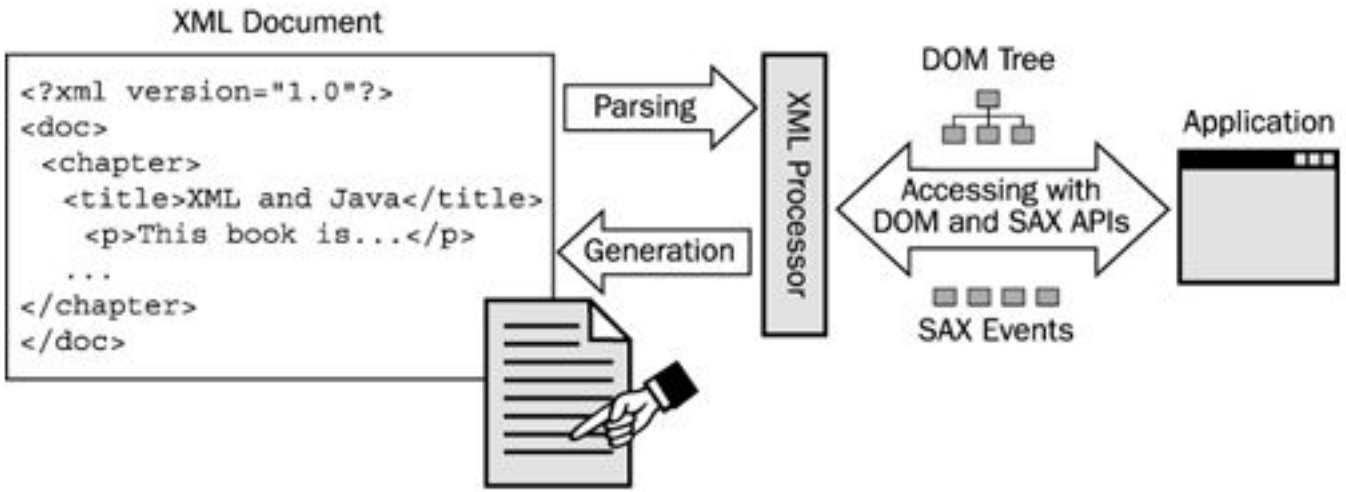
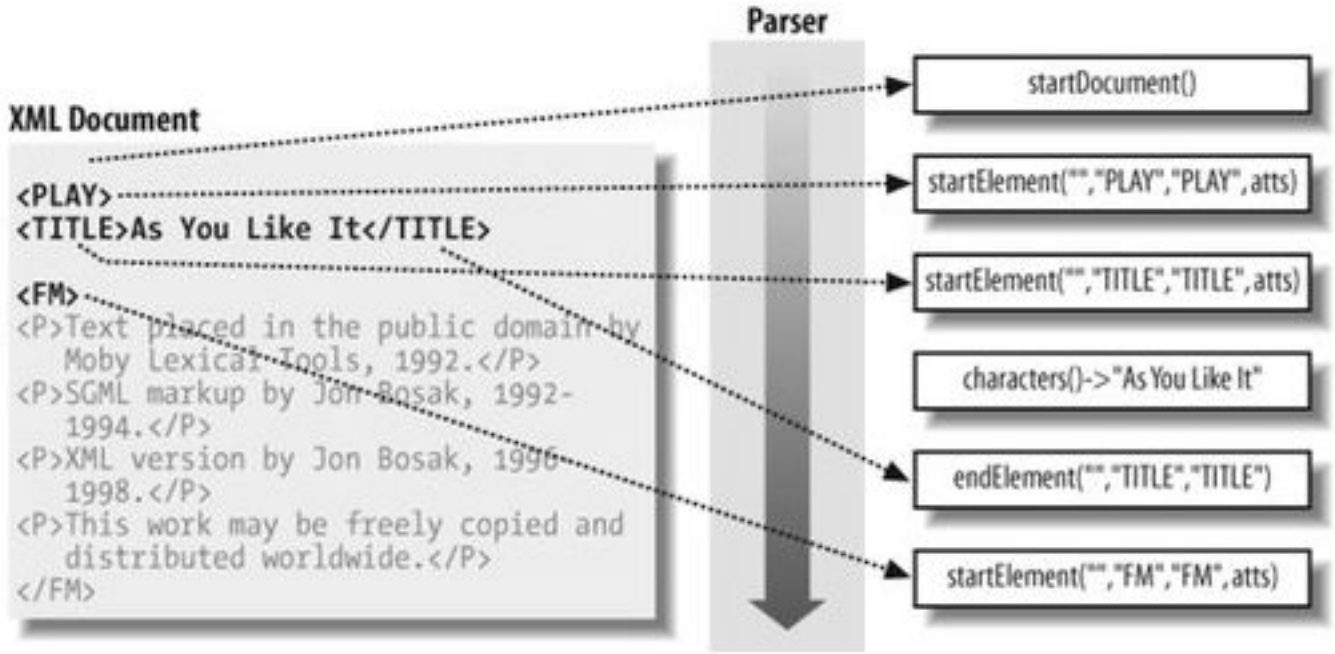
# Delivering Excellence in Software Engineering

