

<http://8.217.11.251>

Tools Version:

JDK 23.0.2 + apache-maven-3.9.9 + Spring Boot 3.4.3 + Spring Security 6.4.3 + MyBatis 3.0.4 + Redis 7.2.7 + Kafka 3.9.0 + Elasticsearch 7.17.1 + MySQL 9.2.0 + captcha 2.3.2 + Spring Email 3.4.3 + Quartz + caffeine + Spring Boot Actuator

Run this project in your localhost:

wenn you install all the tools, connect to your database, then run these four commands in four sperate terminals:

```
brew services start redis
```

```
zookeeper-server-start /opt/homebrew/etc/zookeeper/zoo.cfg
```

```
kafka-server-start /opt/homebrew/etc/kafka/server.properties
```

```
(base) chutongren@ChutongdeMacBook-Pro elasticsearch-7.17.1 % ./bin/elasticsearch
```

Funtionalities:

Login: Email-based registration with activation email, Secure password storage using MD5 + salted hashing, Login with randomized CAPTCHA verification, Session management for login state persistence, Dynamic UI rendering (different views for guests vs. authenticated users),

About me: My Profile(show the number of Following: 0 Follower: 1 Likes: 3), My posts, Settings(upload New Avatar, set New Password), log out

Post: Post creation/commenting with sensitive word filtering, Private messaging system, sorted list in latest and hottest, see post detail, pagnition

Social Features: Like/upvote mechanism, User follow system, Real-time system notifications(when somebody give you a like/comment/reply/follow)

Messages: Show comment, send comment, comment list, show the number of unread(status)

MySQL

Even if it is added to the environment variable, the command initialization must be typed into bin.

```
mysqld --initialize --console
```

```
C:\Users\Administrator>d:
```

```
D:\>cd d:\work\mysql-8.0.16-winx64\bin
```

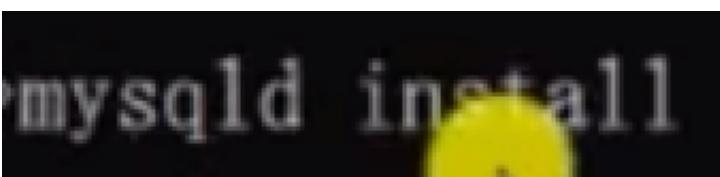
```
d:\work\mysql-8.0.16-winx64\bin>mysqld --initialize --console
```

```
2019-05-31T14:31:46.297908Z 5 [Note] [MY-010454] [Server] A temporary password is generated for root@localhost: /5=Xhal)h4/
```

Copy this password, then

```
ChutongdeMacBook-Pro:bin root# sudo ./mysqld --initialize --console
2025-02-23T21:56:27.897615Z 0 [System] [MY-015017] [Server] MySQL Server Initialization - start.
2025-02-23T21:56:27.898730Z 0 [Warning] [MY-013711] [Server] Manifest file '/usr/local/mysql-8.4.4-macos15-arm64/bin/mysqld.my' is not read-only. For better security, please make sure that the file is read-only.
2025-02-23T21:56:27.899241Z 0 [System] [MY-013169] [Server] /usr/local/mysql-8.4.4-macos15-arm64/bin/mysqld (mysqld 8.4.4) initializing of server in progress as process 97051
2025-02-23T21:56:27.901227Z 0 [Warning] [MY-010159] [Server] Setting lower_case_table_names=2 because file system for /usr/local/mysql-8.4.4-macos15-arm64/data/ is case insensitive
2025-02-23T21:56:27.910568Z 1 [System] [MY-013576] [InnoDB] InnoDB initialization has started.
2025-02-23T21:56:28.035152Z 1 [System] [MY-013577] [InnoDB] InnoDB initialization has ended.
2025-02-23T21:56:29.061629Z 6 [Note] [MY-010454] [Server] A temporary password is generated for root@localhost: s-kaXigp(3=9
2025-02-23T21:56:29.401854Z 0 [System] [MY-013172] [Server] Received SHUTDOWN from user <via user signal>. Shutting down mysqld (Version: 8.4.4).
2025-02-23T21:56:30.165174Z 0 [System] [MY-015018] [Server] MySQL Server Initialization - end.
```

A temporary password is generated for root@localhost: s-kaXigp(3=9



```
d:\work\mysql-8.0.16-winx64\bin>net start mysql
MySQL 服务正在启动 .
```

Login + reset password

```
C:\Users\Administrator mysql -uroot -p
Enter password: *****
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 8
Server version: 8.0.16

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owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> alter user root@localhost identified by 'lihonghe';
Query OK, 0 rows affected (0.01 sec)
```

brew install mysql

mysql_secure_installation 下载成功，配置密码

Error resolution: <https://juejin.cn/post/6844903831298375693>

mysql.server start # Start MySQL first

mysql -u root -p # Log in to MySQL 2025@MySQL

You install MySQL on macOS with Homebrew, and you don't need the my.ini file. On macOS and Linux, the MySQL configuration file is my.cnf, not my.ini on Windows.

create database

```
[mysql]> create database community;
Query OK, 1 row affected (0.00 sec)
```

```
[mysql]> show databases;
+-----+
| Database |
+-----+
| community |
| information_schema |
| mysql |
| performance_schema |
| sys |
+-----+
5 rows in set (0.02 sec)
```

create schema(tables) in database

```
[mysql]> use community;
Database changed
[mysql]> source /Users/chutongren/Documents/job/nowcoder/community-init-sql-1.5/init_schema.sql
Query OK, 0 rows affected (0.01 sec)

Query OK, 0 rows affected (0.00 sec)

Query OK, 0 rows affected (0.00 sec)

Query OK, 0 rows affected (0.00 sec)
```

```
[mysql]> show tables;
```

Tables_in_community
comment
discuss_post
login_ticket
message
user

```
5 rows in set (0.00 sec)
```

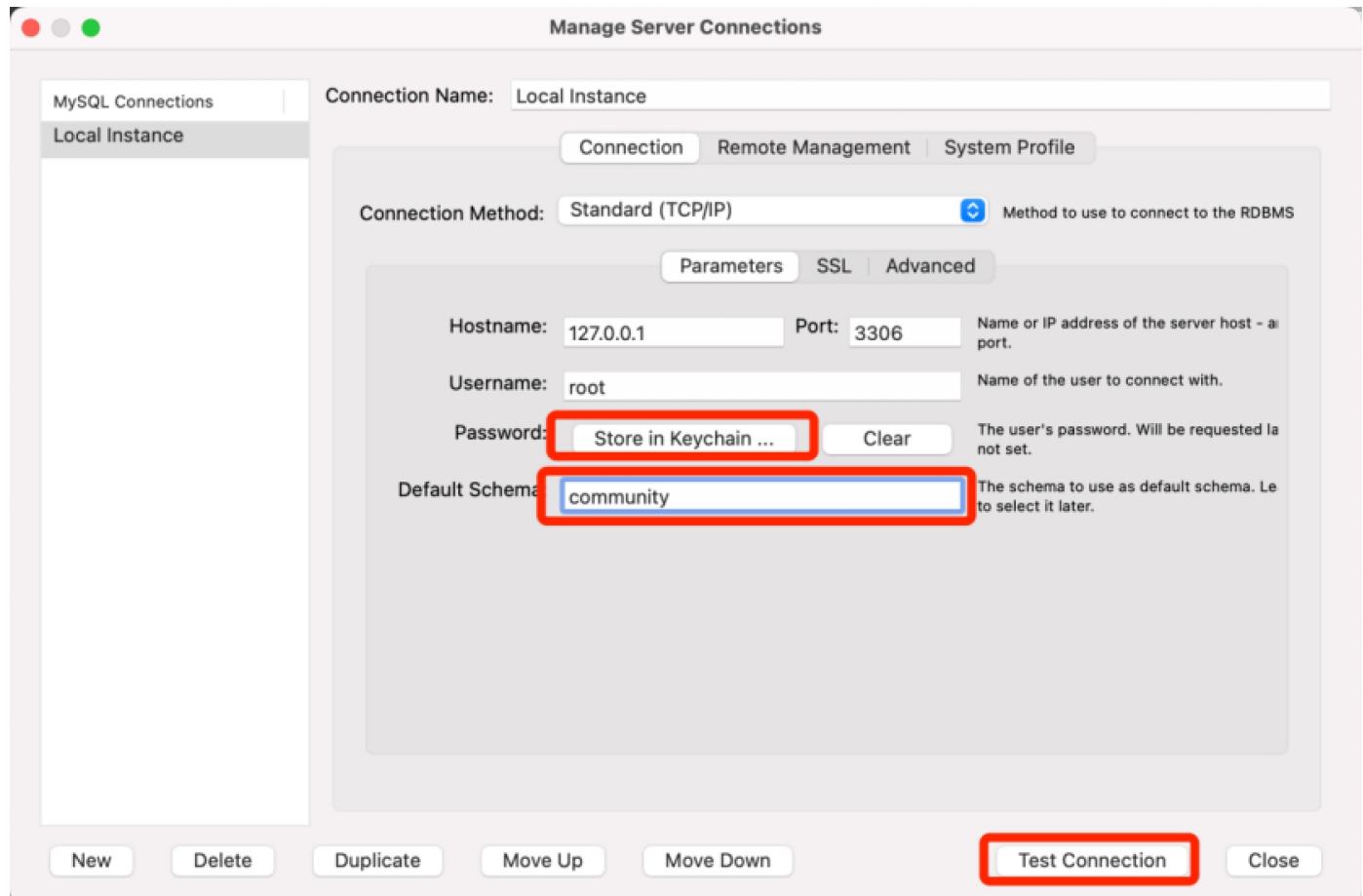
```
import init_data.sql
```

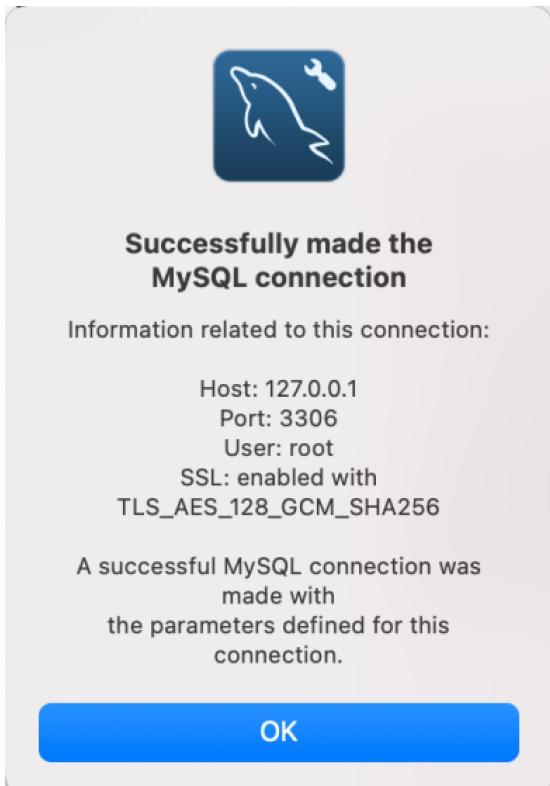
```
[mysql]> source /Users/chutongren/Documents/job/nowcoder/community-init-sql-1.5/init_data.sql;
Query OK, 0 rows affected (0.00 sec)

Query OK, 0 rows affected (0.00 sec)

Query OK, 0 rows affected (0.00 sec)
```

```
[mysql]> select * from user;
+----+-----+-----+-----+
| id | username | password | type | status | activation_code | create_time |
| salt | email | header_url |
+----+-----+-----+-----+
```





Login Modul

Send Activation Email automatically

Spring Email(<https://mvnrepository.com/search?q=Spring+Mail>)

1.Enable POP3/SMTP service in the mailbox

2.Config: # MailProperties

```
# MailProperties
spring.mail.host = smtp.sina.com
spring.mail.port= 465
spring.mail.username=nowcoderofficial@sina.com
spring.mail.password=a3cf42ac35af7c17 # NOT Login password, BUT
spring.mail.protocol=smtp
spring.mail.properties.mail.smtp.ssl.enable=true # need to be set as true
```

3.utils/MailClient.java

Creating and sending MimeMessage with JavaMailSender

MimeMessagHelper simplifies the creation and configuration of MimeMessage

```
@Component
public class MailClient { // JavaMailSender -> MimeMessageHelper -> MimeMessage
    @Autowired
```

```

private JavaMailSender mailSender;

@Value("${spring.mail.username}")
private String from;

public void sendMail(String to, String subject, String content) {
    try{
        MimeMessage message = mailSender.createMimeMessage();
        MimeMessageHelper helper = new MimeMessageHelper(message); // sender helper
        helper.setFrom(from); // message, from, to, subject, content
        helper.setTo(to);
        helper.setSubject(subject);
        helper.setText(content,true);
        mailSender.send(helper.getMimeMessage());
    }catch (MessagingException e){
        logger.error("email sent failed: "+e.getMessage());
    }
}
}

```

4. Write test class

The error is due to: Password changed to authorization code: a3cf42ac35af7c17

! On June 7th, I tried registering a new user in China. No matter how many times I tested, **the activation email never arrived.**

So I ran two test functions in MailTests.java and made a surprising discovery:

- When the HTML template only contains a simple <p> tag, the activation email is received successfully.
- As soon as there's a URL in the HTML (like an tag), even though the function may run successfully, the email is not received at all.

