

面向服务的软件工程 Assignment One

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校档案馆档案管理

Schema 设计

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:am="archive-management"
            xmlns:xs="http://www.w3.org/2001/XMLSchema"
            targetNamespace="archive-management">

    <xs:simpleType name="gender" final="restriction">
        <xs:restriction base="xs:string">
            <xs:enumeration value="male"/>
            <xs:enumeration value="man"/>
        </xs:restriction>
    </xs:simpleType>

    <xs:complexType name="studentInfo">
        <xs:sequence>
            <xs:element name="id" type="xs:string"/>
            <xs:element name="name" type="xs:string"/>
            <xs:element name="age" type="xs:int"/>
            <xs:element name="gender" type="am:gender"/>
            <xs:element name="major" type="xs:string"/>
            <xs:element name="enrollYear" type="xs:int"/>
        </xs:sequence>
    </xs:complexType>

    <xs:element name="studentInfo" type="am:studentInfo"/>
</xs:schema>
```

XML 实例

```
<?xml version="1.0" encoding="UTF-8"?>
<am:studentInfo xmlns:am="archive-management">
    <id>201250001</id>
    <name>Bond</name>
    <age>35</age>
    <gender>man</gender>
    <major>Computer Science</major>
    <enrollYear>2020</enrollYear>
</am:studentInfo>
```

上课签到

Schema 设计

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:si="sign-in"
            xmlns:xs="http://www.w3.org/2001/XMLSchema"
            targetNamespace="sign-in">

    <xs:complexType name="studentInfo">
        <xs:sequence>
            <xs:element name="id" type="xs:string"/>
            <xs:element name="name" type="xs:string"/>
            <xs:element name="className" type="xs:string"/>
            <xs:element name="signInTime" type="xs:dateTime"/>
        </xs:sequence>
    </xs:complexType>

    <xs:element name="student" type="si:studentInfo"/>
</xs:schema>
```

XML 实例

```
<?xml version="1.0" encoding="UTF-8"?>
<si:student xmlns:si="sign-in"
            xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
            xsi:noNamespaceSchemaLocation="StudentInfo.xsd">
    <id>201250001</id>
    <name>Bond</name>
    <className>Machine Learning</className>
    <signInTime>2023-11-14T13:58:00</signInTime>
</si:student>
```

XML Processing(DOM)

以学生为聚合的成绩报告单 Schema

CourseInfo.xsd:

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
            targetNamespace="educational-admin">
    <xs:complexType name="courseInfo">
        <xs:sequence>
            <xs:element name="courseName" type="xs:string"/>
        </xs:sequence>
    </xs:complexType>
</xs:schema>
```

```

    </xs:complexType>
</xs:schema>

```

Grade.xsd:

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
    targetNamespace="educational-admin">
    <xs:complexType name="grade">
        <xs:sequence>
            <xs:element name="usualGrade" type="xs:decimal"/>
            <xs:element name="finalGrade" type="xs:decimal"/>
            <xs:element name="totalGrade" type="xs:decimal"/>
        </xs:sequence>
    </xs:complexType>
</xs:schema>

```

StudentGrades.xsd:

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:ea="educational-admin"
    xmlns:am="archive-management"
    xmlns:xs="http://www.w3.org/2001/XMLSchema"
    targetNamespace="educational-admin">

    <xs:import namespace="archive-management" schemaLocation="../archive-
management/StudentInfo.xsd"/>
    <xs:include schemaLocation="CourseInfo.xsd"/>
    <xs:include schemaLocation="Grade.xsd"/>

    <xs:element name="studentGradeList">
        <xs:complexType>
            <xs:sequence>
                <xs:element name="studentGrade" type="ea:studentGrade"
maxOccurs="unbounded"/>
            </xs:sequence>
        </xs:complexType>
    </xs:element>

    <xs:complexType name="studentGrade">
        <xs:sequence>
            <xs:element name="studentInfo" type="am:studentInfo"/>
            <xs:element name="courseGrades" type="ea:studentCourseGrade"/>
        </xs:sequence>
    </xs:complexType>

    <xs:complexType name="studentCourseGrade">
        <xs:sequence>
            <xs:element name="courseInfo" type="ea:courseInfo"/>

```

```

        <xs:element name="grade" type="ea:grade"
maxOccurs="unbounded"/>
    </xs:sequence>
</xs:complexType>
</xs:schema>

```

脚本处理

```

public class EducationalAdminServiceImpl implements
EducationalAdminService {

    private final ArchiveManagementService archiveManagementService;

    public EducationalAdminServiceImpl(ArchiveManagementService
archiveManagementService) {
        this.archiveManagementService = archiveManagementService;
    }

    /**
     * 处理学生成绩单
     */
    @Override
    public void handleStudentGrade() {
        // 获取学生信息
        StudentInfo studentInfo =
archiveManagementService.getStudentInfos().get(0);
        // 生成学生信息
        List<StudentInfo> studentInfos =
DataUtils.generateStudentInfos(9);
        studentInfos.add(studentInfo);
        // 生成成绩
        List<StudentGrade> studentGrades =
DataUtils.generateStudentGrades(studentInfos);
        // 转化为 XML 文档
        DocumentUtils.toXML(new StudentGradeList(studentGrades),
            "src/main/resources/educational-admin/StudentGrades.xml",
StudentGradeList.class);
    }
}

```

使用 DOM 读取 XML 文件

```

public class ArchiveManagementServiceImpl implements
ArchiveManagementService {

    private static final String RESOURCES_PATH = "/archive-management/";
    private static final String XML_FILE = RESOURCES_PATH +
"StudentInfo.xml";
    private static final String SCHEMA_FILE = RESOURCES_PATH +

```

```

"StudentInfo.xsd";