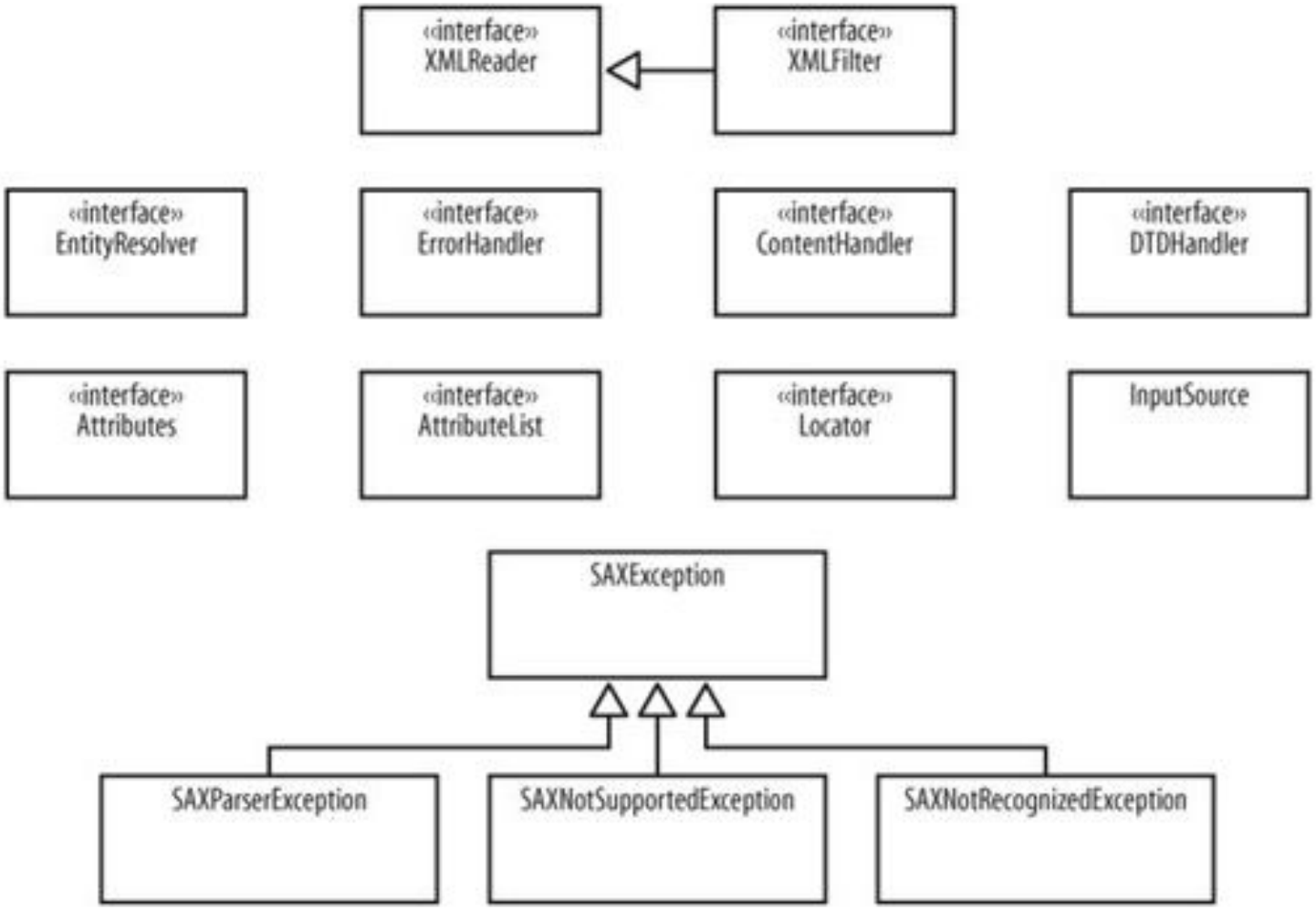
# XML парсеры



# SAX парсер (Simple API for XML)



# SAX API



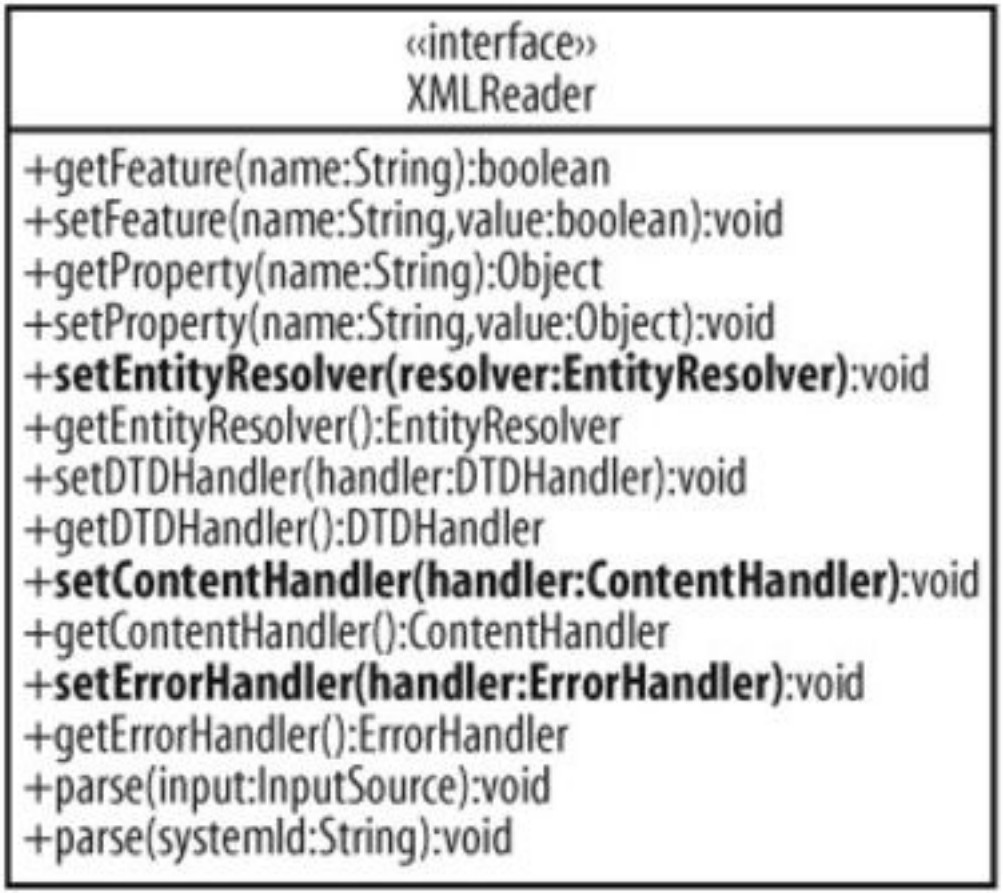
# Использование SAX

```
// Инстанциирование Reader
XMLReader reader = new org.apache.xerces.parsers.SAXParser( );

// Старт парсинг
reader.parse(uri);
```

