Spring Boot 入门之持久层篇（三）

一、前言

上一篇[《Spring Boot 入门之 Web 篇（二）》]介绍了 Spring Boot 的 Web 开发相关的内容，项目的开发离不开数据，因此本篇开始介绍持久层相关的知识。

二、整合 JdbcTemplate

2.1 添加依赖

```
<!-- jdbc -->
<dependency>
    <groupId>org.springframework.boot</groupId>
    <artifactId>spring-boot-starter-jdbc</artifactId>
</dependency>

<!-- mysql 驱动包 -->
<dependency>
    <groupId>mysql</groupId>
    <artifactId>mysql-connector-java</artifactId>
</dependency>
```

2.2 配置数据库连接

在 application.properties 中添加：

```
spring.datasource.driver-class-name=com.mysql.jdbc.Driver
spring.datasource.url=jdbc:mysql://localhost:3306/springboot?
useUnicode=true&characterEncoding=utf8&serverTimezone=UTC
spring.datasource.username=root
spring.datasource.password=tiger
```

其中，可以不指定 driver-class-name，因为 spring boot 会自动识别 url。

2.3 测试

2.3.1 建表

在 MySQL 中创建名为 springboot 的数据库，在该库中创建 user 表：

```
CREATE TABLE `user` (
    `id` INT(11) NOT NULL AUTO_INCREMENT,
    `username` VARCHAR(50) NOT NULL,
    `password` VARCHAR(64) NOT NULL,
    `birthday` DATE NOT NULL,
    PRIMARY KEY (`id`)
)
COLLATE='utf8_general_ci'
ENGINE=InnoDB
AUTO_INCREMENT=3
;
```

2.3.2 建实体类

```
public class User implements Serializable{

    private static final long serialVersionUID = -6249397911566315813L;

    private Integer id;

    private String username;

    private String password;

    private Date birthday;

}
```

setter 和 getter 方法此处省略。

2.3.3 dao 接口

接口和实现类如下：

```
public interface UserDao {

    public int insert(User user);

    public int deleteById(Integer id);

    public int update(User user);

    public User getById(Integer id);
}

@Repository
public class UserDaoImpl implements UserDao {

    @Autowired
    private JdbcTemplate jdbcTemplate;

    @Override
    public int insert(User user) {
        String sql = "insert into user(id,username,password,birthday)
values(?,?,?,?)";
        return this.jdbcTemplate.update(
                            sql,
                            user.getId(),
                            user.getUsername(),
                            user.getPassword(),
                            user.getBirthday()
                                        );
    }

    @Override
    public int deleteById(Integer id) {
        String sql = "delete from user where id = ?";
        return this.jdbcTemplate.update(sql,id);
    }

    @Override
    public int update(User user) {
        String sql = "update user set password = ? where id = ?";
        return this.jdbcTemplate.update(
```

```
                                sql,
                                user.getPassword(),
                                user.getId()
                                        );
    }

    @Override
    public User getById(Integer id) {
        String sql = "select * from user where id = ?";
        return this.jdbcTemplate.queryForObject(sql, new RowMapper<User>()
{

            @Override
            public User mapRow(ResultSet rs, int rowNum) throws
SQLException {
                User user = new User();
                user.setId(rs.getInt("id"));
                user.setUsername(rs.getString("username"));
                user.setPassword(rs.getString("password"));
                user.setBirthday(rs.getDate("birthday"));
                return user;
            }

        },id);
    }

}
```

2.3.4 测试类：

```
@RunWith(SpringRunner.class)
@SpringBootTest
public class UserDaoTest {

    @Autowired
    private UserDao userDao;


    @Test
    public void testInsert() {
        User user = new User();
        user.setId(1);
        user.setUsername("张三");
        user.setPassword("zhangsan");
        user.setBirthday(new Date());

        int result = this.userDao.insert(user);
        System.out.println(result);
    }

    @Test
    public void testGetById() {
        User user = this.userDao.getById(1);
        System.out.println(user.getUsername());
    }

    @Test
    public void testUpdate() {
        User user = new User();
        user.setId(1);
        user.setPassword("zhangsan123");
        this.userDao.update(user);
    }

    @Test
    public void testDeleteById() {
        int result = this.userDao.deleteById(1);
        System.out.println(result);
    }
}
```

测试结果省略...