@Override
public List<StudentInfo> getStudentInfos() {
    String documentPath = "src/main/resources" + XML_FILE;
    try {
        DocumentBuilderFactory factory =
DocumentBuilderFactory.newInstance();
        DocumentBuilder builder = factory.newDocumentBuilder();
        Document document = builder.parse(documentPath);
        return readContentFromDocument(document);
    } catch (Exception e) {
        throw new RuntimeException(e);
    }
}

private List<StudentInfo> readContentFromDocument(Document document) {
    List<StudentInfo> contentList = new ArrayList<>();
    NodeList nodelist =
document.getElementsByTagName("am:studentInfo");
    for (int i = 0; i < nodelist.getLength(); i++) {
        Node node = nodelist.item(i);
        if (node.getNodeType() == Node.ELEMENT_NODE) {
            Element element = (Element) node;
            StudentInfo studentInfo = new StudentInfo();

            studentInfo.setId(element.getElementsByTagName("id").item(0).getTextContent());

            studentInfo.setName(element.getElementsByTagName("name").item(0).getTextContent());

            studentInfo.setAge(Integer.parseInt(element.getElementsByTagName("age").item(0).getTextContent()));

            studentInfo.setMajor(element.getElementsByTagName("major").item(0).getTextContent());

            studentInfo.setGender(element.getElementsByTagName("gender").item(0).getTextContent());

            studentInfo.setEnrollYear(Integer.parseInt(element.getElementsByTagName("enrollYear").item(0).getTextContent()));
            contentList.add(studentInfo);
        }
    }

    return contentList;
}
}

```

数据生成可以查看 [DataUtils.java](#)

结果展示

```

<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ea:studentGradeList xmlns:ea="educational-admin">
  <ea:studentGrade>
    <courseGrades>
      <courseInfo>
        <courseName>Machine Learning</courseName>
      </courseInfo>
      <grade>
        <finalGrade>12.9</finalGrade>
        <totalGrade>13.6</totalGrade>
        <usualGrade>0.7</usualGrade>
      </grade>
    </courseGrades>
    <courseGrades>
      <courseInfo>
        <courseName>Big Data Analysis</courseName>
      </courseInfo>
      <grade>
        <finalGrade>54.0</finalGrade>
        <totalGrade>54.1</totalGrade>
        <usualGrade>0.1</usualGrade>
      </grade>
    </courseGrades>
    <courseGrades>
      <courseInfo>
        <courseName>Cloud Native</courseName>
      </courseInfo>
      <grade>
        <finalGrade>52.8</finalGrade>
        <totalGrade>82.4</totalGrade>
        <usualGrade>29.6</usualGrade>
      </grade>
    </courseGrades>
    <courseGrades>
      <courseInfo>
        <courseName>Software Engineering and Computing
I</courseName>
      </courseInfo>
      <grade>
        <finalGrade>45.4</finalGrade>
        <totalGrade>76.8</totalGrade>
        <usualGrade>31.4</usualGrade>
      </grade>
    </courseGrades>
    <courseGrades>
      <courseInfo>
        <courseName>Software Engineering and Computing
II</courseName>
      </courseInfo>
      <grade>

```

```

        <finalGrade>9.7</finalGrade>
        <totalGrade>30.599999999999998</totalGrade>
        <usualGrade>20.9</usualGrade>
    </grade>
</courseGrades>
<studentInfo>
    <age>21</age>
    <enrollYear>2023</enrollYear>
    <gender>female</gender>
    <id>201250390</id>
    <major>Geography</major>
    <name>Edward</name>
</studentInfo>
</ea:studentGrade>
<ea:studentGrade>
    <courseGrades>
        <courseInfo>
            <courseName>Machine Learning</courseName>
        </courseInfo>
        <grade>
            <finalGrade>16.3</finalGrade>
            <totalGrade>41.0</totalGrade>
            <usualGrade>24.7</usualGrade>
        </grade>
    </courseGrades>
<courseGrades>
    <courseInfo>
        <courseName>Big Data Analysis</courseName>
    </courseInfo>
    <grade>
        <finalGrade>31.1</finalGrade>
        <totalGrade>39.2</totalGrade>
        <usualGrade>8.1</usualGrade>
    </grade>
</courseGrades>
<courseGrades>
    <courseInfo>
        <courseName>Cloud Native</courseName>
    </courseInfo>
    <grade>
        <finalGrade>2.5</finalGrade>
        <totalGrade>20.8</totalGrade>
        <usualGrade>18.3</usualGrade>
    </grade>
</courseGrades>
<courseGrades>
    <courseInfo>
        <courseName>Software Engineering and Computing
I</courseName>
    </courseInfo>
    <grade>
        <finalGrade>9.2</finalGrade>
        <totalGrade>24.7</totalGrade>
        <usualGrade>15.5</usualGrade>

```

```

        </grade>
    </courseGrades>
</courseGrades>
    <courseInfo>
        <courseName>Software Engineering and Computing
II</courseName>
    </courseInfo>
    <grade>
        <finalGrade>54.8</finalGrade>
        <totalGrade>64.39999999999999</totalGrade>
        <usualGrade>9.6</usualGrade>
    </grade>
</courseGrades>
<studentInfo>
    <age>19</age>
    <enrollYear>2000</enrollYear>
    <gender>female</gender>
    <id>201250230</id>
    <major>Astronomy</major>
    <name>Samuel</name>
</studentInfo>
</ea:studentGrade>
<ea:studentGrade>
    <courseGrades>
        <courseInfo>
            <courseName>Machine Learning</courseName>
        </courseInfo>
        <grade>
            <finalGrade>17.3</finalGrade>
            <totalGrade>37.6</totalGrade>
            <usualGrade>20.3</usualGrade>
        </grade>
    </courseGrades>
</courseGrades>
<courseGrades>
    <courseInfo>
        <courseName>Big Data Analysis</courseName>
    </courseInfo>
    <grade>
        <finalGrade>28.6</finalGrade>
        <totalGrade>40.0</totalGrade>
        <usualGrade>11.4</usualGrade>
    </grade>
</courseGrades>
<courseGrades>
    <courseInfo>
        <courseName>Cloud Native</courseName>
    </courseInfo>
    <grade>
        <finalGrade>13.4</finalGrade>
        <totalGrade>26.1</totalGrade>
        <usualGrade>12.7</usualGrade>
    </grade>
</courseGrades>
<courseGrades>

```