Then I checked the error message in the console:

```

org.springframework.mail.MailAuthenticationException: Authentication failed at
org.springframework.mail.javamail.JavaMailSenderImpl.doSend(JavaMailSenderImpl.java:402)
...
Caused by: jakarta.mail.AuthenticationFailedException: 535 5.7.8 authentication failed
... 35 more

```

The core error is definitely related to Emailbox authentication. Possible causes include:

- ? Maybe the SMTP authorization code expired?
- ? Maybe the newly added function broke something?
- ? Maybe it's the VPN? (I noticed some VPN-related info in the logs, which made me suspicious)

After many tests, I finally discovered the real reason: **It was the VPN causing the email authentication to fail!** As soon as I turned off the VPN, the activation emails were sent and received successfully. All in all, as long as Redis is running, Kafka is running, Elasticsearch is running and VPN is OFF, then this function works perfectly. (Aaaahhhh!!! It was the VPN all along!!! I spend a whole night to find it out!

Register

Utils

```
public static String generateUUID(){
    return UUID.randomUUID().toString().replaceAll("-", ""); //只要字母和数字就够了
}
// MD5 encryption encrypts pw 1 can only encrypt but not decrypt 2 each encryption
becomes a value // MD5加密 对pw加密 1只能加密不能解密 2每次加密都是变成一个值
// hello + 3e4a8 (salt) -> abc123def456abc
public static String md5(String key){
    if(StringUtils.isBlank(key)){
        return null;
    }
    return DigestUtils.md5DigestAsHex(key.getBytes());
}
```

Login

verification code generation

Kaptcha(<https://mvnrepository.com/search?q=Kaptcha+>)

1 用户在前端访问 /kaptcha

2 服务器生成随机验证码（文本 + 图片）。

3 服务器把验证码文本存入 session。用于后续比较

4 服务器把验证码图片发送给浏览器。

5 用户在登录页面看到验证码图片

用户提交登录请求 (/login)

服务器从 session 取出验证码文本，和用户输入的验证码进行对比：

```
session.getAttribute("kaptcha");
```

匹配：继续检查用户名、密码。

不匹配：提示 "验证码不正确"，拒绝登录。

refresh_kaptcha() 函数生成一个新的路径 path，其中包含一个随机数 Math.random() 以防止浏览器缓存图片。
\$("#kaptcha").attr("src",path); 使用 jQuery 选择器 \$("#kaptcha") 找到 id="kaptcha" 的 元素，并将其 src 属性更新为新的路径 path，从而刷新验证码图片。

user_id是连接login_ticket 表和user表的， expired是过期时间， 决定目前是登录状态还是未登录状态 (logout)

login_ticket 登录凭证（颁发给浏览器的

整张表都是围绕ticket的， ticket是登录的唯一凭证（于是我们就知道了哪个用户在登录

status 0有效， 1无效

user_id

id自动生成

数据访问层

entity/LoginTicket 成员变量+getter and setter+toString方法

dao/LoginTicketMapper接口

声明@Mapper注解，

insertLoginTicket (LoginTicket) 插入

LoginTicket selectByTicket(String ticket);

int updateStatus(String ticket, int status) 更改状态

法一： -mapper.xml

法二： 写对应的注解， 小括号里面一个花括号， 花括号里面多个字符串， 帮我们拼成一个server

写testInsertLoginTicket测试CRUD是否实现

业务层 逻辑 首先传入的值不能为空； 其次

表现层 Login

login.html：

默认值

中name="username" 的作用：

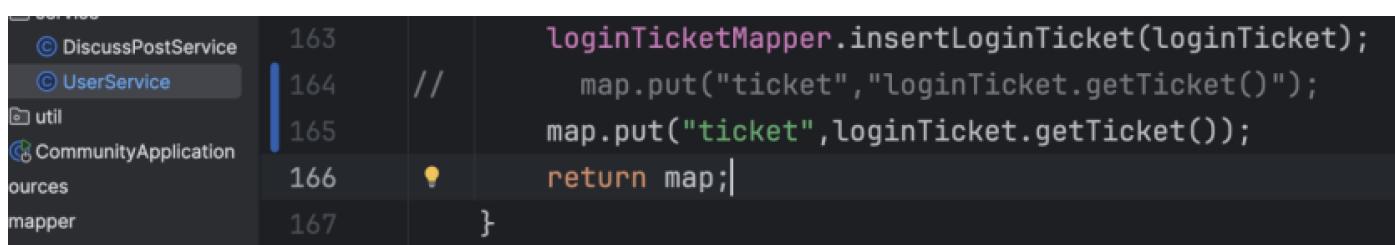
指定输入框在表单提交时的参数名称， 保证数据能正确传递给服务器。

与 th:value 配合使用， 实现表单回显， 避免用户重复输入。

在 Spring MVC 中用于对象绑定， 让表单数据自动映射到 Java 对象。

logout， 数据库ticket的状态还是0不变

输出Ticket， 发现他的值是loginTicket.getTicket()， 太奇怪了， 应该是个String， 而且getTicket()这个方法显示没有被使用。这个bug找的我好生气



```
 163     loginTicketMapper.insertLoginTicket(loginTicket);
 164     // map.put("ticket", "loginTicket.getTicket()");
 165     map.put("ticket", loginTicket.getTicket());
 166     return map;
 167 }
```

The screenshot shows a code editor with Java code. The code is part of a service class, likely UserService, which interacts with a login ticket mapper. The code includes an insertion of a login ticket, a comment, and a map entry for the ticket. The line numbers 163 through 167 are visible on the left, and the code itself is on the right. The code uses both the standard getTicket() method and a string representation of the ticket.

显示登录信息 依靠拦截器

if登录， 头部显示123:

if未登录， 头部显示456:

user表没有存在浏览器端， 因为比较敏感， 只存了一个ticket， 然后可以查到user id， 然后可以拿着user id去user表查询用户信息

从request里面取cookie->封装成util/CookieUtil.java

Show Login Status with Interceptor

To display the login status of the current user, we implement an Interceptor to retrieve the login ticket stored in the browser's cookie, validate it, and fetch the corresponding user. Then we make the user information accessible throughout the whole lifecycle of the request.

Step 1: Create a Utility to Read Cookie Values

```
public class CookieUtil {  
  
    public static String getValue(HttpServletRequest request, String name) {  
        if(request==null||name==null){  
            throw new IllegalArgumentException("The request parameter name can not be null");  
        }  
        Cookie[] cookies = request.getCookies();  
        if(cookies != null){  
            for(Cookie cookie : cookies){  
                if(cookie.getName().equals(name)){  
                    return cookie.getValue();  
                }  
            }  
        }  
        return null;  
    }  
}
```

Step 2: Use a HostHolder Utility to Replace HttpSession

HostHolder is a utility class that stores user information in a ThreadLocal, so it is accessible across the different layers of the application during a single request thread.

```
@Component  
public class HostHolder {  
    private ThreadLocal<User> users = new ThreadLocal<>();  
    public void setUser(User user) {users.set(user);};  
    public User getUser() {return users.get();}  
    public void clear() {users.remove();}  
}
```

Step 3: Define an Interceptor

We create a `LoginTicketInterceptor` class that implements `HandlerInterceptor` and override its three core methods:

`preHandle()` — executed before the controller is invoked

`postHandle()` — executed after the controller but before the view is rendered

`afterCompletion()` — executed after the view is rendered (i.e., after `TemplateEngine` processing)

```
@Component
public class LoginTicketInterceptor implements HandlerInterceptor {

    @Autowired
    private UserService userService;

    @Autowired
    private HostHolder hostHolder;

    @Override
    public boolean preHandle(HttpServletRequest request, HttpServletResponse response,
Object handler) throws Exception {
        // Retrieve login ticket from cookie
        String ticket = CookieUtil.getValue(request, "ticket");

        if (ticket != null) {
            // Fetch login ticket from the database
            LoginTicket loginTicket = userService.findLoginTicket(ticket);
            // Check if the ticket is valid
            if (loginTicket != null && loginTicket.getStatus() == 0 &&
loginTicket.getExpired().after(new Date())) {
                // Fetch user based on the login ticket
                User user = userService.findUserById(loginTicket.getUserId());
                // Store user in current thread (for this request)
                hostHolder.setUser(user);
            }
        }
        return true;
    }

    @Override
    public void postHandle(HttpServletRequest request, HttpServletResponse response,
Object handler, ModelAndView modelAndView) throws Exception {
        User user = hostHolder.getUser();
        if (user != null && modelAndView != null) {
            // Add user to the model so that views can access it
            modelAndView.addObject("loginUser", user);
        }
    }

    @Override
    public void afterCompletion(HttpServletRequest request, HttpServletResponse response,
Object handler, Exception ex) throws Exception {
```

```

        // Clear user information to prevent memory leaks
        hostHolder.clear();
    }
}

```

Step 4: Register the Interceptor in Configuration

In order that Spring can apply it to incoming requests, we need to register LoginTicketInterceptor in our WebMvcConfigurer

```

@Configuration
public class WebMvcConfig implements WebMvcConfigurer {
    @Autowired
    private LoginTicketInterceptor loginTicketInterceptor;

    @Override
    public void addInterceptors(InterceptorRegistry registry) {
        registry.addInterceptor(loginTicketInterceptor)
            .excludePathPatterns("/**/*.*css", "/**/*.*js", "/**/*.*png", "/**/*.*jpg", "/**/*.*jpeg");
    }
}

```

Step 5: index.html

Use the `loginUser` object, which is stored in the Model, to check whether the user is logged in.

If the user is **logged in**, display "**Messages**" and "**My Profile**" on the homepage.

If the user is **not logged in**, display "**Sign up**" and "**Sign in**".

Messages

Sign up | Sign in

User Avatar

Posts Modul

filter sensitive words with Prefix Tree(Trie)

WHAT is Trie?

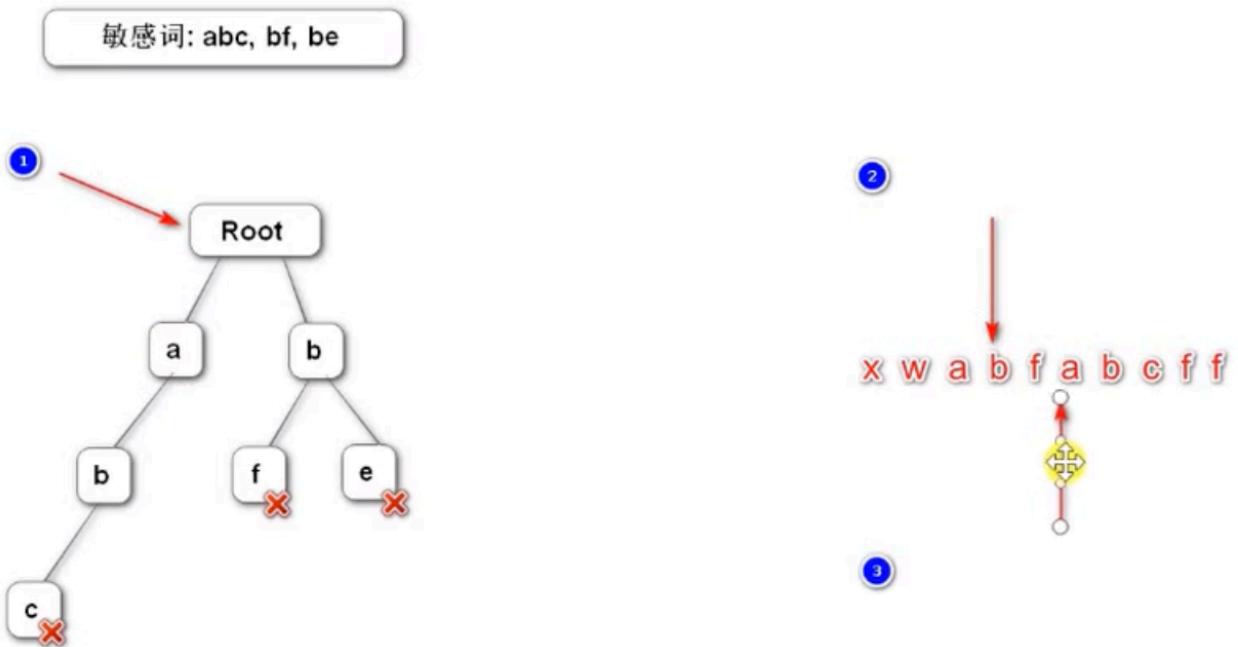
A Trie is a tree data structure used to store strings efficiently. The root node contains no character. Every child node (except the root) contains exactly one character. A path from the root to a leaf forms a string. If the string is a sensitive word, the leaf node is marked. Among sibling nodes, each character is unique.

Trie is trading memory space for time.

