics of multiple-choice questions to the instructor. The quiz creation, however, is not limited to multiple-choice format, it can be text form, too.

Process

We utilized the methodology of Extreme Programming (short as XP). Extreme Programming is a software process methodology that is used to enhance software quality and responsiveness to a changing customer. It aims at modularizing units and urging frequent iterations to integrate units. XP is extremely useful because it splits up the development into short cycles, and builds bottom up. It starts with the most critical functionality, building up to additional and peripheral

features. This avoids programming of features until they are actually needed. This improves productivity and often guarantees that so far the project works. It also enables the client to check the progress frequently. If any change is proposed, the team can quickly adjust the code base, without wasting too much of the progress. In practice, XP is realized as pair programming, in doing extensive code reviews, and unit test.

The properties and advantages of XP fit with the condition of our team. We have time and ability constraints. Employing XP helps us in making feasible progress and meet project requirements. We set up bi-week iterations and plan for each iteration. We meet every week to ensure the goal for the iteration will be met by the end. At each iteration meeting, we evaluate our progress. If we face any issue, or decide to change our plan, we update plan for future iterations. In practice, we cut some of the irrelevant features and focused on messaging and quiz features in the classroom platform. This rendered clearer theme. And we enriched the two parts with more manipulations. As a result, we used Extreme Programming to produce a workable web application. Under its help, we built the software bottom up and refined the proposal to a plan with clear user stories and concrete theme.

Requirement/Specification

Specifically, we expect our platform to enable account creation and login. User type determines permissions. Only instructors can create classroom. And the instructor(s) will become the admin of the classroom, in the way that they can post quizzes and end the class session.

When creating an account, a user goes to the Relink homepage. He/She can click on the create account button. This will then redirect him to another page in which he/she will enter information like email address, password and name. He/She will also specify the status of this account, i.e., an instructor or a student. After successful account creation, the user can login as an instructor or a student.

If an user login as instructor, he/she can create a virtual classroom session. The backend will generate a unique Id of the classroom. This will be used to identify the classroom. Our database

saves data of each room session by its Id. And the Id allows students to join in the classroom. Instructors and students can enter the Id in blank for “join classroom” to be added in the room and forwarded to the classroom page.

Once in the classroom session, instructors and students can send public message. This message can be question, reply, comment or announcement. The real-time chatting service will broadcast this message to all the participants in the virtual classroom, including the instructors. Other students who know the answer can choose to answer the question, or to discuss the question. So they can do online chatting classroom-wide. For the same contents, students can choose to send message anonymously. We make this feature to protect privacy and reduce participation pressure for students to post what they actually care about or have confusion on. The “anonymous” option is a button that can be clicked by the side of the “submit” button. Once the option is selected, message sender will appear as “Student Anonymous”.

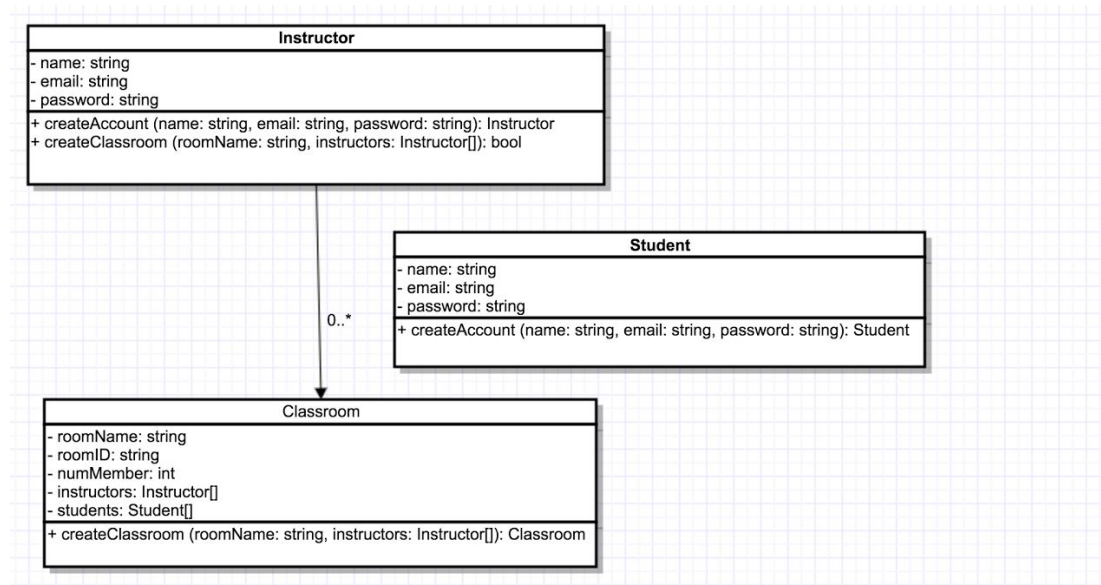
So far, we have introduced a partial structure of the website platform. Essentially, the classroom is a chatting board if the instructor haven’t posted quiz (finished feature) or anything else (to be expected). In the virtual classroom, instructor can post quiz at anytime. Once the instructor decides to make a quiz. He/She clicks the “create quiz” button and get to a web page form. The form acts as a template where instructor can fill in with questions and choices (if a multiple-choice or true-false question). Instructor can add more choices to a question and add questions of a quiz to be posted. Once the instructor finish entering information, he/she can click “submit” to post the quiz visible to students in the classroom.