```

        <courseInfo>
            <courseName>Software Engineering and Computing
I</courseName>
        </courseInfo>
        <grade>
            <finalGrade>13.4</finalGrade>
            <totalGrade>49.5</totalGrade>
            <usualGrade>36.1</usualGrade>
        </grade>
    </courseGrades>
    <courseGrades>
        <courseInfo>
            <courseName>Software Engineering and Computing
II</courseName>
        </courseInfo>
        <grade>
            <finalGrade>51.0</finalGrade>
            <totalGrade>60.7</totalGrade>
            <usualGrade>9.7</usualGrade>
        </grade>
    </courseGrades>
    <studentInfo>
        <age>22</age>
        <enrollYear>2001</enrollYear>
        <gender>female</gender>
        <id>201250964</id>
        <major>Software Engineering</major>
        <name>Katherine</name>
    </studentInfo>
</ea:studentGrade>
<ea:studentGrade>
    <courseGrades>
        <courseInfo>
            <courseName>Machine Learning</courseName>
        </courseInfo>
        <grade>
            <finalGrade>22.3</finalGrade>
            <totalGrade>61.599999999999994</totalGrade>
            <usualGrade>39.3</usualGrade>
        </grade>
    </courseGrades>
    <courseGrades>
        <courseInfo>
            <courseName>Big Data Analysis</courseName>
        </courseInfo>
        <grade>
            <finalGrade>25.2</finalGrade>
            <totalGrade>46.2</totalGrade>
            <usualGrade>21.0</usualGrade>
        </grade>
    </courseGrades>
    <courseGrades>
        <courseInfo>
            <courseName>Cloud Native</courseName>

```

```

        </courseInfo>
        <grade>
            <finalGrade>2.6</finalGrade>
            <totalGrade>7.6</totalGrade>
            <usualGrade>5.0</usualGrade>
        </grade>
    </courseGrades>
    <courseGrades>
        <courseInfo>
            <courseName>Software Engineering and Computing
I</courseName>
        </courseInfo>
        <grade>
            <finalGrade>51.0</finalGrade>
            <totalGrade>77.7</totalGrade>
            <usualGrade>26.7</usualGrade>
        </grade>
    </courseGrades>
    <courseGrades>
        <courseInfo>
            <courseName>Software Engineering and Computing
II</courseName>
        </courseInfo>
        <grade>
            <finalGrade>9.2</finalGrade>
            <totalGrade>43.8</totalGrade>
            <usualGrade>34.6</usualGrade>
        </grade>
    </courseGrades>
    <studentInfo>
        <age>23</age>
        <enrollYear>2012</enrollYear>
        <gender>female</gender>
        <id>201250545</id>
        <major>Astronomy</major>
        <name>Peter</name>
    </studentInfo>
</ea:studentGrade>
<ea:studentGrade>
    <courseGrades>
        <courseInfo>
            <courseName>Machine Learning</courseName>
        </courseInfo>
        <grade>
            <finalGrade>11.3</finalGrade>
            <totalGrade>22.5</totalGrade>
            <usualGrade>11.2</usualGrade>
        </grade>
    </courseGrades>
    <courseGrades>
        <courseInfo>
            <courseName>Big Data Analysis</courseName>
        </courseInfo>
        <grade>

```

```

        <finalGrade>32.9</finalGrade>
        <totalGrade>40.8</totalGrade>
        <usualGrade>7.9</usualGrade>
    </grade>
</courseGrades>
<courseGrades>
    <courseInfo>
        <courseName>Cloud Native</courseName>
    </courseInfo>
    <grade>
        <finalGrade>35.8</finalGrade>
        <totalGrade>37.8</totalGrade>
        <usualGrade>2.0</usualGrade>
    </grade>
</courseGrades>
<courseGrades>
    <courseInfo>
        <courseName>Software Engineering and Computing
I</courseName>
    </courseInfo>
    <grade>
        <finalGrade>18.5</finalGrade>
        <totalGrade>36.9</totalGrade>
        <usualGrade>18.4</usualGrade>
    </grade>
</courseGrades>
<courseGrades>
    <courseInfo>
        <courseName>Software Engineering and Computing
II</courseName>
    </courseInfo>
    <grade>
        <finalGrade>45.1</finalGrade>
        <totalGrade>75.0</totalGrade>
        <usualGrade>29.9</usualGrade>
    </grade>
</courseGrades>
<studentInfo>
    <age>18</age>
    <enrollYear>2011</enrollYear>
    <gender>male</gender>
    <id>201250631</id>
    <major>Software Engineering</major>
    <name>Fiona</name>
</studentInfo>
</ea:studentGrade>
<ea:studentGrade>
    <courseGrades>
        <courseInfo>
            <courseName>Machine Learning</courseName>
        </courseInfo>
        <grade>
            <finalGrade>40.4</finalGrade>
            <totalGrade>69.0</totalGrade>

```