Applications: String searching, Word frequency statistics(HOT words), String sorting

You use a `StringBuilder`:

- If the substring is **not** a sensitive word, append the characters as they are.
- If it **is** a sensitive word, replace the entire word with ***** symbols.
- After replacement, move Pointer 2 forward and reset Pointer 1 to the root.
- input is a text, output is a text without sensitive words



There are three pointers: Pointer 1: Points to the root of the Trie, used to traverse the tree. Pointer 2: Points to the current character in the string from left to right; marks the start of a potential word. It never moves backward. Pointer 3: Starts from Pointer 2 and moves forward; marks the end of a potential word. It resets when Pointer 2 moves forward.

HOW?

Step1: Define the prefix tree. util/class SensitiveFilter

Step2: Initialize it using the list of sensitive words. resources/sensitive-words.txt

Step3: Implement a filtering method that checks and replaces sensitive words. public String filter(String text){}

post with AJAX

AJAX stands for Asynchronous JavaScript and XML. It's not a new technology, but rather a new way of using existing technologies. With AJAX, a web page can update parts of its content asynchronously — that is, without refreshing the entire page. Although the "X" stands for XML, nowadays JSON is more commonly used because it's easier to parse and work with in JavaScript. 增量更新显示在页面上, 不需要刷新页面

Using **jQuery** to send an AJAX request: In an HTML page, we can add a small button. When the button is clicked, a **POST** request is sent asynchronously. This allows us to interact with the server and retrieve data **without reloading the page**.

? Two Ways to send user input data from Frontend to Backend in a Spring Boot web app:

1. **Form Submission** (e.g., login, register):

- Sends data by reloading the page.
- Spring MVC automatically binds form fields to Java objects using matching `name` attributes.

2. AJAX Request (e.g., posting, commenting):

- Sends data asynchronously without reloading the page.
- You manually collect input and send it using `$.post()` or `fetch()`.
- The backend receives it as individual parameters or a JSON object.

 **Use form submission for page navigation; use AJAX for smoother user experience with partial updates.**

`loginUser` is a user object passed from the backend controller to the HTML page via the Model. The `th:if="${loginUser!=null}"` condition in Thymeleaf ensures that the Post button is only displayed if a user is logged in.

```
th:if="${loginUser!=null}"
// if logged in, then show "Post"
```

 After click a post, what happened?

Click -> change url(add postId after url)

turn to `discuss/detail` site

Spring MVC's automatic binding mechanism: The `name` attribute in the HTML form must strictly match the field name of the Java class (case-sensitive) and must be accessed through Getter/Setter: It is required to access properties through getter/setter (even if the field is `private`), not directly `.name`, which is a manifestation of encapsulation. Spring MVC 的自动绑定机制：HTML 表单中的 `name` 属性必须与 Java 类的字段名 **严格匹配**（区分大小写）**必须通过 Getter/Setter 访问**：要求通过 getter/setter 访问属性（即使字段是 `private`），不能直接`.name`，这是封装性的体现。

```
<select id="selectDiscussPosts" resultType="DiscussPost">
    select <include refid="selectFields"></include>
    from discuss_post
    where status != 2
--      如果传进来的 userId 不等于 0, 就加上 and user_id = #{userId} 这个过滤条件。
    <if test="userId!=0">
        and user_id = #{userId}
    </if>
    <if test="orderMode==0">
        order by type desc, create_time desc
    </if>
    <if test="orderMode==1">
        order by type desc, score desc, create_time desc
    </if>
    limit #{offset}, #{limit}
</select>
```

Spring Data Access - Transaction Management

The phantom read condition is to count multiple data (such as the total number of posts), which is acceptable, for example, we count in the middle of the night

Optimistic lock: Even if there is concurrency, there is usually no problem

幻读条件是统计多条数据（比如帖子总数），可以接受，比如我们后半夜统计

乐观锁：即使并发了，通常也不会有问题

Declarative Transaction Management

Programmatic Transaction Management: only want to control a part of it.

Show Comments in Post Detail Page

entity_type: type(target of comment) 1:post, 2:comment

entity_id: id of that post/comment

target_id: Under a post, you can also comment a comment, whom you comment to

Status: 2:deleted

- `entity_type + entity_id` 共同构成 复合外键，实现评论与多种实体关联的灵活性。

```
where status=0  
and entity_type=#{entityType}  
and entity_id=#{entityId}
```

Add a Comment

Add a Comment in db, then revise the number of comments

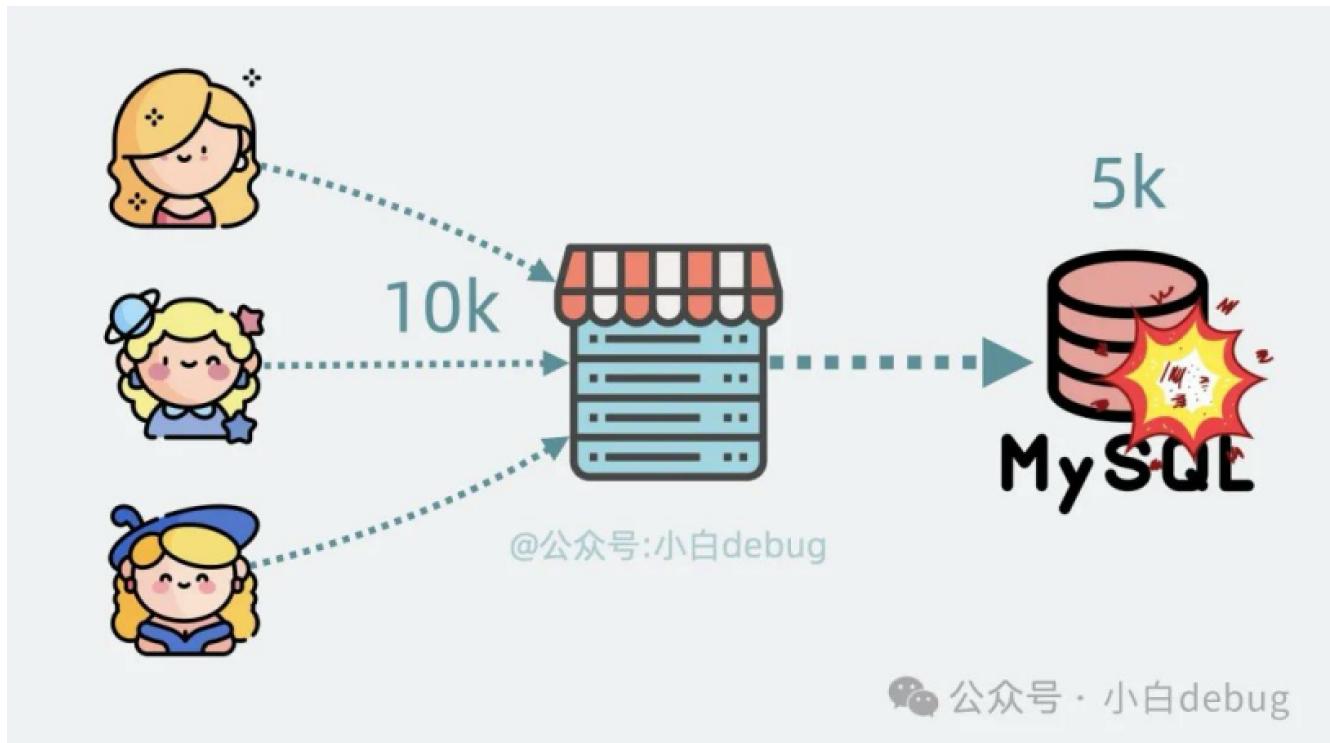
Messages

Redis - like

A lightning-fast, in-memory cache & database for high-speed data access. Redis解决QPS高的问题，比如双11秒杀或者春运抢车票，Redis是内存存储 + 单线程IO多路复用 → 轻松支撑10万+ QPS。提升的是数据查询性能，避免MySQL被突发流量击穿

As a programmer maintaining a **Product Service**:

- Service needs to handle **10,000 QPS** (queries per second)
- Underlying MySQL can only support **5,000 QPS**
- eg. Double 11 flash sales, Spring Festival train ticket rush, Any high-concurrency read operations



Key insight:

- Memory access is **100x faster** than disk access
- MySQL stores data on disk → Slow
- Redis stores data in memory → Fast

Implementation approach:

1. Check Redis (in-memory) first
2. If missing ("cache miss", which means when data isn't found in Redis and must be fetched from MySQL), query MySQL
3. Store MySQL results in Redis for future requests



@公众号:小白debug

公众号 · 小白debug

```
C:\Users\Administrator>redis-cli
127.0.0.1:6379> select 1
OK
127.0.0.1:6379[1]> select 2
OK
127.0.0.1:6379[2]> select 0
OK
127.0.0.1:6379> flushdb
OK
127.0.0.1:6379> set test:count 1
OK
127.0.0.1:6379> get test:count
"1"
127.0.0.1:6379> incr test:count
(integer) 2
127.0.0.1:6379> decr test:count
(integer) 1
127.0.0.1:6379> hset test:user id 1
(integer) 1
127.0.0.1:6379> hset test:user username zhangsan
(integer) 1
127.0.0.1:6379> hget test:user id
1
127.0.0.1:6379> hget test:user username
"zhangsan"
```

```
127.0.0.1:6379> lpush test:ids 101 102 103
(integer) 3
127.0.0.1:6379> llen test:ids
(integer) 3
127.0.0.1:6379> lindex test:ids 0
"103"
127.0.0.1:6379> lindex test:ids 2
"101"
127.0.0.1:6379> lrange test:ids 0 2
1) "103"
2) "102"
3) "101"
127.0.0.1:6379> rpop test:ids
"101"
127.0.0.1:6379> rpop test:ids
"102"
127.0.0.1:6379> sadd test:teachers aaa bbb ccc ddd eee
(integer) 5
127.0.0.1:6379> scard test:teachers
(integer) 5
127.0.0.1:6379> spop test:teachers
"ccc"
127.0.0.1:6379> spop test:teachers
"eee"
```

```
127.0.0.1:6379> zadd test:students 10 aaa 20 bbb 30 ccc 40 ddd 50 eee
(integer) 5
127.0.0.1:6379> zcard test:students
(integer) 5
127.0.0.1:6379> zscore test:students ccc
"30"
127.0.0.1:6379> zrank test:students ccc
(integer) 2
127.0.0.1:6379> zrange test:students 0 2
1) "aaa"
2) "bbb"
3) "ccc"
```

```
127.0.0.1:6379> keys *
1) "test:students"
2) "test:teachers"
3) "test:count"
4) "test:ids"
5) "test:user"
127.0.0.1:6379> keys test*
1) "test:students"
2) "test:teachers"
3) "test:count"
4) "test:ids"
5) "test:user"
127.0.0.1:6379> type test:user
hash
127.0.0.1:6379> exists test:user
(integer) 1
127.0.0.1:6379> del test:user
(integer) 1
127.0.0.1:6379> exists test:user
(integer) 0
127.0.0.1:6379> expire test:students 10
(integer) 1
127.0.0.1:6379> keys *
```

spring redis

```
<dependency>
  <groupId>org.springframework.boot</groupId>
  <artifactId>spring-boot-starter-data-redis</artifactId>
  <version>3.4.3</version>
</dependency>
```

```
# redis
spring.data.redis.database=11
spring.data.redis.host=localhost
spring.data.redis.port=6379
```

```
@Autowired
private RedisTemplate redisTemplate;
```

👉 最终 Redis 中的数据是：

- like:entity:1:233 → Set: [12, 44, 88] 表示这条 entity 被这几个用户点过赞
- like:user:44 → 109 表示用户 44 被赞了 109 次

Redis的事务管理

在 Spring 的 Redis 中，事务管理是通过 `RedisTemplate.execute(new SessionCallback(){...}) + operations.multi() + operations.exec()` 来手动控制的，而不是像数据库那样使用 `@Transactional` 注解。

Follow

📢 Kafka-Based System Notifications (e.g. “Someone commented on your post”)

When you **comment**, **like**, or **follow**, the system automatically sends a notification such as:

“Alice commented on your post”
and includes a link to that post or user.

These user interactions happen **frequently**, so to **improve performance**, we use **Kafka** as a message queue to process them **asynchronously and concurrently**.

Kafka is a **distributed message queue** system. Even without Kafka, you could use a simple **blocking queue**, but Kafka has key advantages:

- Kafka **persists messages to disk**, while blocking queues usually store them in memory.
- **Disk is cheaper and larger than memory**, allowing Kafka to handle large volumes of data.
- Kafka reads/writes are **sequential and fast**, making it ideal for logging, messaging, and event processing.

🧠 Kafka Terminology

- Broker: A Kafka server that stores and serves messages.
- Zookeeper: Manages Kafka brokers and handles cluster coordination.
- Topic: Like a folder, used to store messages of a specific category.
- Partition: A subdivision of a topic to allow parallelism and scalability.