如需打印日志，在日志配置文件中添加如下配置：

```
<logger name="org.springframework.jdbc.core.JdbcTemplate" level="debug"/>
```

三、整合 Spring-data-jpa

3.1 添加依赖

```
<!-- jdbc -->
<dependency>
    <groupId>org.springframework.boot</groupId>
    <artifactId>spring-boot-starter-jdbc</artifactId>
</dependency>

<!-- springboot,jpa 整合包-->
<dependency>
    <groupId>org.springframework.boot</groupId>
    <artifactId>spring-boot-starter-data-jpa</artifactId>
</dependency>

<!-- mysql 驱动包 -->
<dependency>
    <groupId>mysql</groupId>
    <artifactId>mysql-connector-java</artifactId>
</dependency>
```

3.2 配置数据库连接

在 application.properties 中添加：

```
# 数据库连接配置
spring.datasource.driver-class-name=com.mysql.jdbc.Driver
spring.datasource.url=jdbc:mysql://localhost:3306/springboot?
useUnicode=true&characterEncoding=utf8&serverTimezone=UTC
spring.datasource.username=root
spring.datasource.password=tiger

# JPA 配置
spring.jpa.hibernate.ddl-auto=update
spring.jpa.show-sql=true
```

3.3 编码

3.3.1 建表

在 MySQL 中创建名为 springboot 的数据库，在该库中创建 role 表：

```
CREATE TABLE `role` (
    `id` INT(11) NOT NULL AUTO_INCREMENT,
    `name` VARCHAR(10) NOT NULL,
    `descr` VARCHAR(100) NULL DEFAULT NULL,
    PRIMARY KEY (`id`)
)
COLLATE='utf8_general_ci'
ENGINE=InnoDB
;
```

注意，主键 **ID** 为 **AUTO_INCREMENT** 自增。

3.3.2 建实体类

添加相应的注解

```
@Entity
public class Role implements Serializable{

    private static final long serialVersionUID = 3926276668667517847L;

    @Id
    @GeneratedValue
    private Integer id;

    @Column
    private String name;

    @Column
    private String descr;
}
```

setter 和 getter 方法此处省略。

3.3.3 Repository 接口

```
public interface RoleRepository extends JpaRepository<Role, Integer>{

}
```

3.3.4 测试类

```
@RunWith(SpringRunner.class)
@SpringBootTest
public class RoleRepositoryTest {

    @Autowired
    private RoleRepository roleRepository;

    @Test
    public void testInsert() {
        Role role = new Role();
        role.setName("管理员");
        role.setDescr("测试");
        Role result = this.roleRepository.save(role);
        System.out.println(result);
    }

    @Test
    public void testFindOne() {
        Role role = this.roleRepository.findOne(1);
        System.out.println(role);
    }

    @Test
    public void testUpdate() {
        Role role = new Role();
        role.setId(1);
        role.setName("管理员");
        role.setDescr("控制权限");
        Role result = this.roleRepository.save(role);
        System.out.println(result);
    }

    @Test
    public void testDelete() {
        this.roleRepository.delete(1);
    }
}
```

测试结果省略...

四、整合 **Mybatis**

整合 MyBatis 有两种方式：

1. 使用 mybatis 官方提供的 Spring Boot 整合包实现。
2. 使用 mybatis-spring 整合的方式，也就是传统的方式（推荐，此方式容易控制 MyBatis 的配置）。

4.1 配置依赖

方式一：使用官方整合包

1）添加依赖：

```
<!-- springboot,mybatis 整合包 -->
<dependency>
    <groupId>org.mybatis.spring.boot</groupId>
    <artifactId>mybatis-spring-boot-starter</artifactId>
    <version>1.3.0</version>
</dependency>

<!-- mysql 驱动包 -->
<dependency>
    <groupId>mysql</groupId>
    <artifactId>mysql-connector-java</artifactId>
</dependency>
```