```

        <usualGrade>28.6</usualGrade>
      </grade>
    </courseGrades>
  <courseGrades>
    <courseInfo>
      <courseName>Big Data Analysis</courseName>
    </courseInfo>
    <grade>
      <finalGrade>2.1</finalGrade>
      <totalGrade>19.8</totalGrade>
      <usualGrade>17.7</usualGrade>
    </grade>
  </courseGrades>
  <courseGrades>
    <courseInfo>
      <courseName>Cloud Native</courseName>
    </courseInfo>
    <grade>
      <finalGrade>49.3</finalGrade>
      <totalGrade>58.599999999999994</totalGrade>
      <usualGrade>9.3</usualGrade>
    </grade>
  </courseGrades>
  <courseGrades>
    <courseInfo>
      <courseName>Software Engineering and Computing
I</courseName>
    </courseInfo>
    <grade>
      <finalGrade>3.3</finalGrade>
      <totalGrade>9.399999999999999</totalGrade>
      <usualGrade>6.1</usualGrade>
    </grade>
  </courseGrades>
  <courseGrades>
    <courseInfo>
      <courseName>Software Engineering and Computing
II</courseName>
    </courseInfo>
    <grade>
      <finalGrade>10.4</finalGrade>
      <totalGrade>19.5</totalGrade>
      <usualGrade>9.1</usualGrade>
    </grade>
  </courseGrades>
  <studentInfo>
    <age>19</age>
    <enrollYear>2010</enrollYear>
    <gender>female</gender>
    <id>201250107</id>
    <major>Finance</major>
    <name>Katherine</name>
  </studentInfo>
</ea:studentGrade>

```

```

    <ea:studentGrade>
      <courseGrades>
        <courseInfo>
          <courseName>Machine Learning</courseName>
        </courseInfo>
        <grade>
          <finalGrade>8.0</finalGrade>
          <totalGrade>34.9</totalGrade>
          <usualGrade>26.9</usualGrade>
        </grade>
      </courseGrades>
      <courseGrades>
        <courseInfo>
          <courseName>Big Data Analysis</courseName>
        </courseInfo>
        <grade>
          <finalGrade>56.0</finalGrade>
          <totalGrade>67.5</totalGrade>
          <usualGrade>11.5</usualGrade>
        </grade>
      </courseGrades>
      <courseGrades>
        <courseInfo>
          <courseName>Cloud Native</courseName>
        </courseInfo>
        <grade>
          <finalGrade>25.9</finalGrade>
          <totalGrade>45.8</totalGrade>
          <usualGrade>19.9</usualGrade>
        </grade>
      </courseGrades>
      <courseGrades>
        <courseInfo>
          <courseName>Software Engineering and Computing
I</courseName>
        </courseInfo>
        <grade>
          <finalGrade>7.6</finalGrade>
          <totalGrade>16.1</totalGrade>
          <usualGrade>8.5</usualGrade>
        </grade>
      </courseGrades>
      <courseGrades>
        <courseInfo>
          <courseName>Software Engineering and Computing
II</courseName>
        </courseInfo>
        <grade>
          <finalGrade>14.3</finalGrade>
          <totalGrade>36.2</totalGrade>
          <usualGrade>21.9</usualGrade>
        </grade>
      </courseGrades>
    </studentInfo>

```

```

        <age>23</age>
        <enrollYear>2009</enrollYear>
        <gender>female</gender>
        <id>201250704</id>
        <major>Astronomy</major>
        <name>Ursula</name>
    </studentInfo>
</ea:studentGrade>
<ea:studentGrade>
    <courseGrades>
        <courseInfo>
            <courseName>Machine Learning</courseName>
        </courseInfo>
        <grade>
            <finalGrade>51.9</finalGrade>
            <totalGrade>58.5</totalGrade>
            <usualGrade>6.6</usualGrade>
        </grade>
    </courseGrades>
    <courseGrades>
        <courseInfo>
            <courseName>Big Data Analysis</courseName>
        </courseInfo>
        <grade>
            <finalGrade>34.0</finalGrade>
            <totalGrade>55.2</totalGrade>
            <usualGrade>21.2</usualGrade>
        </grade>
    </courseGrades>
    <courseGrades>
        <courseInfo>
            <courseName>Cloud Native</courseName>
        </courseInfo>
        <grade>
            <finalGrade>55.7</finalGrade>
            <totalGrade>66.2</totalGrade>
            <usualGrade>10.5</usualGrade>
        </grade>
    </courseGrades>
    <courseGrades>
        <courseInfo>
            <courseName>Software Engineering and Computing
I</courseName>
        </courseInfo>
        <grade>
            <finalGrade>55.4</finalGrade>
            <totalGrade>62.6</totalGrade>
            <usualGrade>7.2</usualGrade>
        </grade>
    </courseGrades>
    <courseGrades>
        <courseInfo>
            <courseName>Software Engineering and Computing
II</courseName>

```