 Kafka Installation

step1: Install Kafka with homebrew

brew install kafka

step2: Configuration (optional)

/opt/homebrew/etc/kafka/server.properties

don't need to change anything for basic use — default paths will work.

step3: start services

open two separate terminal tabs:

```
zookeeper-server-start /opt/homebrew/etc/zookeeper/zoo.cfg
```

```
kafka-server-start /opt/homebrew/etc/kafka/server.properties
```

```
ATTENTION: Make sure Zookeeper is started before Kafka!
chutongren — java -Xmx512M -Xms512M -server -XX:+UseG...
Last login: Sat Apr 19 22:18:53 on ttv003
(base) chutongren@ChutongdeMacBook-Pro ~ % zookeeper-server-start /opt/homebrew/etc/zookeeper/zoo.cfg
[2025-04-19 22:34:27,680] INFO Reading configuration from: /opt/homebrew/etc/zookeeper/zoo.cfg (org.apache.zookeeper.server.quorum.QuorumPeerConfig)
[2025-04-19 22:34:27,683] INFO clientPortAddress is 0.0.0.0:2181 (org.apache.zookeeper.server.quorum.QuorumPeerConfig)
[2025-04-19 22:34:27,683] INFO secureClientPort is not set (org.apache.zookeeper.server.quorum.QuorumPeerConfig)
[2025-04-19 22:34:27,683] INFO observerMasterPort is not set (org.apache.zookeeper.server.quorum.QuorumPeerConfig)
[2025-04-19 22:34:27,683] INFO metricsProvider.className is org.apache.zookeeper.metrics.impl.DefaultMetricsProvider (org.apache.zookeeper.server.quorum.QuorumPeerConfig)
[2025-04-19 22:34:27,684] INFO replication.factor=1 --partitions=1 --replication-factor=1 --partitions=1 (org.apache.zookeeper.server.DatadirCleanupManager)
[2025-04-19 22:34:27,684] INFO autopurge.snapRetainCount set to 3 (org.apache.zookeeper.server.DatadirCleanupManager)
[2025-04-19 22:34:27,684] INFO autopurge.purgeInterval set to 0 (org.apache.zookeeper.server.DatadirCleanupManager)
[2025-04-19 22:34:27,684] INFO Purge task is not scheduled. (org.apache.zookeeper.server.DatadirCleanupManager)
[2025-04-19 22:34:27,684] WARN Either no config or no quorum defined in config, running in standalone mode (org.apache.zookeeper.server.quorum.QuorumPeerMain)
[2025-04-19 22:34:27,685] INFO Log4j 1.2 jmx support not found; jmx disabled. (o...
chutongren — java -Xmx1G -Xms1G -server -XX:+UseG1GC -...
Last login: Sat Apr 19 22:34:25 on ttv003
(base) chutongren@ChutongdeMacBook-Pro ~ % kafka-server-start /opt/homebrew/etc/kafka/server.properties
[2025-04-19 22:34:48,359] INFO Registered kafka:type=kafka.Log4jController MBean (kafka.utils.Log4jControllerRegistration$)
[2025-04-19 22:34:48,475] INFO Setting -D jdk.tls.rejectClientInitiatedRenegotiation=true to disable client-initiated TLS renegotiation (org.apache.zookeeper.co...
[2025-04-19 22:34:48,525] INFO Registered signal handlers for TERM, INT, HUP (org.apache.kafka.common.util.LoggingSignalHandler)
[2025-04-19 22:34:48,526] INFO starting (kafka.server.KafkaServer)
[2025-04-19 22:34:48,526] INFO Connecting to zookeeper on localhost:2181 (kafka.server.KafkaServer)
[2025-04-19 22:34:48,540] INFO [ZooKeeperClient Kafka server] Initializing a new session to localhost:2181. (kafka.zookeeper.ZooKeeperClient)
[2025-04-19 22:34:48,576] INFO Client environment:zookeeper.version=3.8.4-9316c2a7a97e1666d8f4593f34dd6f3c6ecc436c, built on 2024-02-12 22:16 UTC (org.apache.zookeeper.ZooKeeper)
[2025-04-19 22:34:48,576] INFO Client environment:host.name=chutongdemacbook-pro.fritz.box (org.apache.zookeeper.ZooKeeper)
[2025-04-19 22:34:48,576] INFO Client environment:java.version=23.0.2 (org.apache.zookeeper.ZooKeeper)
[2025-04-19 22:34:48,576] INFO Client environment:java.vendor=Oracle Corporation
```

step 4: create a kafka topic

```
kafka-topics.bat --create --bootstrap-server localhost:9002 --replication 1 --partition 1 --topic test  
kafka-topics.bat --list --bootstrap-server localhost:9002
```

step 5: producer and consumer send and consume messages

```
kafka-console-producer --broker-list localhost:9092 --topic test
```

```
kafka-console-consumer --bootstrap-server localhost:9092 --topic test --from-beginning
```

```
● ● ● chutongren - java -Xmx512M -server -XX:+UseG1GC -XX:M...  
Last login: Sat Apr 19 22:34:46 on ttys004  
(base) chutongren@ChutongdeMacBook-Pro ~ % kafka-topics --create --bootstrap-server localhost:9092 --replication-factor 1 --partitions 1 --topic test  
[2025-04-19 22:34:27,821] INFO Snapshotting: 0x0 to /opt/homebrew/Created topic test.  
ver/data/version-2/snapshot.0 (org.apache.zookeeper.server.persistentFile)  
(base) chutongren@ChutongdeMacBook-Pro ~ % kafka-topics --list --bootstrap-server localhost:9092  
[2025-04-19 22:34:27,823] INFO Snapshot loaded in 5 ms, highest  
id: command not found  
est is 137985504 (org.apache.zookeeper.server.ZKDatabase)  
test chutongren@ChutongdeMacBook-Pro [2025-04-19 22:34:27,823] INFO Snapshotting: 0x0 to /opt/homebrew/Created topic test.  
(base) chutongren@ChutongdeMacBook-Pro ~ % kafka-console-producer.bat --broker-list localhost:9092 --topic test  
[2025-04-19 22:34:27,823] INFO Snapshot taken in 0 ms (org.apache.kafka.clients.producer.internals.ConsumerRunnable)  
zsh: command not found: kafka-console-producer.bat  
(base) chutongren@ChutongdeMacBook-Pro ~ % kafka-console-producer --broker-list localhost:9092 --topic test (org.apache.zookeeper.server.PreRequestProcessor)  
>hallo  
>world  
>Alles Gute  
>  
[2025-04-19 22:34:27,827] INFO zookeeper.request.throttler.shutdownTimeout = 100  
00 ms (org.apache.zookeeper.server.RequestThrottler)  
[2025-04-19 22:34:27,833] INFO Using checkIntervalMs=60000 max  
xNeverUsedIntervalMs=0 (org.apache.zookeeper.server.ContainerManager)  
[2025-04-19 22:34:27,833] INFO ZooKeeper audit is disabled. (org.apache.zookeeper.audit.ZKAuditProvider)  
● ● ● chutongren - java -Xmx512M -server -XX:+UseG1GC -XX:M...  
Last login: Sat Apr 19 22:35:26 on ttys005 4 milliseconds was spent in the scheduler  
(base) chutongren@ChutongdeMacBook-Pro ~ % kafka-console-consumer --bootstrap-server localhost:9092 --topic test --from-beginning [4] INFO [GroupCoordinator 0]: Discovered member id joins group consumer-28213 in Empty  
ew/var/run/zookeer member id joins group consumer-28213 in Empty  
hallo.e.FileTxSn client-1 er id joins console-consumer-434675f5-7249-4f7d-8195-4547805  
world client-1 er id to rejoin with this id. (kafka.coordinator.group.G  
Alles Gute 0, dig client-1 er id joins console-consumer-434675f5-7249-4f7d-8195-4547805  
ew/var/run/zookeer client-1 p console-consumer-28213 in state PreparingRebalance w  
istence.FileTxSn hed. Nod  
the.zookeeper.serv client-1 nsumer_offsets-17) (reason: Adding new member console-  
client-1 instance,FileTxSn d-8195-454780534bec with group instance id None; client  
with the given member-id: console-consumer-434675f5-7249-4f7d-8195-454780534bec  
(Kafka.coordinator.group.GroupCoordinator)  
[2025-04-19 22:36:48,464] INFO [GroupCoordinator 0]: S  
client-1 tnumber-28213 generation 1 (_consumer_offsets-17) with  
client-1 er,group,GroupCoordinator)  
[2025-04-19 22:36:48,464] INFO [GroupCoordinator 0]: A  
client-1 dader console-consumer-434675f5-7249-4f7d-8195-454780534bec  
sumer-28213 for generation 1. The group has 1 members,  
afka.coordinator.group.GroupCoordinator)  
client-1
```

Spring Boot Integration with Kafka

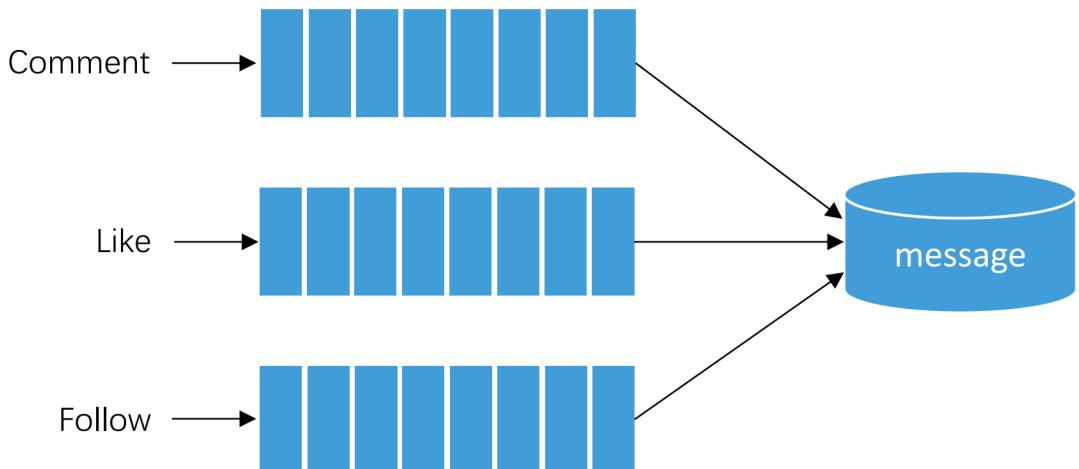
spring kafka

```
# KafkaProperties
spring.kafka.bootstrap-servers=localhost:9092
spring.kafka.consumer.group-id=test-consumer-group
spring.kafka.consumer.enable-auto-commit=true
spring.kafka.consumer.auto-commit-interval=3000 # ms
```

KafkaProducer -> `KafkaTemplate.send(topic,data)` this is a active call

`@KafkaListener(topics = {"test"}), public void handleMessage(ConsumerRecord record)` Passive trigger, automatically as long as there is an event in the queue

Send System Notifications



entity/Event

```
public class Event {
    private String topic; // "comment", "like" or "follow"
    private int userId; // always = 1
    private int entityType;
    private int entityId;
    private int entityUserId;
    private Map<String, Object> data = new HashMap<>(); // link
}
```

event/EventProducer, EventConsumer event data transfer with JSON Format

```
@Component
public class EventProducer {

    @Autowired
    private KafkaTemplate kafkaTemplate;

    public void fireEvent(Event event) {
        kafkaTemplate.send(event.getTopic(), JSONObject.toJSONString(event));
    }
}
```

```

@Component
public class EventConsumer implements CommunityConstant {

    @Autowired
    private MessageService messageService;

    @KafkaListener(topics = {TOPIC_COMMENT, TOPIC_LIKE, TOPIC_FOLLOW})
    public void handleCommentMessage(ConsumerRecord record) {
        if (record == null || record.value() == null) {
            logger.error("The kafka message content is null!");
            return;
        }

        Event event = JSONObject.parseObject(record.value().toString(), Event.class);
        if (event == null) {
            logger.error("Invalid kafka message format!");
            return;
        }

        Message message = new Message();
        message.setFromId(SYSTEM_USER_ID);
        message.setToId(event.getEntityUserId());
        message.setConversationId(event.getTopic());
        message.setCreateTime(new Date());

        Map<String, Object> content = new HashMap<>();
        content.put("userId", event.getUserId());
        content.put("entityType", event.getEntityType());
        content.put("entityId", event.getEntityId());

        if (!event.getData().isEmpty()) {
            for (Map.Entry<String, Object> entry : event.getData().entrySet()) {
                content.put(entry.getKey(), entry.getValue());
            }
        }

        message.setContent(JSONObject.toJSONString(content));
        messageService.addMessage(message);
    }
}

```

controller/ 把Event准备好给eventProducer

```

@Controller
@RequestMapping("/comment")
public class CommentController implements CommunityConstant {
    @RequestMapping(path = "/add/{discussPostId}", method = RequestMethod.POST)
    public String addComment(@PathVariable("discussPostId") int discussPostId, Comment
comment) {
        // ...
    }
}