2）配置数据库连接：

在 application.properties 中添加：

```
# 数据源配置
spring.datasource.driver-class-name=com.mysql.jdbc.Driver
spring.datasource.url=jdbc:mysql://localhost:3306/springboot?
useUnicode=true&characterEncoding=utf8&serverTimezone=UTC
spring.datasource.username=root
spring.datasource.password=tiger

# mybatis 配置
mybatis.config-location=classpath:mybatis/mybatis-config.xml
mybatis.mapper-locations=classpath:mybatis/mapper/*.xml
```

方式二：原始 **Jar** 包 **+** 手动编程

1）添加依赖：

```
<!-- jdbc -->
<dependency>
    <groupId>org.springframework.boot</groupId>
    <artifactId>spring-boot-starter-jdbc</artifactId>
</dependency>

<!-- mybatis -->
<dependency>
    <groupId>org.mybatis</groupId>
    <artifactId>mybatis</artifactId>
    <version>3.4.4</version>
</dependency>

<!-- spring,mybatis整合包 -->
<dependency>
    <groupId>org.mybatis</groupId>
    <artifactId>mybatis-spring</artifactId>
    <version>1.3.1</version>
</dependency>

<!-- mysql 驱动包 -->
<dependency>
    <groupId>mysql</groupId>
    <artifactId>mysql-connector-java</artifactId>
</dependency>
```

2）配置数据库连接：

在 application.properties 中添加：

```
# 数据源配置
spring.datasource.driver-class-name=com.mysql.jdbc.Driver
spring.datasource.url=jdbc:mysql://localhost:3306/springboot?
useUnicode=true&characterEncoding=utf8&serverTimezone=UTC
spring.datasource.username=root
spring.datasource.password=tiger
```

3）创建配置类：

```
@Configuration
public class MyBatisConfiguration {

    @Bean
    @ConditionalOnMissingBean // 当容器里没有指定的 Bean 的情况下创建该对象
    public SqlSessionFactoryBean sqlSessionFactory(DataSource dataSource)
{
        SqlSessionFactoryBean sqlSessionFactoryBean = new
SqlSessionFactoryBean();
        // 设置数据源
        sqlSessionFactoryBean.setDataSource(dataSource);

        // 设置mybatis的主配置文件
        sqlSessionFactoryBean.setConfigLocation(new
ClassPathResource("mybatis/mybatis-config.xml"));

        // 设置mapper映射文件
        PathMatchingResourcePatternResolver resolver = new
PathMatchingResourcePatternResolver();
        Resource[] mapperXml;
        try {
            mapperXml =
resolver.getResources("classpath:mybatis/mapper/*.xml");
            sqlSessionFactoryBean.setMapperLocations(mapperXml);
        } catch (IOException e) {
            e.printStackTrace();
        }

        // 设置别名包

sqlSessionFactoryBean.setTypeAliasesPackage("com.light.springboot.domain")
;

        return sqlSessionFactoryBean;
    }

    @Bean
    @ConditionalOnBean(SqlSessionFactoryBean.class) // 当
SqlSessionFactoryBean 实例存在时创建对象
    public MapperScannerConfigurer mapperScannerConfigurer() {
```

```
        MapperScannerConfigurer mapperScannerConfigurer = new
MapperScannerConfigurer();

mapperScannerConfigurer.setBasePackage("com.light.springboot.mapper");
        return mapperScannerConfigurer;
    }
}
```

以上便是两种方式的配置的不同之处，不同之处就在于如何配置 **mybatis** 配置文件和 **mapper** 映射文件的路径。

在 src/main/resources 下创建 mybatis 文件夹，并在 mybatis 文件夹中创建 "mybatis-config.xml" 配置文件，内容如下：