```

        </courseInfo>
        <grade>
            <finalGrade>22.6</finalGrade>
            <totalGrade>50.2</totalGrade>
            <usualGrade>27.6</usualGrade>
        </grade>
    </courseGrades>
    <studentInfo>
        <age>20</age>
        <enrollYear>1996</enrollYear>
        <gender>male</gender>
        <id>201250974</id>
        <major>Astronomy</major>
        <name>Fiona</name>
    </studentInfo>
</ea:studentGrade>
<ea:studentGrade>
    <courseGrades>
        <courseInfo>
            <courseName>Machine Learning</courseName>
        </courseInfo>
        <grade>
            <finalGrade>20.6</finalGrade>
            <totalGrade>57.0</totalGrade>
            <usualGrade>36.4</usualGrade>
        </grade>
    </courseGrades>
    <courseGrades>
        <courseInfo>
            <courseName>Big Data Analysis</courseName>
        </courseInfo>
        <grade>
            <finalGrade>7.1</finalGrade>
            <totalGrade>33.3</totalGrade>
            <usualGrade>26.2</usualGrade>
        </grade>
    </courseGrades>
    <courseGrades>
        <courseInfo>
            <courseName>Cloud Native</courseName>
        </courseInfo>
        <grade>
            <finalGrade>57.9</finalGrade>
            <totalGrade>96.3</totalGrade>
            <usualGrade>38.4</usualGrade>
        </grade>
    </courseGrades>
    <courseGrades>
        <courseInfo>
            <courseName>Software Engineering and Computing
I</courseName>
        </courseInfo>
        <grade>
            <finalGrade>56.8</finalGrade>

```

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```

        </courseGrades>
        <courseGrades>
            <courseInfo>
                <courseName>Software Engineering and Computing
I</courseName>
            </courseInfo>
            <grade>
                <finalGrade>24.4</finalGrade>
                <totalGrade>25.7</totalGrade>
                <usualGrade>1.3</usualGrade>
            </grade>
        </courseGrades>
        <courseGrades>
            <courseInfo>
                <courseName>Software Engineering and Computing
II</courseName>
            </courseInfo>
            <grade>
                <finalGrade>4.2</finalGrade>
                <totalGrade>41.0</totalGrade>
                <usualGrade>36.8</usualGrade>
            </grade>
        </courseGrades>
        <studentInfo>
            <age>35</age>
            <enrollYear>2020</enrollYear>
            <gender>man</gender>
            <id>201250001</id>
            <major>Computer Science</major>
            <name>Bond</name>
        </studentInfo>
    </ea:studentGrade>
</ea:studentGradeList>

```

XML Processing(XSLT, SAX)

以课程为聚合的成绩单 Schema

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:ea="educational-admin"
            xmlns:am="archive-management"
            xmlns:xs="http://www.w3.org/2001/XMLSchema"
            targetNamespace="educational-admin">

    <xs:import namespace="archive-management" schemaLocation="../archive-
management/StudentInfo.xsd"/>
    <xs:include schemaLocation="CourseInfo.xsd"/>
    <xs:include schemaLocation="Grade.xsd"/>

    <xs:element name="courseGradeList">
        <xs:complexType>

```

```

        <xs:sequence>
            <xs:element name="courseGrade" type="ea:courseGrade"
maxOccurs="unbounded"/>
        </xs:sequence>
    </xs:complexType>
</xs:element>

<xs:complexType name="courseGrade">
    <xs:sequence>
        <xs:element name="courseInfo" type="ea:courseInfo"/>
        <xs:element name="courseGrades" type="ea:courseStudentGrade"/>
    </xs:sequence>
</xs:complexType>

<xs:complexType name="courseStudentGrade">
    <xs:sequence>
        <xs:element name="studentInfo" type="am:studentInfo"/>
        <xs:element name="grade" type="ea:grade"
maxOccurs="unbounded"/>
    </xs:sequence>
</xs:complexType>
</xs:schema>

```

XML 转化

使用如下 Java 脚本进行转化

```

public class EducationalAdminServiceImpl implements
EducationalAdminService {

    /**
     * 处理课程成绩单
     */
    @Override
    public void handleCourseGrade() {
        // 读取 StudentGrades.xml
        String documentPath = "src/main/resources/educational-
admin/StudentGrades.xml";
        List<StudentGrade> studentGrades;
        try {
            DocumentBuilderFactory factory =
DocumentBuilderFactory.newInstance();
            DocumentBuilder builder = factory.newDocumentBuilder();
            Document document = builder.parse(documentPath);
            studentGrades = readStudentGradeFromDocument(document);
        } catch (Exception e) {
            throw new RuntimeException(e);
        }

        // 转换为 CourseGrades
        List<CourseGrade> courseGrades =

```

```

convertStudentGrades2CourseGrades(studentGrades);
    // 按照总评成绩进行排序
    courseGrades.forEach(courseGrade ->
courseGrade.getStudentGrades().sort((o1, o2) ->
o2.getGrade().getTotalGrade().compareTo(o1.getGrade().getTotalGrade())));

    DocumentUtils.toXML(new CourseGradeList(courseGrades),
"src/main/resources/educational-admin/SortedCourseGrades.xml",
CourseGradeList.class);

    // 保留任意不及格成绩
    courseGrades.forEach(courseGrade ->
courseGrade.setStudentGrades(courseGrade.getStudentGrades().stream().filter(
studentGrade -> studentGrade.getGrade().getTotalGrade() <
60).collect(Collectors.toList())));

    DocumentUtils.toXML(new CourseGradeList(courseGrades),
"src/main/resources/educational-admin/FailedCourseGrades.xml",
CourseGradeList.class);
}

private List<StudentGrade> readStudentGradeFromDocument(Document
document) {
    List<StudentGrade> studentGrades = new ArrayList<>();
    NodeList nodelist =
document.getElementsByTagName("ea:studentGradeList");
    for (int i = 0; i < nodelist.getLength(); i++) {
        Node node = nodelist.item(i);
        if (node.getNodeType() == Node.ELEMENT_NODE) {
            Element element = (Element) node;
            StudentGrade studentGrade = new StudentGrade();

            // handle studentCourseGrade
            List<StudentCourseGrade> courseGrades = new ArrayList<>();
            NodeList courseGradesNodeList =
element.getElementsByTagName("courseGrades");
            for (int j = 0; j < courseGradesNodeList.getLength(); j++)
{
                Node courseGradeNode = courseGradesNodeList.item(j);
                if (courseGradeNode.getNodeType() ==
Node.ELEMENT_NODE) {
                    Element courseGradeElement = (Element)
courseGradeNode;
                    StudentCourseGrade courseGrade = new
StudentCourseGrade();

                    Element courseInfo = (Element)
courseGradeElement.getElementsByTagName("courseInfo").item(0);
                    courseGrade.setCourseInfo(new
CourseInfo(courseInfo.getElementsByTagName("courseName").item(0).getTextCo
ntent()));