```

```

Event event = new Event()
    .setTopic(TOPIC_COMMENT)
    .setUserId(hostHolder.getUser().getId())
    .setEntityType(comment.getEntityType())
    .setEntityId(comment.getEntityId())
    .setData("postId", discussPostId);

if (comment.getEntityType() == ENTITY_TYPE_POST) {
    DiscussPost target =
discussPostService.findDiscussPostById(comment.getEntityId());
    event.setEntityUserId(target.getUserId());
} else if (comment.getEntityType() == ENTITY_TYPE_COMMENT) {
    Comment target = commentService.findCommentById(comment.getEntityId());
    event.setEntityUserId(target.getUserId());
}
eventProducer.fireEvent(event);

return "redirect:/discuss/detail/" + discussPostId;
}
}

```

```

@Controller
public class LikeController implements CommunityConstant {
    @RequestMapping(path = "/like", method = RequestMethod.POST)
    @ResponseBody
    public String like(int entityType, int entityId, int entityUserId, int postId) {
        // ...

        if (likeStatus == 1) {
            Event event = new Event()
                .setTopic(TOPIC_LIKE)
                .setUserId(hostHolder.getUser().getId())
                .setEntityType(entityType)
                .setEntityId(entityId)
                .setEntityUserId(entityUserId)
                .setData("postId", postId);
            eventProducer.fireEvent(event);
        }

        return CommunityUtil.getJSONString(0, null, map);
    }
}

```

```

@Controller
public class FollowController implements CommunityConstant {
    @RequestMapping(path = "/follow", method = RequestMethod.POST)
    @ResponseBody
    public String follow(int entityType, int entityId) {
        User user = hostHolder.getUser();
        followService.follow(user.getId(), entityType, entityId);
    }
}

```

```

        Event event = new Event()
            .setTopic(TOPIC_FOLLOW)
            .setUserId(hostHolder.getUser().getId())
            .setEntityType(entityType)
            .setEntityId(entityId)
            .setEntityUserId(entityId);
        eventProducer.fireEvent(event);

        return CommunityUtil.getJSONString(0, "Followed!");
    }
}

```

Show unread numbers

```

Message selectLatestNotice(int userId, String topic);

int selectNoticeCount(int userId, String topic);

int selectNoticeUnreadCount(int userId, String topic);

List<Message> selectNotices(int userId, String topic, int offset, int limit);

```

```

<select id="selectLatestNotice" resultType="Message">
    select <include refid="selectFields"></include>
    from message
    where id in (
        select max(id) from message
        where status != 2
        and from_id = 1
        and to_id = #{userId}
        and conversation_id = #{topic}
    )
</select>

<select id="selectNoticeCount" resultType="int">
    select count(id) from message
    where status != 2
    and from_id = 1
    and to_id = #{userId}
        and conversation_id = #{topic}
</select>

<select id="selectNoticeUnreadCount" resultType="int">
    select count(id) from message
    where status = 0
    and from_id = 1
    and to_id = #{userId}
    <if test="topic!=null">
        and conversation_id = #{topic}
    </if>
</select>

```

```

<select id="selectNotices" resultType="Message">
    select <include refid="selectFields"></include>
    from message
    where status != 2
    and from_id = 1
    and to_id = #{userId}
    and conversation_id = #{topic}
    order by create_time desc
    limit #{offset}, #{limit}
</select>

```

```

public Message findLatestNotice(int userId, String topic) {
    return messageMapper.selectLatestNotice(userId, topic);
}

public int findNoticeCount(int userId, String topic) {
    return messageMapper.selectNoticeCount(userId, topic);
}

public int findNoticeUnreadCount(int userId, String topic) {
    return messageMapper.selectNoticeUnreadCount(userId, topic);
}

public List<Message> findNotices(int userId, String topic, int offset, int limit) {
    return messageMapper.selectNotices(userId, topic, offset, limit);
}

```

```

@RequestMapping(path = "/notice/list", method = RequestMethod.GET)
public String getNoticeList(Model model) {
    User user = hostHolder.getUser();

    Message message = messageService.findLatestNotice(user.getId(), TOPIC_COMMENT);
    Map<String, Object> messageVO = new HashMap<>();
    if (message != null) {
        messageVO.put("message", message);

        String content = HtmlUtils.htmlUnescape(message.getContent());
        Map<String, Object> data = JSONObject.parseObject(content, HashMap.class);

        messageVO.put("user", userService.findUserById((Integer) data.get("userId")));
        messageVO.put("entityType", data.get("entityType"));
        messageVO.put("entityId", data.get("entityId"));
        messageVO.put("postId", data.get("postId"));

        int count = messageService.findNoticeCount(user.getId(), TOPIC_COMMENT);
        messageVO.put("count", count);

        int unread = messageService.findNoticeUnreadCount(user.getId(), TOPIC_COMMENT);
        messageVO.put("unread", unread);
    }
}

```

```

}

model.addAttribute("commentNotice", messageVO);

message = messageService.findLatestNotice(user.getId(), TOPIC_LIKE);
messageVO = new HashMap<>();
if (message != null) {
    messageVO.put("message", message);

    String content = HtmlUtils.htmlUnescape(message.getContent());
    Map<String, Object> data = JSONObject.parseObject(content, HashMap.class);

    messageVO.put("user", userService.findUserById((Integer) data.get("userId")));
    messageVO.put("entityType", data.get("entityType"));
    messageVO.put("entityId", data.get("entityId"));
    messageVO.put("postId", data.get("postId"));

    int count = messageService.findNoticeCount(user.getId(), TOPIC_LIKE);
    messageVO.put("count", count);

    int unread = messageService.findNoticeUnreadCount(user.getId(), TOPIC_LIKE);
    messageVO.put("unread", unread);
}
model.addAttribute("likeNotice", messageVO);

message = messageService.findLatestNotice(user.getId(), TOPIC_FOLLOW);
messageVO = new HashMap<>();
if (message != null) {
    messageVO.put("message", message);

    String content = HtmlUtils.htmlUnescape(message.getContent());
    Map<String, Object> data = JSONObject.parseObject(content, HashMap.class);

    messageVO.put("user", userService.findUserById((Integer) data.get("userId")));
    messageVO.put("entityType", data.get("entityType"));
    messageVO.put("entityId", data.get("entityId"));

    int count = messageService.findNoticeCount(user.getId(), TOPIC_FOLLOW);
    messageVO.put("count", count);

    int unread = messageService.findNoticeUnreadCount(user.getId(), TOPIC_FOLLOW);
    messageVO.put("unread", unread);
}
model.addAttribute("followNotice", messageVO);

// count(unread)
int letterUnreadCount = messageService.findLetterUnreadCount(user.getId(), null);
model.addAttribute("letterUnreadCount", letterUnreadCount);
int noticeUnreadCount = messageService.findNoticeUnreadCount(user.getId(), null);
model.addAttribute("noticeUnreadCount", noticeUnreadCount);

```

```

        return "/site/notice";
    }

@RequestMapping(path = "/notice/detail/{topic}", method = RequestMethod.GET)
public String getNoticeDetail(@PathVariable("topic") String topic, Page page, Model
model) {
    User user = hostHolder.getUser();

    page.setLimit(5);
    page.setPath("/notice/detail/" + topic);
    page.setRows(messageService.findNoticeCount(user.getId(), topic));

    List<Message> noticeList = messageService.findNotices(user.getId(), topic,
page.getOffset(), page.getLimit());
    List<Map<String, Object>> noticeVoList = new ArrayList<>();
    if (noticeList != null) {
        for (Message notice : noticeList) {
            Map<String, Object> map = new HashMap<>();
            // 通知
            map.put("notice", notice);
            // 内容
            String content = HtmlUtils.htmlUnescape(notice.getContent());
            Map<String, Object> data = JSONObject.parseObject(content, HashMap.class);
            map.put("user", userService.findUserById((Integer) data.get("userId")));
            map.put("entityType", data.get("entityType"));
            map.put("entityId", data.get("entityId"));
            map.put("postId", data.get("postId"));
            // 通知作者
            map.put("fromUser", userService.findUserById(notice.getFromId()));

            noticeVoList.add(map);
        }
    }
    model.addAttribute("notices", noticeVoList);

    // 设置已读
    List<Integer> ids = getLetterIds(noticeList);
    if (!ids.isEmpty()) {
        messageService.readMessage(ids);
    }

    return "/site/notice-detail";
}

```

write a postman function

Elasticsearch Fundamentals

1. Introduction to Elasticsearch

- A **distributed, RESTful** search and analytics engine
- Capabilities:
 - Supports **full-text search** across diverse data types
 - Delivers **real-time** search results with high speed
 - Designed for **horizontal scaling** (handles PB-scale data per second)

2. Core Terminology

Term	Definition
Index 索引 (db) -> Table	A collection of documents (analogous to a database in SQL)
Type 类型 (Table 一张表)	Deprecated in v7.0+ (Formerly a logical category within an index)
Document 文档 (行, 一条数据)	Basic unit of data (JSON format), like a "row" in SQL
Field 字段 (列)	A key-value pair within a document (e.g., <code>"title": "Elasticsearch 101"</code>)
Cluster 集群 (一群服务器)	A set of connected nodes that hold all data
Node 节点 (其中一台)	A single server in the cluster
Shard 分片 (一个索引拆分成多个分片去存, 提高并发能力)	A subset of an index's data (enables distributed storage)
Replica 副本 (提高可用性)	A copy of a shard for fault tolerance

Setting Up Elasticsearch for Search: A Step-by-Step Guide

1. Overview

- **Purpose:** Sync database data to Elasticsearch (ES) for fast full-text search (default port: 9200)
- **Prerequisite Services:**

```
brew services start redis
zookeeper-server-start /opt/homebrew/etc/zookeeper/zoo.cfg
kafka-server-start /opt/homebrew/etc/kafka/server.properties
./bin/elasticsearch # Launch ES
```

2. Installation & Configuration

A. Download & Run

1. Download from [Elasticsearch Official Site](#)
2. Navigate to the installation folder and start:

```
cd /Users/chutongren/Documents/job/nowcoder/tools/elasticsearch-7.17.1  
./bin/elasticsearch
```

B. Fixing macOS Security Errors



- **Issue:** macOS blocks unsigned JDK on Apple Silicon (M1/M2/M3)
- **Solution:**

```
sudo xattr -rd com.apple.quarantine /Library/Java/JavaVirtualMachines/jdk-23.jdk
```

C. Install Chinese IK Analyzer Plugin

- **Method 1 (CLI):**

```
bin/elasticsearch-plugin install https://get.infini.cloud/elasticsearch/analysis-ik/7.17.1
```

- **Method 2 (Manual):**

1. Download plugin ZIP from [IK GitHub](#)
2. Unzip to `plugins/ik/` in the ES installation directory

- **Custom Words:** Configure new terms in `plugins/ik/config/IKAnalyzer.cfg.xml`

D. Configure `elasticsearch.yml`

```
cluster.name: nowcoder
path.data: /Users/chutongren/Documents/job/nowcoder/tools/elasticsearch-7.17.1/data
path.logs: /Users/chutongren/Documents/job/nowcoder/tools/elasticsearch-7.17.1/logs
// xpack.security.enabled: false # Disable auth for local dev
```

3. Integration with Spring Boot

- **Application Properties:**

```
spring.elasticsearch.uris=localhost:9200 # No "http://" needed
```

- **Conflict Note:** ES 7+ no longer clashes with Netty (used by Redis).

4. Verification & Troubleshooting

A. Check ES Health

```
curl -X GET "localhost:9200/_cat/health?v"
```

- **Error Fix:** If connection fails, clear SSL passwords:

```
./bin/elasticsearch-keystore remove
xpack.security.transport.ssl.keystore.secure_password
./bin/elasticsearch-keystore remove xpack.security.http.ssl.keystore.secure_password
```

- **Test:** Access `http://localhost:9200` in browser or via `curl`.

B. Postman/curl Examples

- Create an index:

```
curl -X PUT "localhost:9200/my_index"
```

- Search data:

```
curl -X GET "localhost:9200/my_index/_search?q=title:elasticsearch"
```

5. Key Takeaways

- **ES vs. DB:** ES is a search engine, not a primary database. Sync only search-needed fields.
- **Performance:** Avoid wildcard queries (`*text*`) for better speed.
- **Security:** Disable `xpack.security` **only for local development.**

Here's a polished English version of your Elasticsearch implementation notes, structured for a technical blog post with clear explanations and code samples:

Implementing Elasticsearch Search in Spring Boot: Version Compatibility Solutions

1. Version Downgrade Rationale

- **Problem:** Code tutorials used Elasticsearch 7.x, but initial setup with ES 9.0.0 failed due to API changes.
- **Solution:** Switched to **ES 7.17.10 (LTS version)** with tested code from [this guide](#).