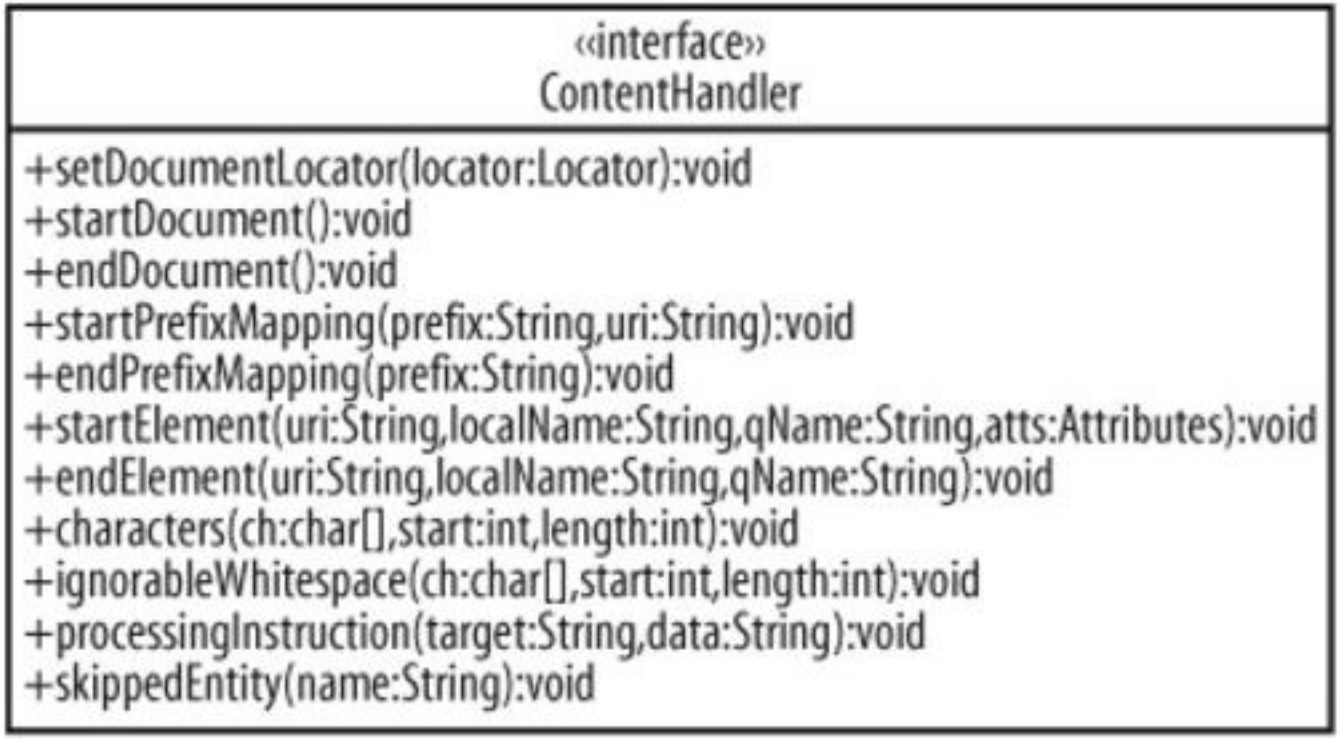
**Выбор другого вендора**

```
java -Dorg.xml.sax.driver=org.apache.xerces.parsers.SAXParser

XMLReader reader = XMLReaderFactory.createXMLReader( );
```

# SAX – XMLReader интерфейс



# SAX – ContentHandler



# SAX события

```
public void setDocumentLocator(Locator locator) {
    // Save this for later use
    this.locator = locator;
}
```

```
public void startDocument( ) throws SAXException {
// No visual events occur here
}

public void endDocument( ) throws SAXException {
// No visual events occur here
}
```

# SAX события

```
<catalog>
    <books>
        <book title="XML" mlns:xlink="http://www.w3.org/1999/xlink">
            <cover xlink:type="simple" xlink:show="onLoad"
        xlink:href="xmlnutCover.jpg"  ALT="XML " width="125" height="350" />
        </book>
    </books>
</catalog>
```

```
public void startPrefixMapping(String prefix, String uri) {
    // No visual events occur here.
    namespaceMappings.put(uri, prefix);
}
public void endPrefixMapping(String prefix) {
// No visual events occur here.
    for (Iterator i = namespaceMappings.keySet( ).iterator( );
        i.hasNext( ); ) {
        String uri = (String)i.next( );
        String thisPrefix = (String)namespaceMappings.get(uri);
    if (prefix.equals(thisPrefix)) {
        namespaceMappings.remove(uri); break;
    }
}
```

# SAX события

**public void startElement(String namespaceURI, String localName, String qName, Attributes atts) throws SAXException**

**public void endElement(String namespaceURI, String localName, String qName) throws SAXException**

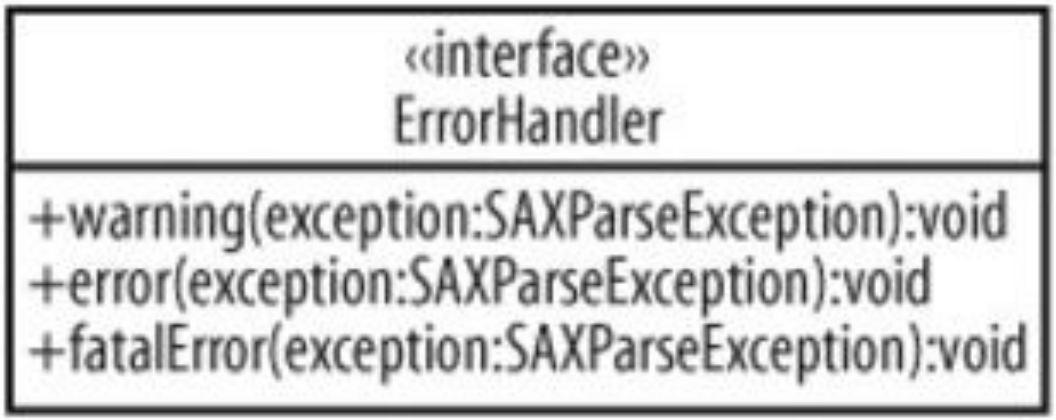
# SAX события

```
public void characters(char[] ch, int start, int length) throws SAXException{

 //Не правильно
    for (int i=0; i<ch.length; i++) {
System.out.println(ch[i]);
    }

//Правильно
     String data = new String(ch, start, length);
}
```