                    Element grade = (Element)
courseGradeElement.getElementsByTagName("grade").item(0);
                    double usualGrade =

```

```
Double.parseDouble(grade.getElementsByTagName("usualGrade").item(0).getTextContent());

        double finalGrade =
Double.parseDouble(grade.getElementsByTagName("finalGrade").item(0).getTextContent());

        double totalGrade =
Double.parseDouble(grade.getElementsByTagName("totalGrade").item(0).getTextContent());

        courseGrade.setGrade(Grade.builder()
            .usualGrade(usualGrade)
            .finalGrade(finalGrade)
            .totalGrade(totalGrade)
            .build());

        courseGrades.add(courseGrade);
    }
}

// handle studentInfo
StudentInfo studentInfo = null;
Node studentInfoNode =
element.getElementsByTagName("studentInfo").item(0);
    if (studentInfoNode.getNodeType() == Node.ELEMENT_NODE) {
        Element studentInfoElement = (Element)
studentInfoNode;

        studentInfo = new
StudentInfo(studentInfoElement.getElementsByTagName("id").item(0).getTextContent(),

studentInfoElement.getElementsByTagName("name").item(0).getTextContent(),

Integer.parseInt(studentInfoElement.getElementsByTagName("age").item(0).getTextContent()),

studentInfoElement.getElementsByTagName("gender").item(0).getTextContent(),
,

studentInfoElement.getElementsByTagName("major").item(0).getTextContent(),

Integer.parseInt(studentInfoElement.getElementsByTagName("enrollYear").item(0).getTextContent())
    );
    }

    studentGrade.setCourseGrades(courseGrades);
    studentGrade.setStudentInfo(studentInfo);
    studentGrades.add(studentGrade);
}
}

return studentGrades;
}
```

```

private List<CourseGrade>
convertStudentGrades2CourseGrades(List<StudentGrade> studentGrades) {
    List<CourseGrade> targetCourseGrades = new ArrayList<>();
    studentGrades.forEach(studentGrade -> {
        StudentInfo studentInfo = studentGrade.getStudentInfo();
        List<StudentCourseGrade> courseGrades =
studentGrade.getCourseGrades();
        courseGrades.forEach(courseGrade -> {
            CourseStudentGrade courseStudentGrade =
CourseStudentGrade.builder()
                .studentInfo(studentInfo)
                .grade(courseGrade.getGrade())
                .build();
            if (targetCourseGrades.stream()
                .noneMatch(targetCourseGrade ->
targetCourseGrade.getCourseInfo().getCourseName().equals(courseGrade.getCo
urseInfo().getCourseName())) {
                // 说明此时在结果中还没有这个课程
                targetCourseGrades.add(CourseGrade.builder()
                    .courseInfo(courseGrade.getCourseInfo())
                    .studentGrades(new ArrayList<>
(Collections.singletonList(courseStudentGrade)))
                    .build());
            } else {
                // 说明在结果中已经有了这个课程
                targetCourseGrades.stream()
                    .filter(targetCourseGrade ->
targetCourseGrade.getCourseInfo().getCourseName().equals(courseGrade.getCo
urseInfo().getCourseName()))
                    .forEach(targetCourseGrade ->
targetCourseGrade.getStudentGrades().add(courseStudentGrade));
            }
        });
    });
    return targetCourseGrades;
}
}

```

XML 过滤

使用 XSLT 和 SAX 进行过滤（两种方式）

SAX Handler 定义如下：

```

public class FilterXML {

    private static final String INPUT_FILE = "input.xml";
    private static final String OUTPUT_FILE = "output.xml";

    public static void main(String[] args) throws Exception {
        File inputFile = new File(INPUT_FILE);
    }
}

```

```
File outputFile = new File(OUTPUT_FILE);

SAXParserFactory factory = SAXParserFactory.newInstance();
SAXParser saxParser = factory.newSAXParser();

ContentFilter contentHandler = new ContentFilter();
saxParser.parse(inputFile, contentHandler);

TransformerFactory transformerFactory =
TransformerFactory.newInstance();
Transformer transformer = transformerFactory.newTransformer();
transformer.setOutputProperty(OutputKeys.INDENT, "yes");
transformer.setOutputProperty("{http://xml.apache.org/xslt}indent-
amount", "2");

OutputStreamWriter writer = new OutputStreamWriter(new
FileOutputStream(outputFile), "UTF-8");
StreamResult result = new StreamResult(writer);

Source source = new SAXSource(contentHandler.getXMLReader(),
contentHandler.getInputSource());
transformer.transform(source, result);

System.out.println("Output to file saved!");
}

private static class ContentFilter extends DefaultHandler {
    private boolean inTotalGradeTag;
    private int totalGrade;
    private StringBuilder characters = new StringBuilder();
    private Deque<String> elementStack = new ArrayDeque<>();

    public XMLReader getXMLReader() {
        return null;
    }

    public InputSource getInputSource() {
        return new InputSource(new
StringReader(this.characters.toString()));
    }

    @Override
    public void startElement(String uri, String localName, String
qName, Attributes attributes)
        throws SAXException {
        super.startElement(uri, localName, qName, attributes);
        this.elementStack.push(qName);
        if ("totalGrade".equals(qName)) {
            this.inTotalGradeTag = true;
        }
    }

    @Override
    public void endElement(String uri, String localName, String qName)
```

```

throws SAXException {
    super.endElement(uri, localName, qName);
    this.elementStack.pop();
    if ("totalGrade".equals(qName)) {
        this.inTotalGradeTag = false;
    }
}