2. Key Implementation Steps

A. Entity Mapping (`DiscussPost.java`)

```
import org.springframework.data.elasticsearch.annotations.*;

@Document(indexName = "discusspost") // ES index name
public class DiscussPost {
    @Id
    private int id;

    @Field(type = FieldType.Text, analyzer = "ik_max_word") // Chinese分词
    private String title;

    @Field(type = FieldType.Text, analyzer = "ik_max_word")
    private String content;

    @Field(type = FieldType.Integer)
    private int type; // 1=置顶, 0=普通

    @Field(type = FieldType.Double)
    private double score; // 权重

    @Field(type = FieldType.Date, format = DateFormat.basic_date_time)
    private Date createTime;
}
```

B. Repository Interface (Unmodified)

```
public interface DiscussPostRepository extends ElasticsearchRepository<DiscussPost,
Integer> {
    // Inherits CRUD methods like save(), delete(), search()
}
```

3. Search Implementation (Test Class)

```
import org.springframework.data.elasticsearch.core.*;
import org.springframework.data.elasticsearch.core.query.*;
```

```
public class ElasticsearchTests {

    @Autowired
    private ElasticsearchOperations elasticsearchOperations;

    @Autowired
    private DiscussPostRepository discussRepository;

    // 1. Insert Test Data
    @Test
    public void testInsert() {
        DiscussPost post = new DiscussPost();
        post.setId(1001);
        post.setTitle("互联网寒冬求职指南");
        post.setContent("大厂裁员潮下的职业规划...");
        post.setType(0);
        post.setScore(88.8);
        post.setCreateTime(new Date());
        discussRepository.save(post);
    }

    // 2. Complex Search
    @Test
    public void testSearch() {
        // Step 1: Build Query
        NativeSearchQuery query = new NativeSearchQueryBuilder()
            .withQuery(QueryBuilders.multiMatchQuery("互联网寒冬", "title", "content"))
            .withSort(SortBuilders.fieldSort("type").order(SortOrder.DESC))           // 置顶优
先
            .withSort(SortBuilders.fieldSort("score").order(SortOrder.DESC))          // 高分优先
            .withSort(SortBuilders.fieldSort("createTime").order(SortOrder.DESC))
            .withPageable(PageRequest.of(0, 10)) // 分页
            .withHighlightFields(
                new HighlightBuilder.Field("title").preTags("<em>").postTags("</em>"),
                new HighlightBuilder.Field("content").preTags("<em>").postTags("</em>")
            )
            .build();

        // Step 2: Execute
        SearchHits<DiscussPost> hits = elasticsearchOperations.search(query,
        DiscussPost.class);

        // Step 3: Process Results
        hits.getSearchHits().forEach(hit -> {
            DiscussPost post = hit.getContent();
            Map<String, List<String>> highlights = hit.getHighlightFields();
            // Apply highlights (if any)
            if (highlights.containsKey("title")) {
                post.setTitle(highlights.get("title").get(0));
            }
            System.out.println(post);
        });
    }
}
```

```
    });
}
}
```

4. Critical Notes

A. API Compatibility

- **Avoid deprecated clients:**
 - ES 5.x: `TransportClient` ✘
 - ES 7.x: `RestHighLevelClient` ✘
 - **Recommended:**
 - Spring Data Elasticsearch (as shown above)
 - Or ES 8+ Java Client ([Official Docs](#))

B. Highlighting Workaround

- ES returns raw data with `` tags – frontend handles rendering:

```
// React/Vue example
<div v-html="post.title"></div> // Renders <em> tags as red
```

C. Why Downgrade Worked

- Spring Data Elasticsearch 4.x (used here) has **best compatibility** with ES 7.x.
- ES 9.x requires Spring Data Elasticsearch 5.x + major code refactoring.

5. Verification Steps

1. Check indices:

```
curl -X GET "localhost:9200/_cat/indices?v"
```

2. Query data:

```
curl -X GET "localhost:9200/discusspost/_search?q=title:互联网寒冬"
```

GET localhost:9200/discusspost/_mapping Send

Params Authorization Headers (7) Body Scripts Tests Settings Cookies

Body Cookies Headers (5) Test Results | ⏱

200 OK • 47 ms • 715 B • 🌐 | e.g. Save Response ⚙️

{ } JSON ▾ ▷ Preview ⏷ Visualize | ▾

```
1 {  
2   "discusspost": {  
3     "mappings": {  
4       "properties": {  
5         "_class": {  
6           "type": "keyword",  
7           "index": false,  
8           "doc_values": false  
9         },  
10        "commentCount": {  
11          "type": "integer"  
12        },  
13        "content": {  
14          "type": "text",  
15          "analyzer": "ik_max_word",  
16          "search_analyzer": "ik_smart"  
17        },  
18        "createTime": {  
19          "type": "date",  
20          "format": "date_optional_time||epoch_millis"  
21        },  
22        "id": {  
23          "type": "long"  
24        },  
25        "score": {  
26      }
```

GET localhost:9200/_analyze Send

Params Authorization Headers (9) Body ● Scripts Tests Settings Cookies

none form-data x-www-form-urlencoded raw binary GraphQL JSON ▾ Beautify

Body Cookies Headers (5) Test Results | ⏱

200 OK • 51 ms • 567 B • 🌐 | e.g. Save Response ⚙️

{ } JSON ▾ ▷ Preview ⏷ Visualize | ▾

```
1 {  
2   "analyzer": "ik_smart",  
3   "text": "public"  
4 }
```

```
1 {  
2   "tokens": [  
3     {  
4       "token": "public",  
5       "start_offset": 0,  
6       "end_offset": 6,  
7       "type": "ENGLISH",  
8       "position": 0  
9     }  
10   ]  
11 }
```

The screenshot shows a POSTMAN interface with the following details:

- Method:** GET
- URL:** localhost:9200/discusspost/_search
- Body:** (highlighted) contains the following JSON query:


```

1  {
2   "query": {
3     "multi_match": {
4       "query": "public",
5       "fields": ["title", "content"]
6     }
7   }
8 }
```
- Response Status:** 200 OK
- Response Time:** 51 ms
- Response Size:** 602 B
- Response Content:** (partial)


```

1 {
2   "took": 8,
3   "timed_out": false,
4   "_shards": {
5     "total": 1,
6     "successful": 1,
7     "skipped": 0,
8     "failed": 0
9   },
10  "hits": {
11    "total": {
12      "value": 0,
13      "relation": "eq"
14    },
15    "max_score": null,
16    "hits": []
17  }
18 }
```

? public搜索，搜索不出来那条帖子

Elasticsearch 对英文和中文混合时，得分机制可能让英文词匹配效果变差，尤其是当其他字段干扰更大时。

Solution: create a new indice

```

@Document(indexName = "new_discusspost") // ✓ 索引名 (类似数据库表名)
public class DiscussPost {

    @Id // ✓ 主键
    private Long id;

    @Field(type = FieldType.Text, analyzer = "ik_max_word", searchAnalyzer = "ik_smart")
    private String title;

    @Field(type = FieldType.Text, analyzer = "ik_max_word", searchAnalyzer = "ik_smart")
    private String content;
}
```

or

```

PUT /discusspost_new
{
  "mappings": {
    "properties": {
```

```

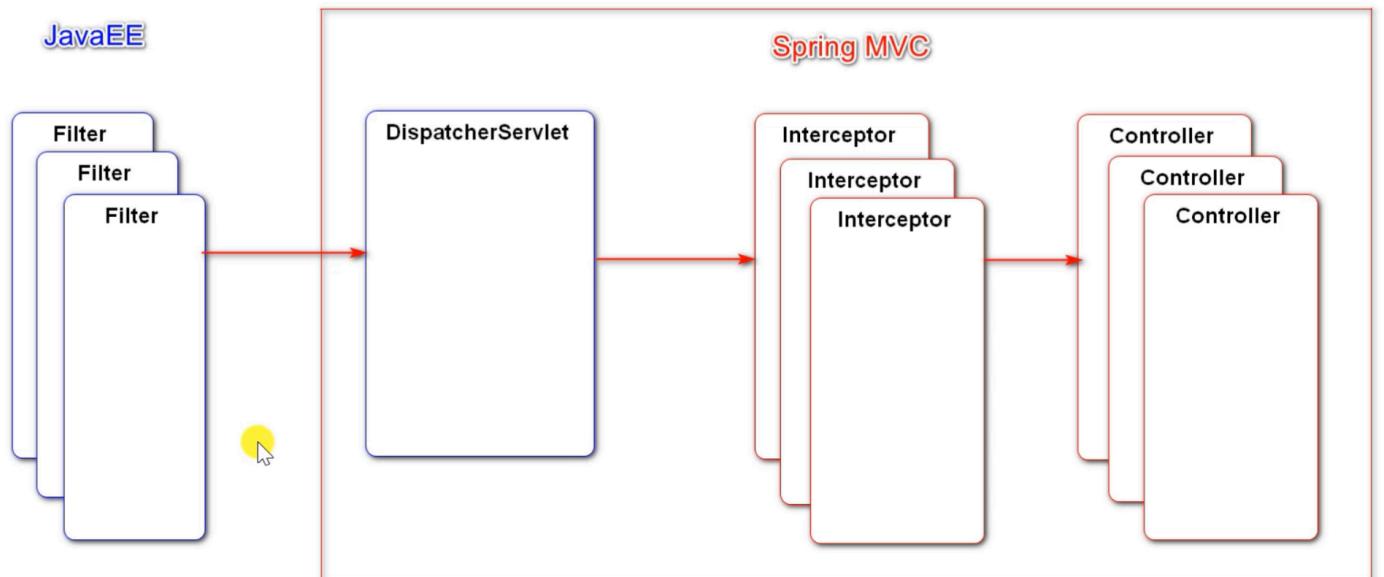
    "title": {
        "type": "text",
        "analyzer": "ik_max_word",
        "search_analyzer": "ik_smart"
    },
    "content": {
        "type": "text",
        "analyzer": "ik_max_word",
        "search_analyzer": "ik_smart"
    },
    "userId": {
        "type": "integer"
    },
    ...
}
}
}

```

analyzer 和 search_analyzer 区别?

名称	用于什么阶段?	举例说明
analyzer	存数据时的分词方式	"public post" → [public, post]
search_analyzer	搜索查询时的分词方式	搜索 "public" 时, 也拆成 [public]

Spring Security - 置顶、加精、删除



```

<dependency>
    <groupId>org.springframework.boot</groupId>
    <artifactId>spring-boot-starter-security</artifactId>
</dependency>
<dependency>
    <groupId>org.thymeleaf.extras</groupId>
    <artifactId>thymeleaf-extras-springsecurity6</artifactId>
</dependency>

```

Spring Security

Access Control

- **Login Verification**
 - Previously implemented via an interceptor, this basic permission management solution is now deprecated.
 - Use spring security to replace LoginRequiredInterceptor
- **Authorization Configuration**
 - Assign access permissions (e.g., regular user, moderator, administrator) to all requests within the system.
- **Authentication Scheme**
 - Bypass the Security authentication process and adopt the system's original authentication method.
- **CSRF Configuration**
 - Fundamentals of CSRF attack prevention, with configurations for forms and AJAX.

```

<form class="form-inline my-2 my-lg-0" th:action="@{/search}">
    <input class="form-control mr-sm-2" type="search" aria-label="Search" name="keyword"
th:value="${keyword}"/>
    <button class="btn btn-outline-light my-2 my-sm-0" type="submit">Search</button>
</form>

```

// LoginRequiredInterceptor (之前用的 interceptor 是应用层的请求拦截, Spring Security 处理的是安全层的身份权限管理, 两个层面不完全一样, 但目的类似: 控制访问。

```

String AUTHORITY_USER = "user"; // only logged in can view setting, upload, add,
letter, notice, like, follow/unfollow

String AUTHORITY_ADMIN = "admin"; // only admin can delete a post or set a post as Top

String AUTHORITY_MODERATOR = "moderator"; // only moderator can set a post as Top
}

```

config

定义哪些请求路径需要认证和授权，哪些可以匿名访问

定义没有登录或权限不足时的处理逻辑

配置忽略静态资源的安全拦截

自定义退出登录接口

注入用于持久化 SecurityContext (认证信息) 的仓库

UserService (getAuthorities)

LoginTicketInterceptor (用getAuthorities查出该user的权限，是普通用户还是管理员还是，放在hostHolder里)