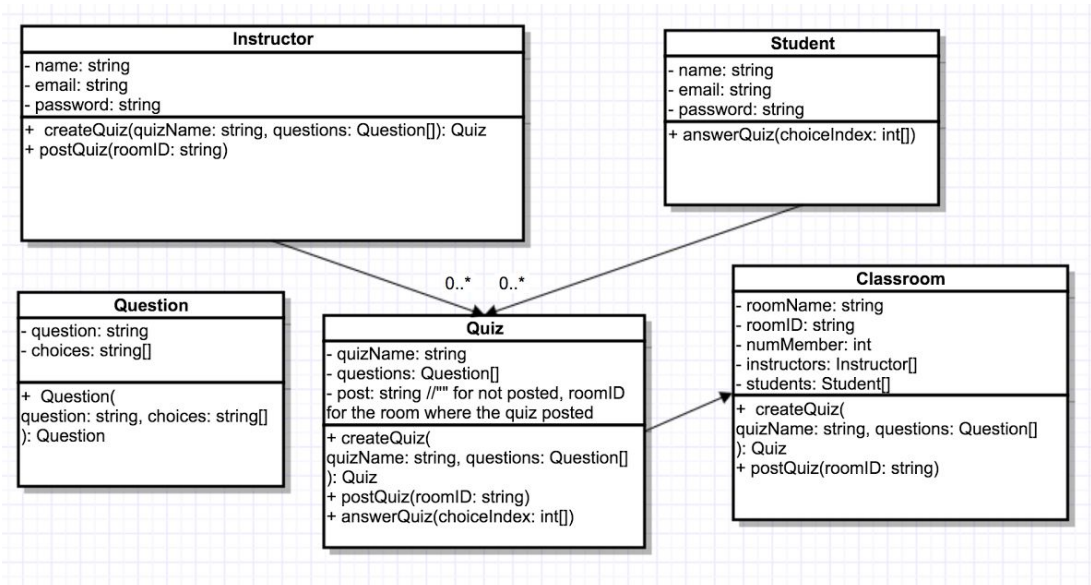
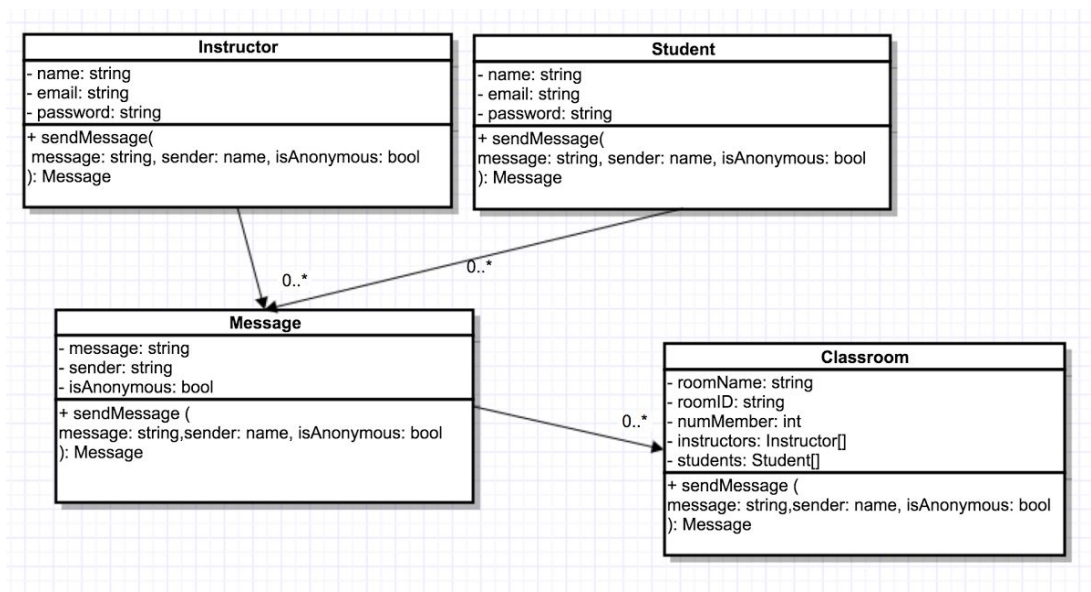
The backend will collect students’ response and generate statistics. The quiz feature is relatively independent from the classroom session. Instructors can create quizzes before the classroom session on live and save it. Students can save quizzes for later review, so the quizzes stay valid even after the classroom session ends.