# SAX парсинг

```
// Создаем экземпляр для парсинга
XMLReader reader = XMLReaderFactory.createXMLReader( );

//Создаем ContentHandler
ContentHandler  myHandler = new MyHandler();

//Регистрируем content handler
reader.setContentHandler(myHandler);

// Разбираем InputSource
inputSource = new InputSource(xmlURI);
reader.parse(inputSource);
```

# SAX - ErrorHandler




class MyHandler implements ContentHandler, **ErrorHandler**

# SAX – ErrorHandler события

```
public void warning(SAXParseException exception) throws SAXException
{
    try {
        FileWriter fw = new FileWriter("error.log");
        BufferedWriter bw = new BufferedWriter(fw);
        bw.write("Warning: " + exception.getMessage( ) + "\n");
        bw.flush( );
        bw.close( );
        fw.close( );
    } catch (IOException e) {
        throw new SAXException("Could not write to log file", e);
    }
}
```

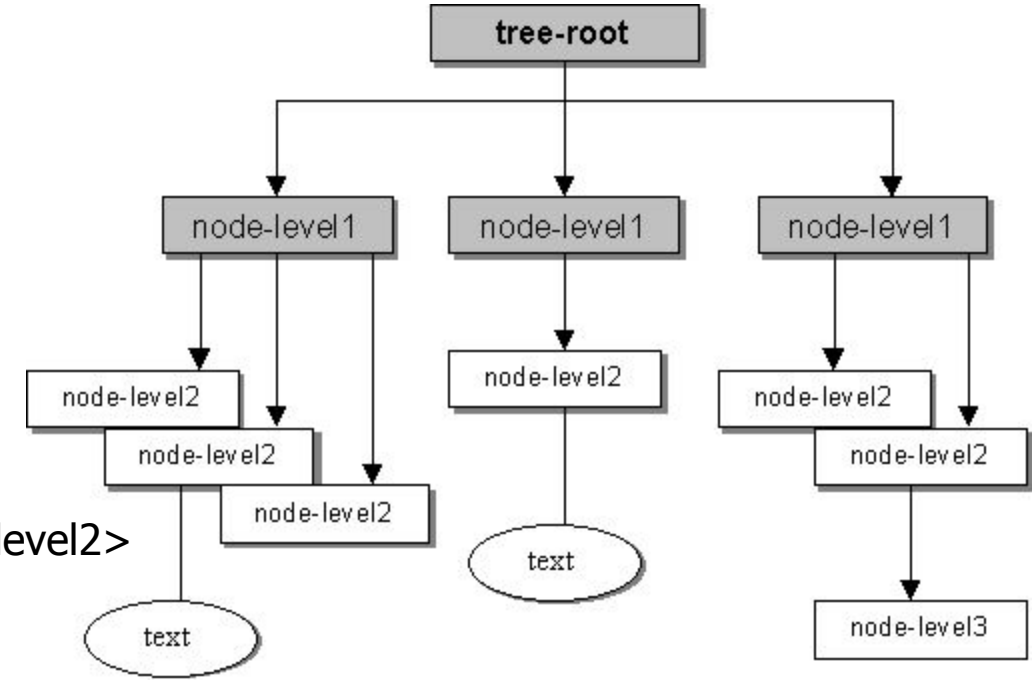