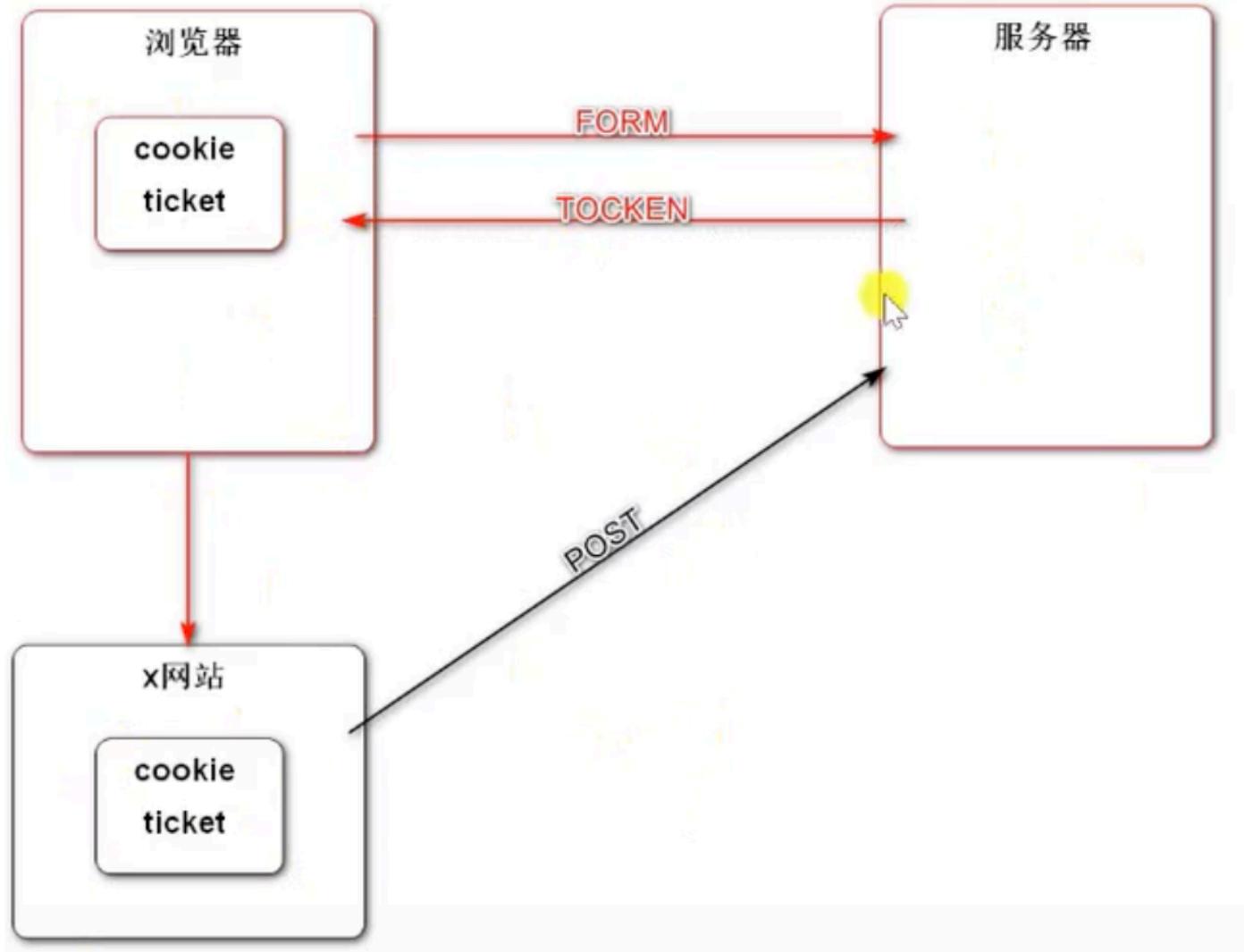
```
@RequestMapping(path = "/logout", method = RequestMethod.GET)
public String logout(@CookieValue("ticket") String ticket) {
    userService.logout(ticket);

    // 清理SecurityContextHolder中的权限！！！
    SecurityContextHolder.clearContext();

    return "redirect:/login";
}
```

LoginTicketInterceptor它本身不决定请求是否放行，只负责“登录状态的初始化”（把数据拿到，然后之后的请求都可以用，取一次数据，一劳永逸的感觉），即“当前是谁”这个上下文的准备。LoginRequiredInterceptor拦截每个进入Controller的请求，没登录就跳到登录页面，没权限就跳错误提示页面（所以被spring security代替了这个功能）

CSRF是一个不好的网站盗取你cookie ticket凭证，假扮你的身份去访问服务器，想服务器提交数据



cookie对，但是token不对

```
<!-- 回帖输入 -->
<div class="container mt-3">
  <form class="replyform" method="post" action="/community/comment/add/234"><input type="hidden" name="_csrf" value="1fef91fe-f2cf-40d5-bf27-570501809a3f"/>
```

spring security帮忙生成的，防止rscf攻击的凭证

```
<!--访问该页面时，在此处生成CSRF令牌。-->
<meta name="_csrf" th:content="${_csrf.token}">
<meta name="_csrf_header" th:content="${_csrf.headerName}">
```

index.html

```
// 发送AJAX请求之前，将CSRF令牌设置到请求的消息头中。
// var token = $("meta[name='_csrf']").attr("content");
// var header = $("meta[name='_csrf_header']").attr("content")
$(document).ajaxSend(function(e, xhr, options){
  xhr.setRequestHeader(header, token);
});
```

Index.js

Top, delete

Nowcoder11, 12, 13: admin , 123456, can delete, userType 1

Nowcoder21, 22, 23, 24: , 123456

部署项目

Github Education Pack

AWS

Tencent Cloud, Aliyun Cloud free-test 1month

```
scp -i /Users/chutongren/Documents/job/nowcoder/nowcoder-key-first.pem  
/Users/chutongren/Documents/job/nowcoder/community-init-sql-1.5.zip root@8.217.11.251:/root/test/  
[base) chutongren@08c8488d-b657-426f-86ec-6981cf87ce59 nowcoder % ssh -i /Users/  
chutongren/Documents/job/nowcoder/nowcoder-key-first.pem root@8.217.11.251  
Last login: Tue Jun 17 22:58:29 2025 from 8.139.112.77  
  
Welcome to Alibaba Cloud Elastic Compute Service !  
[root@iZj6c8scuanyuz892kofsZ ~]# mkdir -p /root/test/  
[root@iZj6c8scuanyuz892kofsZ ~]# exit  
logout  
Connection to 8.217.11.251 closed.  
[base) chutongren@08c8488d-b657-426f-86ec-6981cf87ce59 nowcoder % scp -i /Users/  
chutongren/Documents/job/nowcoder/nowcoder-key-first.pem /Users/chutongren/Docum  
ents/job/nowcoder/community-init-sql-1.5.zip root@8.217.11.251:/root/test/  
community-init-sql-1.5.zip 100% 16KB 78.0KB/s 00:00
```

cd ~

yum list unzip*

yum install -y unzip_x86_64

1.

yum list java*

yum install -y -latest-open-jdk

上面的我没用，因为jdk竟然是11版本，太老了吧，用的<https://juejin.cn/post/7234428563965247546>

tar -zvxf jdk-23.0.2_linux-x64_bin.tar.gz -C /usr/local/jdk

export JAVA_HOME=/usr/local/jdk/jdk-23.0.2

export CLASSPATH=\$CLASSPATH:\$JAVA_HOME/lib

export PATH=\$PATH:\$JAVA_HOME/bin

```
java -version
```

2.

```
cd /root
```

```
tar -zxvf apache-maven-3.9.10-bin.tar.gz -C /opt
```

```
cd /opt/apache-maven-3.9.10/
```

```
pwd
```

配置环境变量etc/profile: vim /etc/profile

CLICK o

```
export PATH=$PATH:/opt/apache-maven-3.9.10/bin
```

ESC, :wq

source /etc/profile 使其生效

```
echo $PATH /usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/root/bin:/opt/apache-maven-3.9.10/bin
```

3.

```
yum install -y https://repo.mysql.com/mysql80-community-release-el7-5.noarch.rpm
```

```
yum install -y mysql-community-server
```

```
rpm --import https://repo.mysql.com/RPM-GPG-KEY-mysql-2023
```

```
yum clean all
```

```
rm -rf /var/cache/yum
```

```
yum makecache
```

```
systemctl start mysqld //启动
```

```
systemctl status mysql
```

```
[root@iZj6c8scuanyuuz892kofsZ ~]# systemctl start mysqld
[root@iZj6c8scuanyuuz892kofsZ ~]# systemctl status mysql
Unit mysql.service could not be found. ?
[root@iZj6c8scuanyuuz892kofsZ ~]# systemctl status mysqld
● mysqld.service - MySQL Server
   Loaded: loaded (/usr/lib/systemd/system/mysqld.service; enabled; vendor preset: disabled)
   Active: active (running) since Wed 2025-06-18 01:31:10 CST; 35s ago
     Docs: man:mysqld(8)
           http://dev.mysql.com/doc/refman/en/using-systemd.html
   Process: 13610 ExecStartPre=/usr/bin/mysqld_pre_systemd (code=exited, status=0/SUCCESS)
 Main PID: 13703 (mysqld)
   Status: "Server is operational"
    CGroup: /system.slice/mysqld.service
              └─13703 /usr/sbin/mysqld

Jun 18 01:31:01 iZj6c8scuanyuuz892kofsZ systemd[1]: Starting MySQL Server...
Jun 18 01:31:10 iZj6c8scuanyuuz892kofsZ systemd[1]: Started MySQL Server. ?
[root@iZj6c8scuanyuuz892kofsZ ~]#
```

grep 'password' /var/log/mysqld.log

2025-06-17T17:31:04.469074Z 6 [Note] [MY-010454] [Server] A temporary password is generated for root@localhost: OJAokhQYR4*+

alter user root@localhost identified by 'Nowcoder_123';

4

```
scp -i /Users/chutongren/Documents/job/nowcoder/nowcoder-key-first.pem
/Users/chutongren/Documents/job/nowcoder/init_sql.zip root@8.217.11.251:/root/
unzip -d /root init_sql.zip
```

mysql -u root -p

create database community;

use community;

source /root/init_sql/init_schema.sql;

source /root/init_sql/init_data.sql;

source /root/init_sql/tables_mysql_innodb.sql;

show tables;

SELECT header_url FROM user;

修改用户头像路径，带有localhost存在本机的改成

```
UPDATE user
SET header_url = 'http://images.nowcoder.com/head/666t.png'
WHERE header_url LIKE 'http://localhost%';
```

5

```
yum list redis*
```

```
yum install -y redis.x86_64
```

```
systemctl start redis
```

```
systemctl status redis
```

```
[root@iZj6c8scuanyuz892kofsZ ~]# systemctl start redis
[root@iZj6c8scuanyuz892kofsZ ~]# systemctl status redis
● redis.service - Redis persistent key-value database
  Loaded: loaded (/usr/lib/systemd/system/redis.service; disabled; vendor preset: disabled)
  Drop-In: /etc/systemd/system/redis.service.d
            └─limit.conf
    Active: active (running) since Wed 2025-06-18 01:56:16 CST; 6s ago
      Main PID: 14508 (redis-server)
        CGroup: /system.slice/redis.service
                  └─14508 /usr/bin/redis-server 127.0.0.1:6379

Jun 18 01:56:16 iZj6c8scuanyuz892kofsZ systemd[1]: Starting Redis persistent key-value database...
Jun 18 01:56:16 iZj6c8scuanyuz892kofsZ systemd[1]: Started Redis persistent key-value database. ⚡
```

redis-cli

```
keys *
```

6

Kafka

```
tar -zvxf kafka_2.13-3.9.0.tgz -C /opt
```

后台启动kafka

```
cd /opt/kafka_2.13-3.9.0
```

```
bin/zookeeper-server-start.sh -daemon config/zookeeper.properties
```

```
nohup bin/kafka-server-start.sh config/server.properties 1>/dev/null 2>&1 &
```

```
bin/kafka-topics.sh --list --bootstrap-server localhost:9092
```

7

```
tar -zvxf elasticsearch-7.17.1-linux-x86_64.tar.gz -C /opt
```

```
unzip -d /opt/elasticsearch-7.17.1/plugins/ik elasticsearch-analysis-ik-7.17.1.zip
```

```
cd /opt/elasticsearch-7.17.1/config
```

```
Vim elasticsearch.yml
```

```
/tmp/elastic/data
```

```
/tmp/elastic/logs
```

```
vim jvm.options
```

-Xms256m

-Xmx512m

~esq

啊啊啊啊啊啊啊 安装错了啊啊啊啊啊按成arm架构的了 应该是x86

rm -rf /opt/elasticsearch-9.0.2 # 删除错误版本

好吧，不兼容，改成安装https://artifacts.elastic.co/downloads/elasticsearch/elasticsearch-7.17.1-linux-x86_64.tar.gz

8

tar -zvxf apache-tomcat-11.0.8.tar.gz -C /opt

vim /etc/profile

Export PATH=\$PATH:/opt/apache-tomcat-11.0.8/bin

source /etc/profile

startup.sh

```
[root@iZj6c8scuanyuuuz892kofsz bin]# startup.sh
Using CATALINA_BASE:   /opt/apache-tomcat-11.0.8
Using CATALINA_HOME:   /opt/apache-tomcat-11.0.8
Using CATALINA_TMPDIR: /opt/apache-tomcat-11.0.8/temp
Using JRE_HOME:        /usr/local/jdk/jdk-23.0.2
Using CLASSPATH:       /opt/apache-tomcat-11.0.8/bin/bootstrap.jar:/opt/apache-tomcat-11.0.8/bin/tomcat-juli.jar
Using CATALINA_OPTS:
Tomcat started.  ?
```

允许 1 自定义 TCP 目的: 8080/8080 源: 所有IPv4(0.0.0.0/0) Tomcat服务 2025年6月17日 22:25:26 编辑 | 复制 | 删除

<http://8.217.11.251:8080/>

Apache Tomcat/11.0.8



If you're seeing this, you've successfully installed Tomcat. Congratulations!