Architecture/Design

We divide this project in 3 major parts: frontend, backend and chat-service. The python to implement backend, that also incorporates Node.js and Socket.io. The chat-service heavily uses socket.io to receive messages from individual users and broadcast to the classroom. The front end uses React to design the webpage.

The structure of the classes are plotted as below. We have the classes of the users, instructor and student. We also define the class of the message and quiz, that inherits the class of questions.





5. Reflection/Lesson learned

Nathan Pitchaikani (pitchai2):

I learned a lot from this project. I learned the basics of Django, which was more difficult than I initially thought it was. I also learned a lot about planning and time management. I feel I could

have planned a bit better so I could accomplish more work. I spent a lot of time trying to get Azure to work however, once I got it working it crashed the next day and when I tried to re-config it; it didn't work. Because of this a lot of time spent went to waste. I should have moved on to a different hosting method earlier like Amazon Web Services. This would have saved me more time and I would have been able to get more work done.

Mukesh Gande (mgande2):

For this project, we choose React as the frontend framework. Since I had never worked with it before, I learned everything from the basics to advanced uses. This also thought me a valuable lesson about working with new technology. To build a sustainable code base you should focus on learning how to accomplish some functionality correctly rather than simply making it work. For example, I created an interface to create quizzes based on assumptions which were incorrect. I spent many hours debugging and eventually rewriting the entire interface. This situation could have been avoided had I simply spent the a few hours mastering the basics. Even though this was a setback, I felt that this lesson was important and worth learning.

Ranran Li (rli17):

I learned new skills and practiced Extreme programming process a lot. Before starting this project, I don't know Django at all. I learned and successfully wrote a backend for this project with my partner. Our team performed pair programming throughout the semester. Pair programming is a good technique and it really increased my efficiency on writing code. In addition, I learned how to work together with different groups. As a member of the backend team, I need to communicate with the front end team for change in demand and debugging. Therefore, I improved my communication skills as well.

Shuang Qu (squ7):

I think the software engineering II teaches me in principle and in practice about software development process. The concept of extreme programming is not complex, but in practice it makes crucial effect. The bi-week meet with TA urges us to be pertinent with plan. And I really learned about the uncertainty with doing project that we may encounter ill behaviors or bugs of the program. Look back, the final shape of the project deviates from the proposal. It is partially due to the ambiguity of the original proposal, and that our concentration on major figures cuts the less relevant ones. After all, from the first-hand experience, I learn to make better proposal

and design valid user stories. The implementation part also teaches me about development programming.

