设计文档

211870287 丁旭

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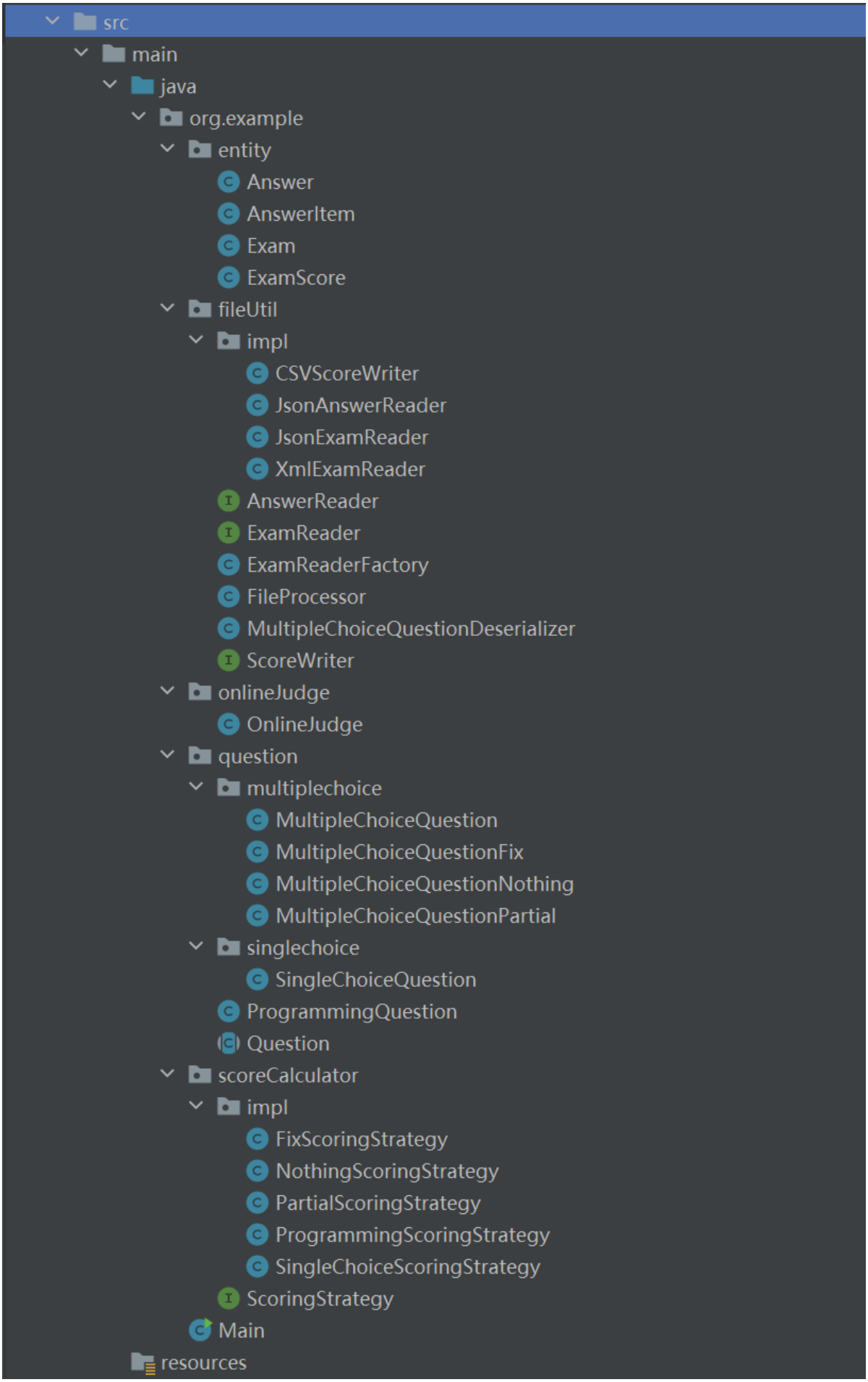