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE configuration
        PUBLIC "-//mybatis.org//DTD Config 3.0//EN"
        "http://mybatis.org/dtd/mybatis-3-config.dtd">
<configuration>
    <settings>
        <!-- 获取数据库自增主键值 -->
        <setting name="useGeneratedKeys" value="true"/>
        <!-- 使用列别名替换列名，默认为 true -->
        <setting name="useColumnLabel" value="true"/>
        <!-- 开启驼峰命名转换：Table(create_time) => Entity(createTime) -->
        <setting name="mapUnderscoreToCamelCase" value="true"/>
    </settings>
</configuration>
```

mybatis 文件夹下再创建一个 "mapper" 文件夹，里边存放 Mpper 接口对应的 mapper 映射文件。

4.2 测试

4.2.1 建表

在 MySQL 中创建名为 springboot 的数据库，在该库中创建 role 表：

```
CREATE TABLE `department` (
    `id` INT(11) NOT NULL,
    `name` VARCHAR(10) NOT NULL,
    `descr` VARCHAR(50) NULL DEFAULT NULL,
    PRIMARY KEY (`id`)
)
ENGINE=InnoDB
;
```

4.2.2 实体类

```
public class Department implements Serializable{

    private static final long serialVersionUID = 6067283535977178571L;

    private Integer id;

    private String name;

    private String descr;
}
```

setet 和 getter 方法省略。

4.2.3 Mapper 接口

```
@Mapper
public interface DepartmentMapper {

    public void insert(Department department);

    public Department getById(Integer id);

    public void update(Department department);

    public void deleteById(Integer id);
}
```

补充：**Mapper** 接口需要添加 **@Mapper** 注解，如果不想使用该注解，可以在启动类上使用 **@MapperScan** 配置 **Mapper** 接口路径

mybatis/mapper/departmentMapper.xml ：

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE mapper PUBLIC "-//mybatis.org//DTD Mapper 3.0//EN"
"http://mybatis.org/dtd/mybatis-3-mapper.dtd">
<mapper namespace="com.light.springboot.dao.DepartmentMapper">

    <insert id="insert"
parameterType="com.light.springboot.domain.Department">
        insert into department(id,name,descr) values(#{id},#{name},#
{descr})
    </insert>

    <select id="getById" parameterType="java.lang.Integer"
resultType="com.light.springboot.domain.Department">
        select id,name,descr from department where id = #{id}
    </select>

    <update id="update"
parameterType="com.light.springboot.domain.Department">
        update department set descr = #{descr} where id = #{id}
    </update>

    <delete id="deleteById" parameterType="java.lang.Integer">
        delete from department where id = #{id}
    </delete>
</mapper>
```

4.2.4 测试类

```
@RunWith(SpringRunner.class)
@SpringBootTest
public class DepartmentTest {

    @Autowired
    private DepartmentMapper departmentMapper;

    @Test
    public void testInsert() {
        Department department = new Department();
        department.setId(1);
        department.setName("研发部");
        department.setDescr("开发产品");
        this.departmentMapper.insert(department);
    }

    @Test
    public void testGetById() {
        Department department = this.departmentMapper.getById(1);
        System.out.println(department);
    }

    @Test
    public void testUpdate() {
        Department department = new Department();
        department.setId(1);
        department.setDescr("开发高级产品");
        this.departmentMapper.update(department);
    }

    @Test
    public void testDeleteById() {
        this.departmentMapper.deleteById(1);
    }
}
```

测试结果省略...

五、配置 **Druid** 数据源

同样地，有两种方式配置：

1）Spring boot，Druid 整合包

2）原始 jar 包 + 手动编程

5.1 Spring boot，Druid 整合包方式

5.1.1 添加依赖

```
<!-- springboot,druid 整合包 -->
<dependency>
   <groupId>com.alibaba</groupId>
   <artifactId>druid-spring-boot-starter</artifactId>
   <version>1.1.8</version>
</dependency>
```