Mingzhe Zhao (mzhao19):

This group project teaches me how the work grows exponentially when the team becomes larger and larger. The overhead in communication and negative work done is immeasurable when the team is not well coordinated, especially when the extreme programming process is not strictly followed. The software engineering process we learned from class make a lot more sense after the team work experience.

Sahana Jain(sjain46):

This group project taught me how even when people work separately on different parts in a group project there are a lot of parts that must be worked on together in the end to get all the different aspects to mesh together well. The pairs seperated the work and each pair worked on frontend, backend, and chat service but it was very important for us to touch base frequently to make sure that everything was working well together. I also learned a lot about new technology that I was uncomfortable with at first such as React and Socket I.O.

Songyu Li (sli111):

I explored many different areas in Software Engineering during this project, and the most valuable experience I got is how to maintain and develop a project from scratch. There are certainly a lot of things to consider if you want your project to be able to grow big. Extensibility, security and coordination between pairs are all important aspects a qualified engineer should comprehend. I also learned how to develop and deploy Node.js web application, and how to design a correct architecture with separate frontend and backend. These experiences together with topics I learned during lecture, such as Quality Assurance, Design and User Experiences, could be very useful in my future career.

Code Documentation

Backend:

Accounts/apps.py

```
Class AccountConfig(AppConfig):
```

Attributes:

```
    name
```

Accounts/models.py

Classes:

```
Class VirtualClassroom(models.Model)
```

Attributes:

```
    Date (models.DateTimeField)
```

```
    Name (models.CharField)
```

```
    instructorId (models.IntergetField)
```

Methods:

```
    __str__(self)
```

```
        Returns Name + instructorId
```

Accounts/views.py

Methods:

```
    index(request)
```

```
        Returns HttpResponse
```

```
    register_view(request)
```

```
        Returns HttpResponse
```

```
    login_view(request)
```

```
        Returns HttpResponse
```

```
    logout_view(request)
```

```
        Returns HttpResponse
```

```
    delete_user(request)
```

```
        Returns HttpResponse
```

```
    insert_room_to_mongo(room, instructor_id)
```

```
        Returns None
```

```
    create_classroom(request)
```

```
        Returns HttpResponse or HttpResponseServerError
```

```
    join_room_view(request, room_id)
```

```
        Returns HttpResponse or HttpResponseServerError
```

```
    send_message(request)
```

```
        Returns HttpResponse or HttpResponseServerError
```

```
    ensure_dir(file_path)
```

```
        Returns None
```

```
    create_quiz(request)
```

```
        Returns HttpResponse or HttpResponseServerError
```

```

send_quiz(request)
    Returns HttpResponse or HttpResponseServerError
posts_quiz(request)
    Returns HttpResponse
list_all_quiz(request)
    Returns HttpResponse
post_topic(request)
    Returns HttpResponseServerError

```

Polls/apps.py

Classes:

```
PollsConfig(AppConfig):
```

Attributes:

```
Name
```

Polls/view.py

Methods:

```

index(request):
    Returns HttpRepsonse

```

Chat_Service

database/room_apis.js

Methods:

```

existUserInRoom(data, cb)
    Returns None
joinRoom(data, cb)
    Returns None
leaveRoom(data, cb)
    Returns None

```

database/room_data.js

Methods:

```

add_room(room_name, socketid)
    Returns None
join_room(room_name, socketid)
    Returns None
check_room(room_name)
    Returns None

```

utility/data_generator.js

Methods:

```

callback(err, res)
    Returns None

```

utility/utlis.js

Methods:

```
resMsg(status,data)
Returns status, data
```

App.js**Methods:**

```
allowCrossDomain(req, res, next)
Returns None
dbJoinRoom(duser, drid, cb)
Returns None dbCheckRoom(data, cb)
Return None
onError(error)
Return None
onListening()
Return None
```

Frontend:**Components/AnswerInput.jsx****Classes:**

```
class AnswerInput
  Attributes:
    questionCount
    setAnswerValue
  Methods:
    SetAnswerValue(event)
    Returns: None
    Render()
    Returns: HTML
```

Components/LabelInputs.jsx**Classes:**

```
class LabeldInput
  Methods:
    render ()
    Return: HTML
```