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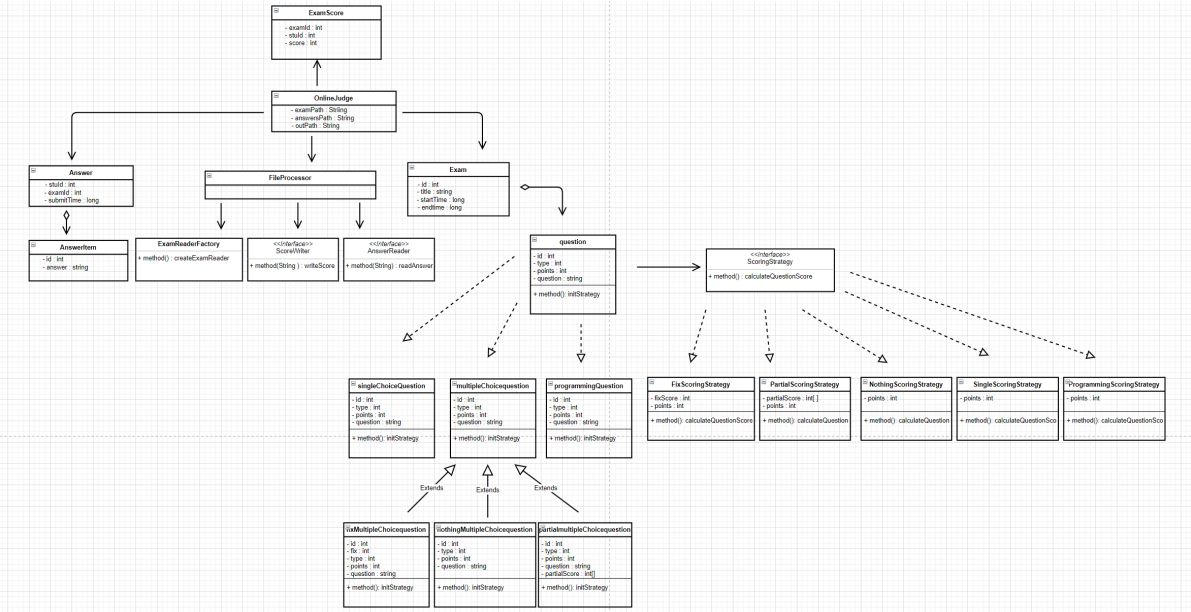
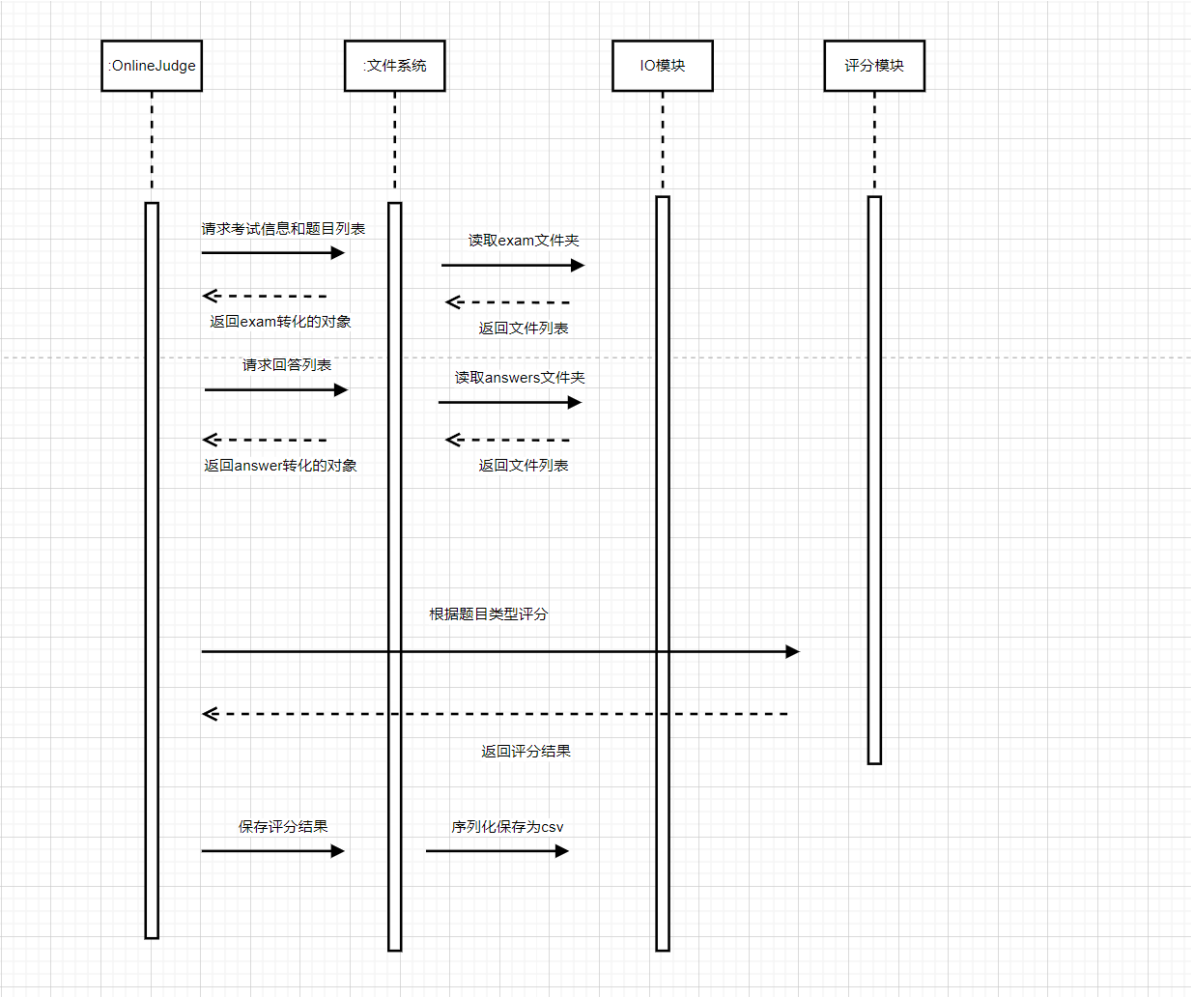