5.1.2 添加配置

在 application.properties 中添加：

```
spring.datasource.driver-class-name=com.mysql.jdbc.Driver
spring.datasource.url=jdbc:mysql://localhost:3306/springboot?
useUnicode=true&characterEncoding=utf8&serverTimezone=UTC
spring.datasource.username=root
spring.datasource.password=tiger

# 修改数据源
spring.datasource.type=com.alibaba.druid.pool.DruidDataSource
spring.datasource.druid.initial-size=5
spring.datasource.druid.min-idle=5
spring.datasource.druid.max-active=20
spring.datasource.druid.max-wait=60000
spring.datasource.druid.time-between-eviction-runs-millis=60000
spring.datasource.druid.min-evictable-idle-time-millis=300000
spring.datasource.druid.validation-query=SELECT 1 FROM DUAL
spring.datasource.druid.test-while-idle=true
spring.datasource.druid.test-on-borrow=false
spring.datasource.druid.test-on-return=false
spring.datasource.druid.pool-prepared-statements=true
spring.datasource.druid.max-pool-prepared-statement-per-connection-size=20
spring.datasource.druid.filters=stat,wall,log4j
```

5.2 原始 jar 包 + 手动编程方式

5.2.1 添加依赖

```
<dependency>
    <groupId>com.alibaba</groupId>
    <artifactId>druid</artifactId>
    <version>1.1.8</version>
</dependency>
```

5.2.2 添加配置

```
spring.datasource.druid.driverClassName=com.mysql.jdbc.Driver
spring.datasource.druid.url=jdbc:mysql://localhost:3306/springboot?
useUnicode=true&characterEncoding=utf8&serverTimezone=UTC
spring.datasource.druid.username=root
spring.datasource.druid.password=tiger

spring.datasource.druid.initialSize=5
spring.datasource.druid.minIdle=5
spring.datasource.druid.maxActive=20
spring.datasource.druid.maxWait=60000
spring.datasource.druid.timeBetweenEvictionRunsMillis=60000
spring.datasource.druid.min-evictableIdleTimeMillis=300000
spring.datasource.druid.validationQuery=SELECT 1 FROM DUAL
spring.datasource.druid.testWhileIdle=true
spring.datasource.druid.testOnBorrow=false
spring.datasource.druid.testOnReturn=false
spring.datasource.druid.poolPreparedStatements=true
spring.datasource.druid.maxPoolPreparedStatementPerConnectionSize=20
spring.datasource.druid.filters=stat,wall
```

注意：配置中都是以 **spring.datasource.druid** 开头，使用驼峰命名

5.2.3 手动编程

```
@Configuration
public class DruidConfiguration {

    @ConfigurationProperties(prefix = "spring.datasource.druid")
    @Bean(initMethod = "init",destroyMethod = "close")
    public DruidDataSource dataSource() {
        DruidDataSource ds = new DruidDataSource();
        ds.setProxyFilters(Arrays.asList(statFilter()));
        return ds;
    }

    @Bean
    public Filter statFilter() {
        StatFilter filter = new StatFilter();
        filter.setSlowSqlMillis(5000);
        filter.setLogSlowSql(true);
        filter.setMergeSql(true);
        return filter;
    }
}
```