# SAX – ErrorHandler события

public void error(SAXParseException exception) throws SAXException

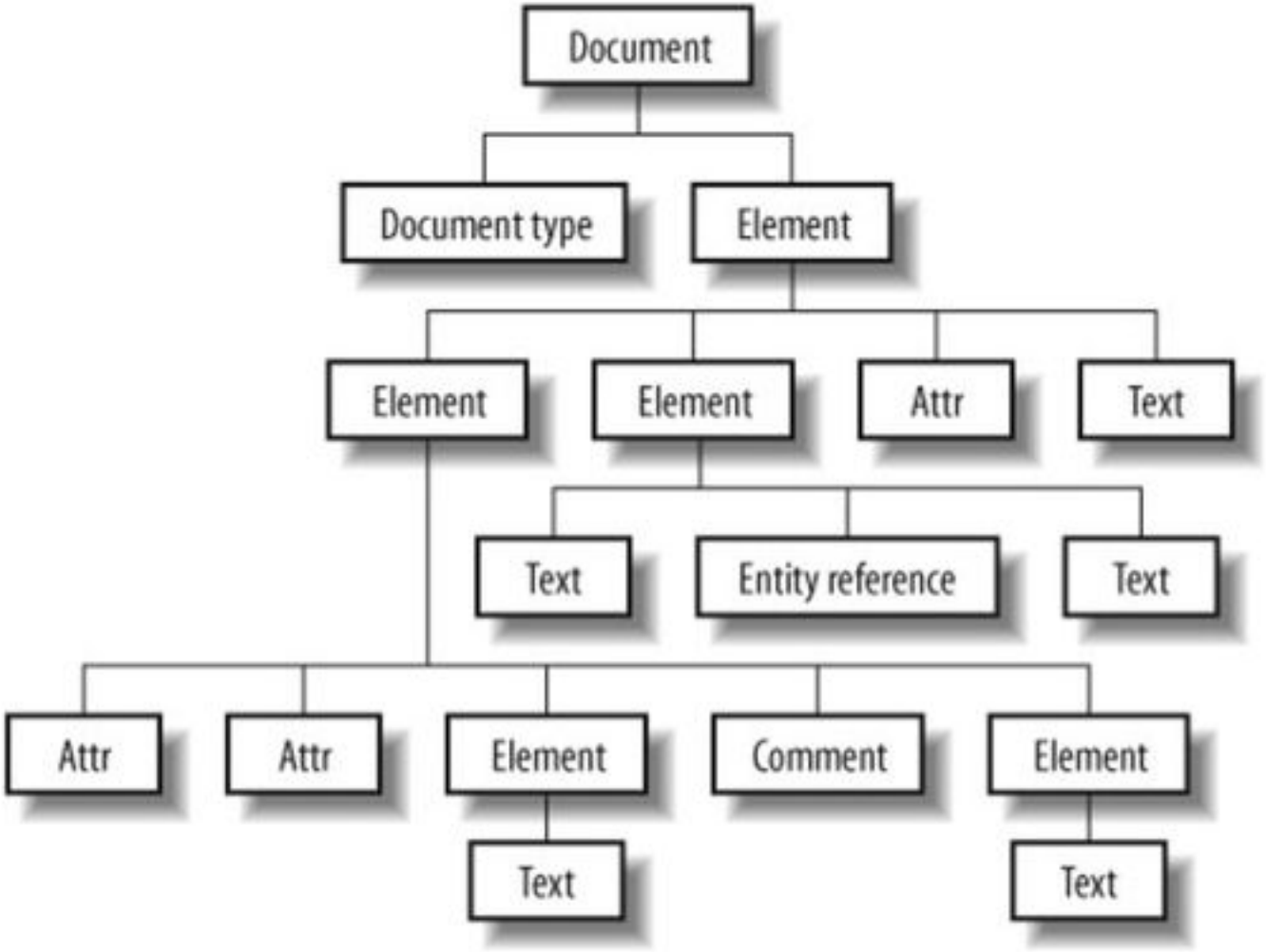
public void fatalError(SAXParseException exception) throws SAXException

# DOM модель

```
<tree-node>
  <node-level1>
    <node-level2/>
    <node-level2>text</node-level2>
    <node-level2/>
  </node-level1>
<node-level1>
   <node-level2>text</node-level2>
<node-level1>
    <node-level2/>
    <node-level2><node-level3/></node-level2>
</node-level1>
</tree-node>
```



# Структура DOM



# DOM парсинг

```
import org.apache.xerces.parsers.DOMParser;
…
public void test(OutputStream outputStream) throws Exception
{
    DOMParser parser = new DOMParser( );

    // Get the DOM tree as a Document object
    FileInputStream fis = new FileInputStream(inputXML);
    parser.parse(new InputSource(fis));
    Document doc = parser.getDocument( );
}
```