流程图



设计原则

- [x] 单一职责

  如ExamScore类，仅作为对csv文件的映射，将每一个学生的成绩保存在表中，作为一个实体类即成绩单

```java
@Data
public class ExamScore {
    2 usages
    @JsonProperty(index = 0)
    private int examId;
    2 usages
    @JsonProperty(index = 1)
    private int stuId;
    2 usages
    @JsonProperty(index = 2)
    private int score;

    // 构造函数
    2 usages  211870287
    public ExamScore(int examId, int stuId, int score) {
        this.examId = examId;
        this.stuId = stuId;
        this.score = score;
    }

    211870287
    @Override
    public String toString() {
        return "ExamScore{" +
                "examId='" + examId + '\'' +
                ", stuId='" + stuId + '\'' +
                ", score=" + score +
                '}';
    }
}
```

- [x] 开闭原则

使用抽象类question作为所有子类的父类，包含最基本的属性id，type，question，points，scoringStrategy（对问题的计算策略，这里的scoringStrategy是一个接口，根据不同question的计分策略按需实现）

```java
@Data
public abstract class Question<T> {

    1 usage
    private int id;
    1 usage
    private int type;
    1 usage
    private String question;
    1 usage
    private int points;

    private ScoringStrategy scoringStrategy;

    1 usage  5 overrides  211870287
    public void initStrategy(){}

    6 overrides  211870287
    @Override
    public String toString() {...}
}
```

- [x] 里氏代换原则

这里使用到Question父类进行计分策略的初始化，可以用其任意子类来进行各自的计分策略的初始化。

```java
1 usage  211870287
private  void initQuestionScoreStrategy(){
    for (Exam exam:idToExamMap.values()){
        exam.getQuestions().forEach(Question::initStrategy);
    }
}
```

- [x] 依赖倒转原则

Exam依赖于抽象类的列表List,而非具体的 多选题、 单选题、编程题

```java
@Data
public class Exam {
    1 usage
    private int id;
    1 usage
    private String title;
    1 usage
    private long startTime;
    1 usage
    private long endTime;

    1 usage
    private List<Question> questions;

    211870287
    @Override
    public String toString() {...}
}
```

- [x] 接口隔离原则

将io处理拆分成三个细分的专业接口

1. 满足**单一职责原则**，将一组相关的操作定义在一个接口中，且在满足高内聚的前提下，接口中的方法越少越好。
2. 可以在进行系统设计时采用**定制服务**的方式，即**为不同的客户端提供宽窄不同的接口**

```java
2 usages  1 implementation  211870287
public interface AnswerReader {
    1 implementation  211870287
    Answer readAnswer(String filePath) throws IOException;
}
```

```java
8 usages  2 implementations  211870287
public interface ExamReader {
    3 usages  2 implementations  211870287
    Exam readExam(String filePath) throws IOException;
}
```


```java
8 usages  2 implementations  211870287
public interface ExamReader {
    3 usages  2 implementations  211870287
    Exam readExam(String filePath) throws IOException;
}
```