通过上文 MyBatis 的测试代码，运行结果如下：

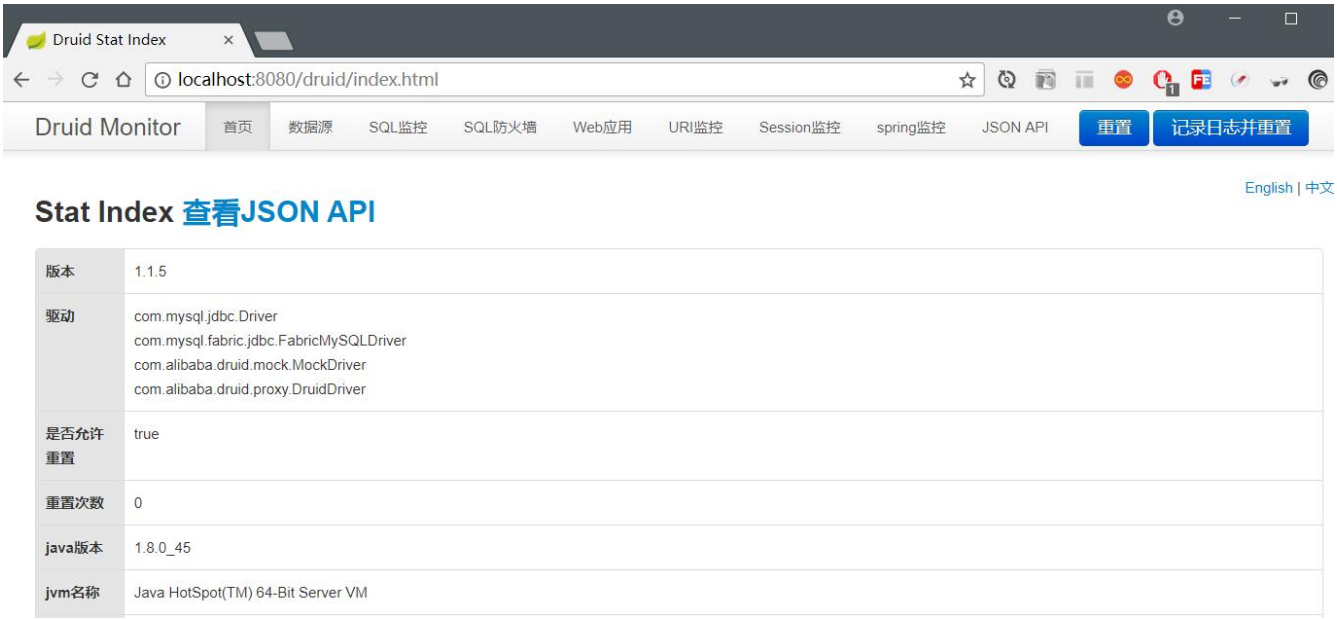
```
|-INFO  [main] com.alibaba.druid.pool.DruidDataSource [932] -| {dataSource-1} inited
|-INFO  [main] org.springframework.orm.jpa.LocalContainerEntityManagerFactoryBean [349] -| Building JPA container EntityManag
|-INFO  [main] org.hibernate.jpa.internal.util.LogHelper [31] -| HHH000204: Processing PersistenceUnitInfo [


|-INFO  [main] org.hibernate.Version [37] -| HHH000412: Hibernate Core {5.0.12.Final}
|-INFO  [main] org.hibernate.cfg.Environment [213] -| HHH000206: hibernate.properties not found
|-INFO  [main] org.hibernate.cfg.Environment [317] -| HHH000021: Bytecode provider name : javassist
|-INFO  [main] org.hibernate.annotations.common.Version [66] -| HCANN000001: Hibernate Commons Annotations {5.0.1.Final}
|-INFO  [main] org.hibernate.dialect.Dialect [156] -| HHH000400: Using dialect: org.hibernate.dialect.MySQL5Dialect
|-INFO  [main] org.springframework.orm.jpa.LocalContainerEntityManagerFactoryBean [379] -| Initialized JPA EntityManagerFacto
|-INFO  [main] org.springframework.web.servlet.mvc.method.annotation.RequestMappingHandlerAdapter [534] -| Looking for @Contr
|-INFO  [main] org.springframework.web.servlet.mvc.method.annotation.RequestMappingHandlerMapping [543] -| Mapped "{[/error]}
|-INFO  [main] org.springframework.web.servlet.mvc.method.annotation.RequestMappingHandlerMapping [543] -| Mapped "{[/error],
|-INFO  [main] org.springframework.web.servlet.handler.SimpleUrlHandlerMapping [362] -| Mapped URL path [/webjars/**] onto ha
|-INFO  [main] org.springframework.web.servlet.handler.SimpleUrlHandlerMapping [362] -| Mapped URL path [/**] onto handler of
|-INFO  [main] org.springframework.web.servlet.handler.SimpleUrlHandlerMapping [362] -| Mapped URL path [/**/favicon.ico] ont
|-INFO  [main] com.light.springboot.DepartmentTest [57] -| Started DepartmentTest in 4.434 seconds (JVM running for 5.09)
|-DEBUG [main] com.light.springboot.dao.DepartmentMapper.insert [159] -| ==>  Preparing: insert into department(id,name,descr
|-DEBUG [main] com.light.springboot.dao.DepartmentMapper.insert [159] -| ==> Parameters: 1(Integer), 研发部(String), 开发产品(
|-DEBUG [main] com.light.springboot.dao.DepartmentMapper.insert [159] -| <==    Updates: 1
|-INFO  [Thread-3] org.springframework.web.context.support.GenericWebApplicationContext [984] -| Closing org.springframework.
|-INFO  [Thread-3] org.springframework.orm.jpa.LocalContainerEntityManagerFactoryBean [548] -| Closing JPA EntityManagerFacto
|-INFO  [Thread-3] com.alibaba.druid.pool.DruidDataSource [1712] -| {dataSource-1} closed
```