Components/LandingPage.jsx**Classes:**

```
class LandingPage
  Attributes:
    navigate
  Methods:
    navigate(dst)
    Returns: this.props.router.push(dst)
    render()
```

Return: HTML

Components/LoadingStore.jsx

Classes:

```
class LoadingStore
```

Attributes:

```
State
```

Methods:

```
componentWillMount()
```

Return: None

```
render()
```

Return: HTML

Components/NavButton.jsx

Classes:

```
class NavButton
```

Attributes:

```
navigate
```

Methods:

```
navigate(dst)
```

Returns: this.props.router.push(dst)

```
render()
```

Return: HTML

Components/Quiz.jsx

Classes:

```
class Quiz
```

Attributes:

```
state
```

```
unsubscribe
```

Methods:

```
setQuizname(event)
```

Return: None

```
addQuestion()
```

Return: None

```
removeQuestion()
```

Return: None

```
saveQuiz()
```

Return: None

```
submitQuiz()
```

Return: None

```
componentWillUnmount()
```

Return: None

```
render()
```

Return: None

Components/QuizQuestionTemplate.jsx

Classes:

```
class QuizQuestionTemplate
```

Attributes:

```
    addAnswer  
    removeAnswer  
    setValue  
    questionCount  
    Currstate
```

Methods:

```
    componentWillMount()  
        Return: None  
    addAnswer()  
        Return: None  
    removeAnswer()  
        Return: None  
    setValue(event)  
        Return: None  
    render()  
        Return: HTML
```

Reducers/quiz.js**Public Methods:**

```
    questionHandler(state, action)  
        Return: state or assign object or answer
```

Scenes/CreateQuiz.jsx**Classes:**

```
class createQuiz
```

Methods:

```
    render()  
        Return: HTML
```

Scene/Home.jsx**Classes:**

```
class Home
```

Attributes:

```
    State  
    Navigate  
    Logout  
    leaveRoom  
    unsubscribe
```

Methods:

```
    componentWillMount()  
        Return: None  
    navigate(dst)
```

```

        Return: None
logout()
        Return: None
leaveRoom()
        Return: None
render()
        Return: HTML

```

Scenes/Instructor.jsx

Classes:

```
class AddClass
```

Attributes:

```

createClass
createQuiz
postQuiz
onSumbit
setValue
navigate
close
proceed

```

Methods:

```

createClass(event)
    Return None
close()
    Return None
proceed()
    Return None
createQuiz(event)
    Return None
postQuiz(event)
    Return None
onSumbit(event)
    Return None
setValue(event)
    Return None
navigate(dst)
    Return None
render()
    Return HTML

```

Scenes/Login.jsx

Public Method:

```

login(name, isInstructor)
    Return: (type,username,isInstructor)

```

Classes:

```

class Login
  Attributes:
    state
    onSumbit
    setValue
  Methods:
    onSubmit(event)
      Return None
    setValue(event)
      Return None
    render()
      Return HTML

```

Scenes/Quiz.jsx

Classes:

```

class createQuiz
  Methods:
    render()
      Return HTML

```

Scenes/Register.jsx

Classes:

```

class Register
  Attributes:
    state
    onSumbit
    updateInstructorState
    setValue
  Methods:
    onSubmit(event)
      Return None
    updateInstructorState(bool)
      Return None
    setValue(event)
      Return None
    render()
      Return None

```

Scenes/Room.jsx

Classes:

```

class Room
  Attributes:
    storeState
  Methods:
    componentDidMount()
      Return None

```

```
onSubmit(event)
    Return None
exitRoom()
    Return None
setValue(event)
    Return None
setAnonymous(event)
    Return None
postQuiz(event)
    Return None
render()
    Return HTML
```

Scenes/Student.jsx

Classes:

```
class Student
```

Attributes:

```
    state
    joinRoom
    setValue
```

Methods:

```
    joinRoom(event)
        Return None
    setValue(event)
        Return None
    render()
        Return HTML
```