- [x] 合成复用原则

Question类组合ScoringStrategy，组合复用以使其可以黑箱复用

```java
@Data
public abstract class Question<T> {

    1 usage
    private int id;
    1 usage
    private int type;
    1 usage
    private String question;
    1 usage
    private int points;

    private ScoringStrategy scoringStrategy;

    1 usage  5 overrides  211870287
    public void initStrategy(){}

    6 overrides  211870287
    @Override
    public String toString() {...}
}
```

- [x] 迪米特法则

在设计的过程中，尽可能的减少了类之间的不必要的通信，使用抽象工厂和接口来减少不同类之间的通信

```java
public class FileProcessor {
    2 usages
    private ExamReaderFactory examReaderFactory = new ExamReaderFactory();
    2 usages
    private ScoreWriter scoreWriter;
    2 usages
    private AnswerReader answerReader;

    1 usage  211870287
    public Map<Integer, Exam> readExam(String examsPath) throws IOException {...}

    1 usage  211870287
    public void saveExamScoreList(String outputPath, List<ExamScore> scoreList) throws IOException {...}

    1 usage  211870287
    public List<Answer> readAnswer(String answersPath) throws IOException {...}
}
```

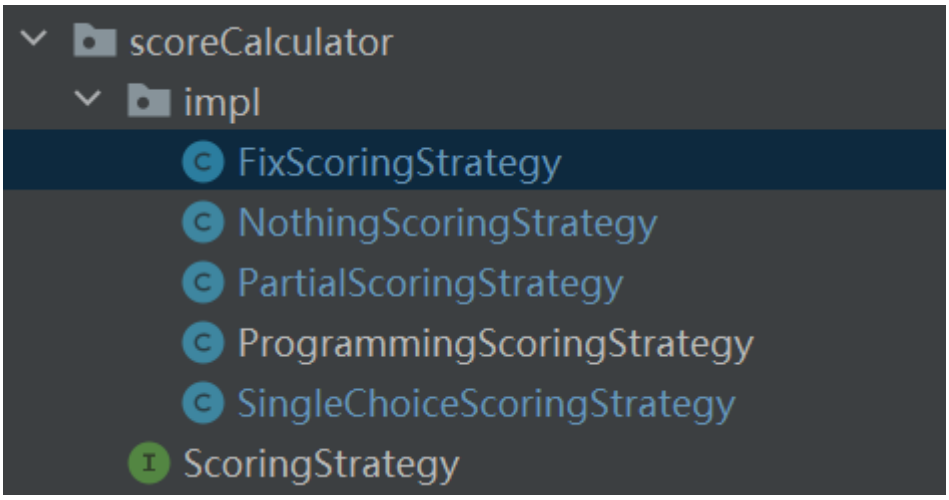
设计模式：

策略模式

定义接口

```
public interface ScoringStrategy {
    1 usage   5 implementations   211870287
    public int calculateQuestionScore(Object self_writtenAnswer);
}
```

实现不同的**计分策略**



再由对应的Question**组合复用**

```java
public abstract class Question<T> {

    1 usage
    private int id;
    1 usage
    private int type;
    1 usage
    private String question;
    1 usage
    private int points;

    private ScoringStrategy scoringStrategy;

    1 usage   5 overrides   211870287
    public void initStrategy(){}

    6 overrides   211870287
    @Override
    public String toString() {...}
}
```

工厂模式

设计读取exam的简单工厂

```java
public class ExamReaderFactory {
    2 usages   211870287
    public static ExamReader createExamReader(String fileExtension) {
        switch (fileExtension) {
            case "json":
                return new JsonExamReader();
            case "xml":
                return new XmlExamReader();
            default:
                throw new IllegalArgumentException("Unsupported file type: " + fileExtension);
        }
    }
}
```