项目已经使用了 Druid 数据源了。

六、配置 **Druid** 监控

默认情况下，Druid 的监控统计功能和页面是开启的。

我们启动项目，访问 http://localhost:8080/druid/index.html，如下图：

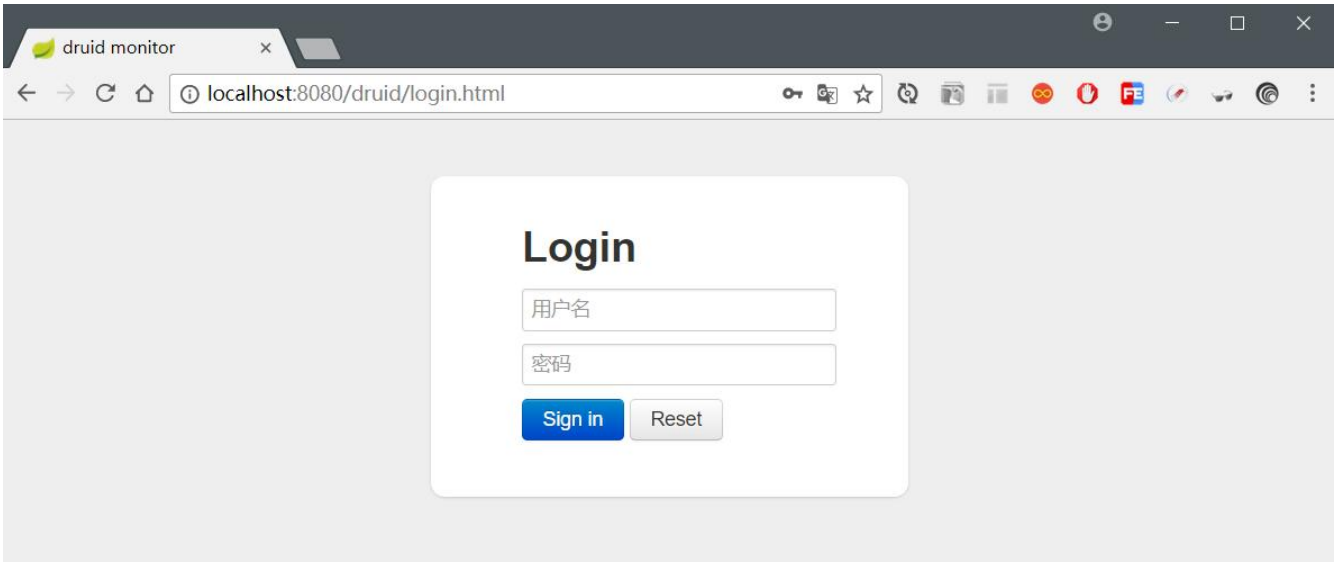


为了保证访问的安全性，我们可以如下配置：

在 application.properties 中添加（方式一）：

```
## druid 监控
spring.datasource.druid.web-stat-filter.enabled=true
spring.datasource.druid.web-stat-filter.url-pattern=/*
spring.datasource.druid.web-stat-
filter.exclusions=*.js,*.gif,*.jpg,*.png,*.css,*.ico,/druid/*

## druid 监控页面
spring.datasource.druid.stat-view-servlet.enabled=true
spring.datasource.druid.stat-view-servlet.url-pattern=/druid/*
spring.datasource.druid.stat-view-servlet.login-username=druid
spring.datasource.druid.stat-view-servlet.login-password=druid123
```

重启项目，再次访问 http://localhost:8080/druid/index.html 地址时需要身份验证：



七、源码下载

- [Spring Boot 入门之持久层篇测试源码]

八、参考资料

- Druid 相关