@Override
public void characters(char ch[], int start, int length) throws
SAXException {
    super.characters(ch, start, length);
    String string = new String(ch, start, length);
    if (this.inTotalGradeTag) {
        try {
            this.totalGrade = Integer.parseInt(string);
            if (this.totalGrade < 60) {
                // print the entire student record with grades
                less than 60

                for (String s : this.elementStack) {
                    startElement("", s, s, null);
                }
                characters(ch, start, length);
                while
                (!"student".equals(this.elementStack.peek())) {
                    endElement("", this.elementStack.pop(),
this.elementStack.pop());
                }
                endElement("", "student", "student");
            }
        } catch (NumberFormatException e) {
            throw new SAXException(e.getMessage(), e);
        }
    }
    this.characters.append(string);
}
}
}

```

结果展示

排序后的结果, SortedCourseGrades.xml:

```

<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<ns2:courseGradeList xmlns:ns2="educational-admin">
  <ns2:courseGrade>
    <courseInfo>
      <courseName>Machine Learning</courseName>
    </courseInfo>
    <studentGrades>
      <grade>

```

```
        <finalGrade>40.4</finalGrade>
        <totalGrade>69.0</totalGrade>
        <usualGrade>28.6</usualGrade>
    </grade>
    <studentInfo>
        <age>21</age>
        <enrollYear>2023</enrollYear>
        <gender>female</gender>
        <id>201250390</id>
        <major>Geography</major>
        <name>Edward</name>
    </studentInfo>
</studentGrades>
<studentGrades>
    <grade>
        <finalGrade>29.0</finalGrade>
        <totalGrade>63.8</totalGrade>
        <usualGrade>34.8</usualGrade>
    </grade>
    <studentInfo>
        <age>21</age>
        <enrollYear>2023</enrollYear>
        <gender>female</gender>
        <id>201250390</id>
        <major>Geography</major>
        <name>Edward</name>
    </studentInfo>
</studentGrades>
<studentGrades>
    <grade>
        <finalGrade>22.3</finalGrade>
        <totalGrade>61.599999999999994</totalGrade>
        <usualGrade>39.3</usualGrade>
    </grade>
    <studentInfo>
        <age>21</age>
        <enrollYear>2023</enrollYear>
        <gender>female</gender>
        <id>201250390</id>
        <major>Geography</major>
        <name>Edward</name>
    </studentInfo>
</studentGrades>
<studentGrades>
    <grade>
        <finalGrade>51.9</finalGrade>
        <totalGrade>58.5</totalGrade>
        <usualGrade>6.6</usualGrade>
    </grade>
    <studentInfo>
        <age>21</age>
        <enrollYear>2023</enrollYear>
        <gender>female</gender>
        <id>201250390</id>
```



```
        <major>Geography</major>
        <name>Edward</name>
    </studentInfo>
</studentGrades>
<studentGrades>
    <grade>
        <finalGrade>20.6</finalGrade>
        <totalGrade>57.0</totalGrade>
        <usualGrade>36.4</usualGrade>
    </grade>
    <studentInfo>
        <age>21</age>
        <enrollYear>2023</enrollYear>
        <gender>female</gender>
        <id>201250390</id>
        <major>Geography</major>
        <name>Edward</name>
    </studentInfo>
</studentGrades>
<studentGrades>
    <grade>
        <finalGrade>16.3</finalGrade>
        <totalGrade>41.0</totalGrade>
        <usualGrade>24.7</usualGrade>
    </grade>
    <studentInfo>
        <age>21</age>
        <enrollYear>2023</enrollYear>
        <gender>female</gender>
        <id>201250390</id>
        <major>Geography</major>
        <name>Edward</name>
    </studentInfo>
</studentGrades>
<studentGrades>
    <grade>
        <finalGrade>17.3</finalGrade>
        <totalGrade>37.6</totalGrade>
        <usualGrade>20.3</usualGrade>
    </grade>
    <studentInfo>
        <age>21</age>
        <enrollYear>2023</enrollYear>
        <gender>female</gender>
        <id>201250390</id>
        <major>Geography</major>
        <name>Edward</name>
    </studentInfo>
</studentGrades>
<studentGrades>
    <grade>
        <finalGrade>8.0</finalGrade>
        <totalGrade>34.9</totalGrade>
        <usualGrade>26.9</usualGrade>
```

```

        </grade>
        <studentInfo>
            <age>21</age>
            <enrollYear>2023</enrollYear>
            <gender>female</gender>
            <id>201250390</id>
            <major>Geography</major>
            <name>Edward</name>
        </studentInfo>
    </studentGrades>
    <studentGrades>
        <grade>
            <finalGrade>11.3</finalGrade>
            <totalGrade>22.5</totalGrade>
            <usualGrade>11.2</usualGrade>
        </grade>
        <studentInfo>
            <age>21</age>
            <enrollYear>2023</enrollYear>
            <gender>female</gender>
            <id>201250390</id>
            <major>Geography</major>
            <name>Edward</name>
        </studentInfo>
    </studentGrades>
    <studentGrades>
        <grade>
            <finalGrade>12.9</finalGrade>
            <totalGrade>13.6</totalGrade>
            <usualGrade>0.7</usualGrade>
        </grade>
        <studentInfo>
            <age>21</age>
            <enrollYear>2023</enrollYear>
            <gender>female</gender>
            <id>201250390</id>
            <major>Geography</major>
            <name>Edward</name>
        </studentInfo>
    </studentGrades>
</ns2:courseGrade>
<ns2:courseGrade>
    <courseInfo>
        <courseName>Big Data Analysis</courseName>
    </courseInfo>
    <studentGrades>
        <grade>
            <finalGrade>56.0</finalGrade>
            <totalGrade>67.5</totalGrade>
            <usualGrade>11.5</usualGrade>
        </grade>
        <studentInfo>
            <age>21</age>
            <enrollYear>2023</enrollYear>

```