根据不同的参数来获取不同的“产品”——对应的reader类

接口设计

```
public interface AnswerReader {
    public Answer readAnswer(String filePath) throws IOException;
    public Answer readAnswer(File jsonFile) throws IOException;
}
```

```
public interface ExamReader {
    Exam readExam(String filePath) throws IOException;
}
```

```
public interface ScoreWriter {
    void writeScore(String filePath) throws IOException;
}
```

```
public interface ScoringStrategy {
    public int calculateQuestionScore(Object self_writtenAnswer);
}
```

抽象类设计

```
public abstract class Question<T> {

    private int id;
    private int type;
    private String question;
    private int points;

    private ScoringStrategy scoringStrategy;

    public void initStrategy(){}

    @Override
    public String toString() {
        return "Question{" +
                "id=" + id +
                ", type=" + type +
                ", question='" + question + '\'' +
                ", points=" + points +
                '}';
    }
}
```

实体设计

```
public class Answer {
    @JsonProperty("examId")
    private int examId;

    @JsonProperty("stuId")
    private int studentId;
```

```
    @JsonProperty("submitTime")
    private long submitTime;

    @JsonProperty("answers")
    private List<AnswerItem> answers;

    @Override
    public String toString() {
        return "Answer{" +
                "\nexamId=" + examId +
                "\nstuId=" + studentId +
                "\nsubmitTime=" + submitTime +
                "\nanswers=" + answers +
                "\n}";
    }

}
```

```
public class AnswerItem {
    private int id;
    private String answer;
}
```

```
public class Exam {
    private int id;
    private String title;
    private long startTime;
    private long endTime;

    private List<Question> questions;

    @Override
    public String toString() {
        return "Exam{\n" +
                "id=" + id +
                "\ntitle='" + title + '\'' +
                "\nstartTime=" + startTime +
                "\nendTime=" + endTime +
                "\nquestions=\n" + questions +
                '}';
    }
}
```

```
public class ExamScore {
    @JsonProperty(index = 0)
    private int examId;
    @JsonProperty(index = 1)
```

```
    private int stuId;
    @JsonProperty(index = 2)
    private int score;

    // 构造函数
    public ExamScore(int examId, int stuId, int score) {
        this.examId = examId;
        this.stuId = stuId;
        this.score = score;
    }

    @Override
    public String toString() {
        return "ExamScore{" +
                "examId='" + examId + '\'' +
                ", stuId='" + stuId + '\'' +
                ", score=" + score +
                '}';
    }
}
```

IO

使用jackon库读取xml文件或者json文件自动转化对其对应的子类实体

1.通过type属性来实例化不同子类

```java
@JsonTypeInfo(
        use = JsonTypeInfo.Id.NAME,
        property = "type")
@JsonSubTypes({
        @JsonSubTypes.Type(value = SingleChoiceQuestion.class, name = "1"),
        @JsonSubTypes.Type(value = MultipleChoiceQuestion.class, name = "2"),
        @JsonSubTypes.Type(value = ProgrammingQuestion.class, name = "3")
})
@Data
public abstract class Question<T> {

    1 usage
    private int id;
    1 usage
    private int type;
    1 usage
    private String question;
    1 usage
    private int points;

    private ScoringStrategy scoringStrategy;

    1 usage  5 overrides  211870287
    public void initStrategy(){}

    6 overrides  211870287
    @Override
    public String toString() {...}
}
```

2.通过scoreMode属性来实例化不同多选题的类

```java
@JsonTypeInfo(
        use = JsonTypeInfo.Id.NAME,
        property = "scoreMode")
@JsonSubTypes({
        @JsonSubTypes.Type(value = MultipleChoiceQuestionFix.class, name = "fix"),
        @JsonSubTypes.Type(value = MultipleChoiceQuestionPartial.class, name = "partial"),
        @JsonSubTypes.Type(value = MultipleChoiceQuestionNothing.class, name = "nothing"),
})

@Data
public class MultipleChoiceQuestion extends Question {
    1 usage
    private String scoreMode;
//    @JacksonXmlProperty(localName = "option")
//    @JacksonXmlElementWrapper(useWrapping = false)
    1 usage
    private List<String> options;
    1 usage
    @JsonProperty("answer")
    @JsonAlias("answers")
    private List<Integer> answer;

    3 usages  211870287
    public MultipleChoiceQuestion() { this.setType(2); }
```