Recommended Reading:

[Security Considerations How-To](#)

[Manager Application How-To](#)

[Clustering/Session Replication How-To](#)

[Server Status](#)

[Manager App](#)

[Host Manager](#)

Developer Quick Start

[Tomcat Setup](#)

[First Web Application](#)

[Realms & AAA](#)

[JDBC DataSources](#)

[Examples](#)

[Servlet Specifications](#)

[Tomcat Versions](#)

Managing Tomcat

For security, access to the `manager webapp` is restricted. Users are defined in:

`$CATALINA_HOME/conf/tomcat-users.xml`

In Tomcat 11.0 access to the manager application is split between different users.

[Read more...](#)

Documentation

[Tomcat 11.0 Documentation](#)

[Tomcat 11.0 Configuration](#)

[Tomcat Wiki](#)

Find additional important configuration information in:

Getting Help

[FAQ and Mailing Lists](#)

The following mailing lists are available:

[tomcat-announce](#)

Important announcements, releases, security vulnerability notifications. (Low volume).

[tomcat-users](#)

```
cd /opt/apache-tomcat-11.0.8
```

```
Cd webapps
```

9

```
yum list nginx*
```

```
yum install -y nginx.x86_64
```

```
vim /etc/nginx/nginx.conf
```

```
upstream myserver {
```

```
    server 127.0.0.1:8080 max_fails=3 fail_timeout=30s; # 修复拼写: fail_timeout }
```

```
server { listen 80; server_name 8.217.11.251; # 修复拼写: server_name location / { proxy_pass http://myserver; proxy_set_header Host $host; proxy_set_header X-Real-IP $remote_addr; } }
```

```
systemctl start nginx
```

```
systemctl status nginx
```

```
:wq
```

```
[root@iZj6c8scuanyuuuz892kofsZ ~]# systemctl start nginx
[root@iZj6c8scuanyuuuz892kofsZ ~]# systemctl status nginx
● nginx.service - The nginx HTTP and reverse proxy server
   Loaded: loaded (/usr/lib/systemd/system/nginx.service; disabled; vendor preset: disabled)
     Active: active (running) since Wed 2025-06-18 04:38:42 CST; 5s ago
       Process: 19985 ExecStart=/usr/sbin/nginx (code=exited, status=0/SUCCESS)
      Process: 19981 ExecStartPre=/usr/sbin/nginx -t (code=exited, status=0/SUCCESS)
      Process: 19979 ExecStartPre=/usr/bin/rm -f /run/nginx.pid (code=exited, status=0/SUCCESS)
    Main PID: 19988 (nginx)
      CGroup: /system.slice/nginx.service
              ├─19988 nginx: master process /usr/sbin/nginx
              ├─19989 nginx: worker process
              └─19990 nginx: worker process

Jun 18 04:38:42 iZj6c8scuanyuuuz892kofsZ systemd[1]: Starting The nginx HTTP and reverse proxy server...
Jun 18 04:38:42 iZj6c8scuanyuuuz892kofsZ nginx[19981]: nginx: the configuration file /etc/nginx/nginx.conf syntax is ok
Jun 18 04:38:42 iZj6c8scuanyuuuz892kofsZ nginx[19981]: nginx: configuration file /etc/nginx/nginx.conf test is successful
Jun 18 04:38:42 iZj6c8scuanyuuuz892kofsZ systemd[1]: Started The nginx HTTP and reverse proxy server.
```

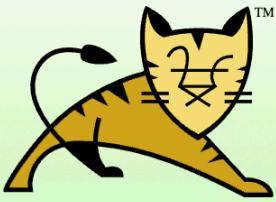
允许 1 自定义 TCP 目的: 80/80 源: 所有IPv4(0.0.0.0/0) nginx代理 2025年6月17日 22:42:37 编辑 | 复制 | 删除

⚠ Not Secure 8.217.11.251

[Home](#) [Documentation](#) [Configuration](#) [Examples](#) [Wiki](#) [Mailing Lists](#)

Apache Tomcat/11.0.8

If you're seeing this, you've successfully installed Tomcat. Co



Recommended Reading:

[Security Considerations How-To](#)

[Manager Application How-To](#)

[Clustering/Session Replication How-To](#)

shutdown.sh

cd /opt/apache-tomcat-11.0.8/

cd webapps/

rm -rf *

改成空的 global.js 和 pr.

```
@RequestMapping(path = "/", method = RequestMethod.GET)
public String root() {
    return "forward:/index";
}
```

scp -i /Users/chutongren/Documents/job/nowcoder/nowcoder-key-first.pem /Users/chutongren/Documents/job/nowcoder/community.zip root@8.217.11.251:/root/

```
unzip -d /root community.zip
cd /community
mvn clean package -Dmaven.test.skip=true

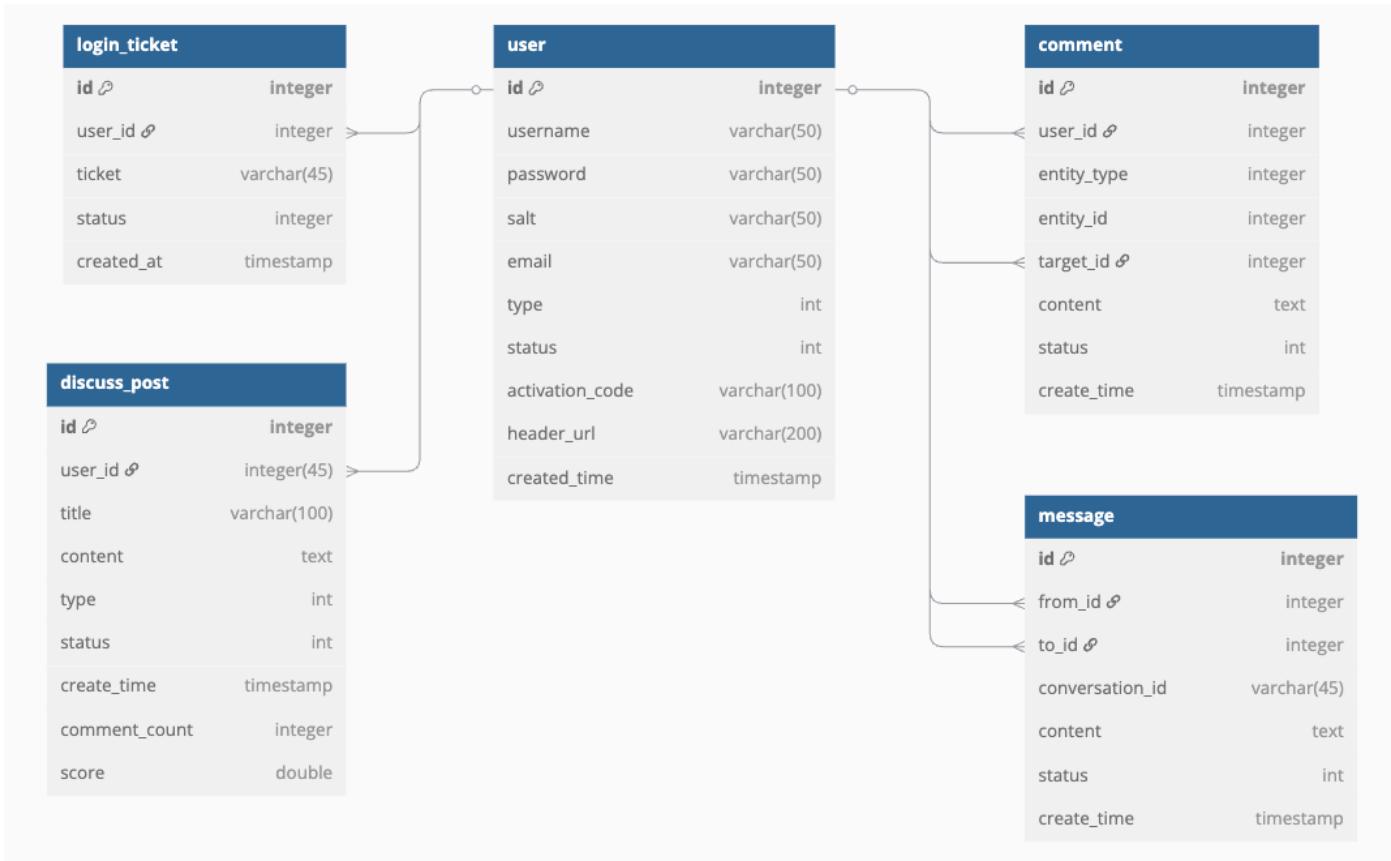
[INFO] oot-loader-tools-3.4.3.jar (465 kB at 3.4 MB/s)
[INFO]   Downloading from central: https://repo.maven.apache.org/maven2/org/apache/commons/commons-4-4.4.jar
[INFO]   Downloaded from central: https://repo.maven.apache.org/maven2/org/vafer/jdependency/2.0.0-M1/jdependency-3.2.1.jar (43 kB at 271 kB/s)
[INFO]   Downloaded from central: https://repo.maven.apache.org/maven2/org/apache/maven/shared/antlr4-runtime-4.4.4.jar (752 kB at 4.0 MB/s)
[INFO] [INFO] Replacing main artifact /root/community/target/ROOT.war with repackaged archive /.
[INFO] [INFO] The original artifact has been renamed to /root/community/target/ROOT.war.original
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 01:04 min
[INFO] Finished at: 2025-06-18T05:14:36+08:00
[INFO] -----
```

```
cd target/ ROOT.WAR
```

```
mv ROOT.war /opt/apache-tomcat-11.0.8/webapps/
```

```
cd /opt/apache-tomcat-11.0.8/webapps/
```

Tables



// Use DBML to define your database structure

// Docs: <https://dbml.dbdiagram.io/docs>

Table user {

 id integer [primary key]

 username varchar(50)

 password varchar(50)

 salt varchar(50)

 email varchar(50)

 type int

 // 1 = normal user, 2 = admin, 3 = author/poster

 status int

 // 0 = active, 1 = inactive

 activation_code varchar(100)

 header_url varchar(200)

 created_time timestamp

}

```
Table login_ticket {  
    id integer [primary key]  
    user_id integer  
    ticket varchar(45) // core  
    status integer // 1 = valid  
    created_at timestamp  
}  
  
}
```

```
Table discuss_post {  
    id integer [primary key]  
    user_id integer(45)  
    title varchar(100)  
    content text  
    type int  
    status int  
    create_time timestamp  
    comment_count integer  
    score double  
}  
  
}
```

```
Table comment {  
    id integer [primary key]  
    user_id integer  
    entity_type integer  
    entity_id integer  
    target_id integer  
    content text  
    status int  
    create_time timestamp  
}  
  
}
```

```
Table message {  
    id integer [primary key]  
    from_id integer  
    to_id integer  
    conversation_id varchar(45)  
    content text  
    status int // 0 = unread, 2 = deleted  
    create_time timestamp  
}
```

// user 与 login_ticket 是一对多 (一个用户可能对应多个登录票)

Ref: login_ticket.user_id > user.id // many-to-one

// user 与 discuss_post 是一对多 (一个用户可以发多个帖子)

Ref: discuss_post.user_id > user.id // many-to-one

// user 与 comment 是一对多 (一个用户可以发多个评论)

Ref: comment.user_id > user.id // many-to-one

Ref: comment.target_id > user.id

// comment 与 discuss_post 存在间接引用 (comment.entity_type = 帖子, 对应 entity_id = discuss_post.id)

// comment.entity_type = 1 → discuss_post.id

// comment.entity_type = 2 → comment.id

// message 表中 from_id 和 to_id 都指向 user

Ref: message.from_id > user.id // many-to-one

Ref: message.to_id > user.id // many-to-one

// Ref notes.field > users.type

// Ref user_posts: discuss_post.user_id > user.id // many-to-one

// Ref: user.id < follows.following_user_id

```
// Ref: user.id < follows.followed_user_id
```

✓ 1. entity_type / entity_id 是不是外键?

是的，它们组合起来是实现“多态关联”(polymorphic association)的一种方式。

- entity_type：表示评论的对象类型（例如 1 表示帖子的评论，2 表示评论的回复）
- entity_id：表示评论的对象 ID，对应 discuss_post.id 或 comment.id

⚠ 但它们不是数据库严格意义上的外键，因为：

- 数据库外键只能指向一个固定的表（不能动态选择表）
- 所以工具通常不会帮你自动画出连线

✓ 所以：从逻辑上说是“外键”，但在数据库设计中，不能直接建外键约束，也不会自动生成连线。

? 3. discuss_post.comment_count 是不是需要连线？

不需要连线，原因如下：

- comment_count 是一个冗余字段 (denormalized field)
- 它是为了提高查询效率，保存的只是统计值，不是外键或关联字段
- 它的值是通过：

sql

Copy Edit

```
SELECT COUNT(*) FROM comment WHERE entity_type = 1 AND entity_id = discuss_post.id
```

计算出来的

- 所以它不需要与 comment 表建立外键或连线