# DOM - типы элементов

```
// Determine action based on node type
switch (node.getNodeType( ))
{
    case Node.DOCUMENT_NODE: break;
    case Node.ELEMENT_NODE: break;
    case Node.TEXT_NODE: break;
    case Node.CDATA_SECTION_NODE: break;
    case Node.COMMENT_NODE: break;
    case Node.PROCESSING_INSTRUCTION_NODE: break;
    case Node.ENTITY_REFERENCE_NODE: break;
    case Node.DOCUMENT_TYPE_NODE: break;
}
```

# Создание XML документа

**Создание DOM дерева**

```
DOMImplementation domImpl = new DOMImplementationImpl( );
Document doc = domImpl.createDocument(null, "item", null);
Element root = doc.getDocumentElement( );
```

**Добавление атрибута id**

```
root.setAttribute("id", id);
```

**Создание нового элемента и текста в нем**

```
Element nameElement = doc.createElement("name");
Text nameText = doc.createTextNode(name);
nameElement.appendChild(nameText);
root.appendChild(nameElement);
```

# DOM - изменение XML

**Изменение содержания элемента**

```
NodeList nameElements = root.getElementsByTagName("name");
Element nameElement = (Element)nameElements.item(0);
Text nameText = (Text)nameElement.getFirstChild( );
nameText.setData(name);
```

**Получение *description* элемента**

```
NodeList descriptionElements =
root.getElementsByTagName("description");
Element descriptionElement = (Element)descriptionElements.item(0);
```

**Удаление и создание другого *description элемента***

```
root.removeChild(descriptionElement);
descriptionElement = doc.createElement("description");
Text descriptionText = doc.createTextNode(description);
descriptionElement.appendChild(descriptionText);
root.appendChild(descriptionElement);
```

# DOM Serialization

**Задаем формат DOM**

```
OutputFormat format = new OutputFormat(doc);
```

**Создаем Writer и Serializer**

```
StringWriter stringOut = new StringWriter();
XMLSerializer serial = new XMLSerializer(stringOut, format);
```

**получаем интерфейс DOMSerializer**

```
serial.asDOMSerializer();
```

**Сериализуем  XML и получаем строку**

```
serial.serialize(doc.getDocumentElement());
String result = stringOut.toString()
```

# Использование Xerces

**(1) Xerces: DOM parser**

```
import org.w3c.dom.Document;
import org.apache.xerces.parsers.DOMParser;
import org.w3c.dom.Document;

String filename;
...
DOMParser parser = new DOMParser();
parser.parse(filename);
Document doc = parser.getDocument();
```