```
        <gender>female</gender>
        <id>201250390</id>
        <major>Geography</major>
        <name>Edward</name>
    </studentInfo>
</studentGrades>
<studentGrades>
    <grade>
        <finalGrade>34.0</finalGrade>
        <totalGrade>55.2</totalGrade>
        <usualGrade>21.2</usualGrade>
    </grade>
    <studentInfo>
        <age>21</age>
        <enrollYear>2023</enrollYear>
        <gender>female</gender>
        <id>201250390</id>
        <major>Geography</major>
        <name>Edward</name>
    </studentInfo>
</studentGrades>
<studentGrades>
    <grade>
        <finalGrade>54.0</finalGrade>
        <totalGrade>54.1</totalGrade>
        <usualGrade>0.1</usualGrade>
    </grade>
    <studentInfo>
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        <enrollYear>2023</enrollYear>
        <gender>female</gender>
        <id>201250390</id>
        <major>Geography</major>
        <name>Edward</name>
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</studentGrades>
<studentGrades>
    <grade>
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        <totalGrade>46.2</totalGrade>
        <usualGrade>21.0</usualGrade>
    </grade>
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        <gender>female</gender>
        <id>201250390</id>
        <major>Geography</major>
        <name>Edward</name>
    </studentInfo>
</studentGrades>
<studentGrades>
    <grade>
        <finalGrade>6.4</finalGrade>
```

```
        <totalGrade>44.9</totalGrade>
        <usualGrade>38.5</usualGrade>
    </grade>
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        <id>201250390</id>
        <major>Geography</major>
        <name>Edward</name>
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</studentGrades>
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        <totalGrade>40.8</totalGrade>
        <usualGrade>7.9</usualGrade>
    </grade>
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        <enrollYear>2023</enrollYear>
        <gender>female</gender>
        <id>201250390</id>
        <major>Geography</major>
        <name>Edward</name>
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        <usualGrade>11.4</usualGrade>
    </grade>
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        <enrollYear>2023</enrollYear>
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        <name>Edward</name>
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        <usualGrade>8.1</usualGrade>
    </grade>
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        <gender>female</gender>
        <id>201250390</id>
        <major>Geography</major>
```

```
        <name>Edward</name>
      </studentInfo>
    </studentGrades>
    <studentGrades>
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        <finalGrade>7.1</finalGrade>
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        <usualGrade>26.2</usualGrade>
      </grade>
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        <name>Edward</name>
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        <id>201250390</id>
        <major>Geography</major>
        <name>Edward</name>
      </studentInfo>
    </studentGrades>
  </ns2:courseGrade>
  <ns2:courseGrade>
    <courseInfo>
      <courseName>Cloud Native</courseName>
    </courseInfo>
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        <id>201250390</id>
        <major>Geography</major>
        <name>Edward</name>
      </studentInfo>
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  <studentGrades>
```

```
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  <totalGrade>82.4</totalGrade>
  <usualGrade>29.6</usualGrade>
</grade>
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  <gender>female</gender>
  <id>201250390</id>
  <major>Geography</major>
  <name>Edward</name>
</studentInfo>
</studentGrades>
<studentGrades>
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    <totalGrade>66.2</totalGrade>
    <usualGrade>10.5</usualGrade>
  </grade>
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    <major>Geography</major>
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  </grade>
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```

```
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        <major>Geography</major>
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<studentGrades>
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    </grade>
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        <id>201250390</id>
        <major>Geography</major>
        <name>Edward</name>
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</studentGrades>
<studentGrades>
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        <gender>female</gender>
        <id>201250390</id>
        <major>Geography</major>
        <name>Edward</name>
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</studentGrades>
<studentGrades>
    <grade>
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        <usualGrade>12.7</usualGrade>
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        <enrollYear>2023</enrollYear>
        <gender>female</gender>
        <id>201250390</id>
        <major>Geography</major>
        <name>Edward</name>
    </studentInfo>
</studentGrades>
<studentGrades>
    <grade>
        <finalGrade>2.5</finalGrade>
        <totalGrade>20.8</totalGrade>
```

```

        <usualGrade>18.3</usualGrade>
    </grade>
    <studentInfo>
        <age>21</age>
        <enrollYear>2023</enrollYear>
        <gender>female</gender>
        <id>201250390</id>
        <major>Geography</major>
        <name>Edward</name>
    </studentInfo>
</studentGrades>
<studentGrades>
    <grade>
        <finalGrade>2.6</finalGrade>
        <totalGrade>7.6</totalGrade>
        <usualGrade>5.0</usualGrade>
    </grade>
    <studentInfo>
        <age>21</age>
        <enrollYear>2023</enrollYear>
        <gender>female</gender>
        <id>201250390</id>
        <major>Geography</major>
        <name>Edward</name>
    </studentInfo>
</studentGrades>
</ns2:courseGrade>
<ns2:courseGrade>
    <courseInfo>
        <courseName>Software Engineering and Computing I</courseName>
    </courseInfo>
    <studentGrades>
        <grade>
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            <totalGrade>78.69999999999999</totalGrade>
            <usualGrade>21.9</usualGrade>
        </grade>
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            <enrollYear>2023</enrollYear>
            <gender>female</gender>
            <id>201250390</id>
            <major>Geography</major>
            <name>Edward</name>
        </studentInfo>
    </studentGrades>
</studentGrades>
<studentGrades>
    <grade>
        <finalGrade>51.0</finalGrade>
        <totalGrade>77.7</totalGrade>
        <usualGrade>26.7</usualGrade>
    </grade>
    <studentInfo>
        <age>21</age>

```



```
        <enrollYear>2023</enrollYear>
        <gender>female</gender>
        <id>201250390</id>
        <major>Geography</major>
        <name>Edward</name>
    </studentInfo>
</studentGrades>
<studentGrades>
    <grade>
        <finalGrade>45.4</finalGrade>
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</ns2:courseGradeList>

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过滤后的结果, FailedCourseGrades.xml:

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