API Documentation

Back-end API

configuration:

python manage.py makemigrations

python manage.py migrate

python manage.py runserver

Home Page

accounts/index

GET

NO Parameters required

Register

accounts/register

POST: {

username = "username"

password = "password"

lastname = "lastname"

firstname = "firstname"

isInstructor = "True" or "False" //default is False

}

Login

accounts/login

POST: {

username = "username"

password = "password"

}

Code: 200

Content: "Teacher login" or "Student login"

Log Out

accounts/logout

POST: {}

will redirect to accounts/index

accounts/delete_user

POST: {

email = 'email'

}

Join Room

accounts/classroom/id

GET request

Success:

Code: 200

Content: "find classroom: " + id

Fail:

Code: 500

Content: ""

Create Room

accounts/newroom

POST request to create new room

POST: {}

Success:

Code: 200

Content: "id"

Fail:

Code: 500

Content: ""

If the user is not logged in

Will be redirect to login page

Send Message

accounts/message

POST request to send a message to backend for authentication and forwarding to chat service{

```
    "message": ...,
    "room_id": ...,
  }
  Response{
    "status": "200 ok" or "500 error",
    "data": {
      ... //some detailed information
    }
  }
```

Create Quiz

accounts/createquiz

POST request to send a quiz to backend for authentication{

```
  "questions": [
    {
      "question": "Some question",
      "answers": ["Answer 1", "Answer 2", "Answer 3"]
    },
    {
      "question": "Some question",
      "answers": ["Answer 1", "Answer 2", "Answer 3"]
    }
  ],
  "quizname": "somename",
  "answers": [0,1]
}
```

```
Response{
  "status": "200 ok" or "500 error",
  "data": quizid
}
```

Post Quiz

accounts/postquiz

POST request to send quizid to backend for authentication{

```

    "quizname": ...
    "instructor_id": ...
  }
Response{
  "status": "200 ok" or "500 error",
  "data": [quizzes, answer] (json list)
}

```

Send Quiz

accounts/sendquiz

POST request to send quizid to backend for authentication and then call chatservice{

```

    "quizname": ...
    "room_id": ...
  }

```

```

Response{
  "status": "200 ok" or "500 error",
  "data": quiz content
}

```

Get all Quiz

accounts/listquiz

Get request to get all quiz names of an instructor

```

Response{
  "status": 200 "ok or 500 "error",
  "data": ['quiz_name_one', 'quiz_name_two' ...]
}

```

Chat Service RESTful API

Send message

POST sock/send

```

request{
  "msg": ...,
  "user": ...,
  "room_id": ...
}
response{

```

```

        "status": "200 ok" or "500 error",
        "data": {
            ... //some detailed information
        }
    }
}

Send quiz
POST sock/sendQuiz
request{
    "user": ...,
    "room_id": ...,
    "quiz_name": quiz file name
}

response{
    "status":
    "data": {
        ... // some detailed info
    }
}

Chatroom
GET sock/room
response{
    "status" : "jjblowd",
    "data" : [all the rooms]
}

POST sock/createRoom
request{
    "room_id": ...shoud be something meaningful and unique
    "room_name": name, "" by default
}
response{
    "status": "200 ok or 500 error",
    "data": {
        ... // some detailed info
    }
}
}

```

SOCKET

Join Room

frontend sends

```
emit('join', {room_id: 'some_id', user: 'username'});
```

server response

```
emit("error", {data: 'room_id does not exist'});
```

or

```
emit("ok", {data: 'joined room_id'});
```

Receive Message

backend sends

```
('message', {room_id})
```

forward message

```
emit('message', {'message': message, 'user': user})
```

forward quiz message

```
emit('commands', {type: 'quiz', name: 'quiz_name'})
```

MongoDB

room collection{

```
"room_name": " ",
```

```
"room_id": " ", //must be unique, otherwise too complicated to resolve conflicts
```

```
//format: time+user_id, time accurate to millisecond
```

```
"room_user": [
```

```
  {"user_id": " "},
```

```
  ...// contains all users in this room
```

```
]
```

```
}
```

experiential ones

post question{

```
"message_msg": " ",
```

```
"message_id": value
```

```
"message_vote": 0
```

```
"room_id": value
```

```
"user_id": value
```

```
}
```

```
vote question{  
  "message_id": value  
  ... "message_vote": ++  
}
```