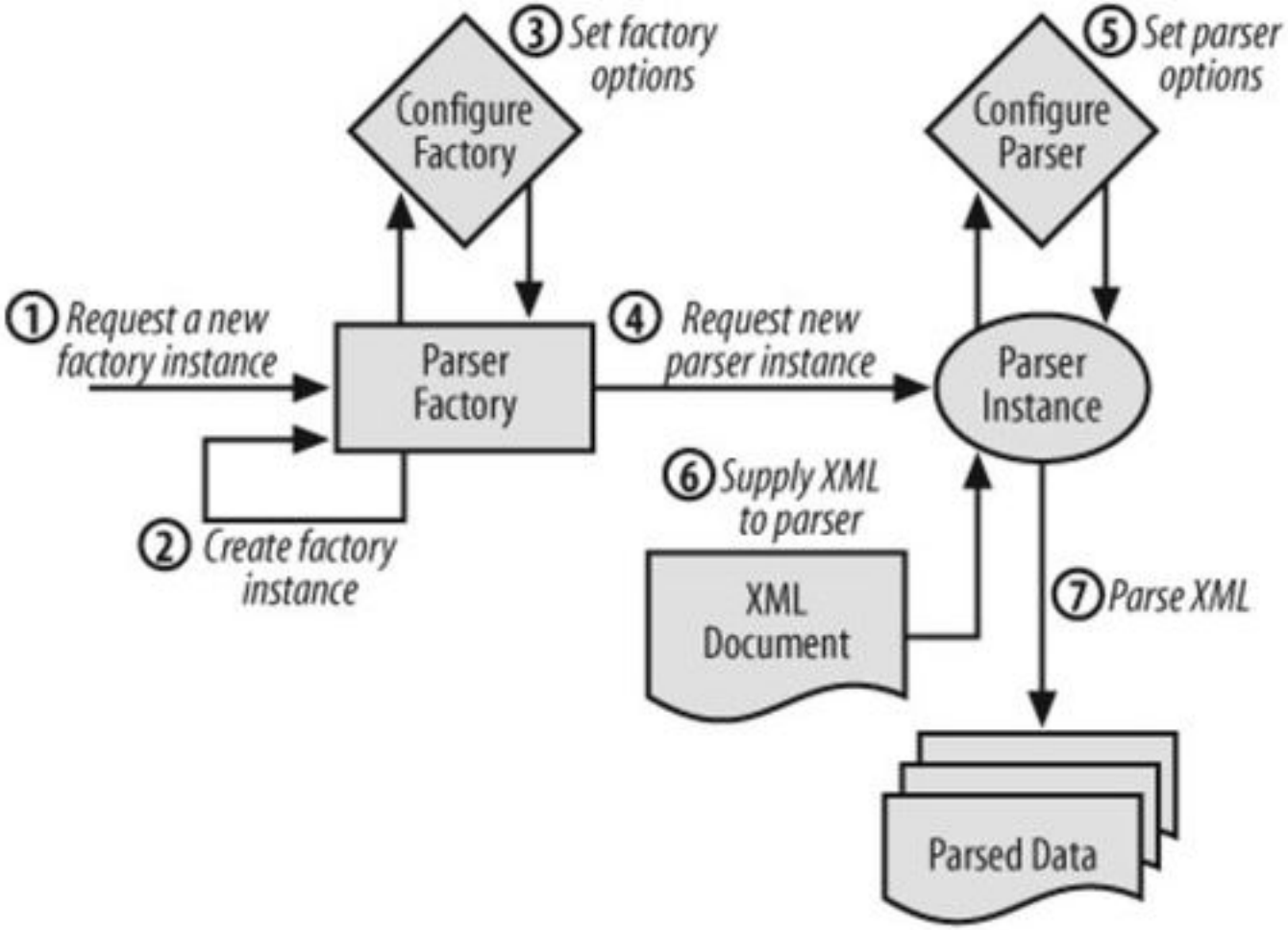
**(2) Xerces: SAX parser**

```
import org.xml.sax.helpers.XMLReaderFactory;
import org.xml.sax.XMLReader;
import org.xml.sax.helpers.DefaultHandler;
import org.w3c.dom.Document;
DefaultHandler handler; String filename;
...
XMLReader parser = XMLReaderFactory.createXMLReader();
parser.setContentHandler(handler);
parser.setDTDHandler(handler);
parser.setErrorHandler(handler);
parser.parse(filename);
```

# Java Abstraction Layer for XML Processing (JAXP)

- **XML Parsing and Validation**
- **XSL Processing**
- **XPath**

# XML парсинг с помощью JAXP



# Использование JAXP

**(1) JAXP: DOM parser**

```
import javax.xml.parsers.DocumentBuilderFactory;
import javax.xml.parsers.DocumentBuilder;
import org.w3c.dom.Document; String filename;
...
DocumentBuilderFactory factory = DocumentBuilderFactory.newInstance();
DocumentBuilder builder = factory.newDocumentBuilder();
Document doc = builder.parse(filename);
```

**(2) JAXP: SAX parser**

```
import javax.xml.parsers.SAXParser;
import javax.xml.parsers.SAXParserFactory;
import org.xml.sax.helpers.DefaultHandler;
import org.w3c.dom.Document;
DefaultHandler handler;
String filename;
...
SAXParserFactory factory = SAXParserFactory.newInstance();
SAXParser parser = factory.newSAXParser();
parser.parse(filename, handler);
```

# StAX (Streaming API for XML)

- **Работа с документом во время парсинга как в SAX.**
- **Приложение руководит порядком разбора**

# StAX – создание XmlStreamReader

```
StringReader stringReader = new StringReader(documentAsString);
XMLInputFactory inputFactory = XMLInputFactory.newInstance( );
XmlStreamReader reader =
    inputFactory.createXMLStreamReader(stringReader);
```

# StAX - XmlStreamReader интерфейс

# StAX - Разбор документа

```
while (reader.hasNext( ))
{
    int type = reader.next( );
    switch (type)
    {
        case XMLStreamConstants. START_DOCUMENT: …
        case XMLStreamConstants.END_DOCUMENT: …
        case XMLStreamConstants.START_ELEMENT: …
        case XMLStreamConstants.END_ELEMENT: …
        case XMLStreamConstants. CHARACTERS: …
        case XMLStreamConstants. ATTRIBUTE: …
        case XMLStreamConstants. CDATA: …
        case XMLStreamConstants. NAMESPACE: …
        case XMLStreamConstants. COMMENT: …
        case XMLStreamConstants. ENTITY_DECLARATION: …
        …
    }
}
```

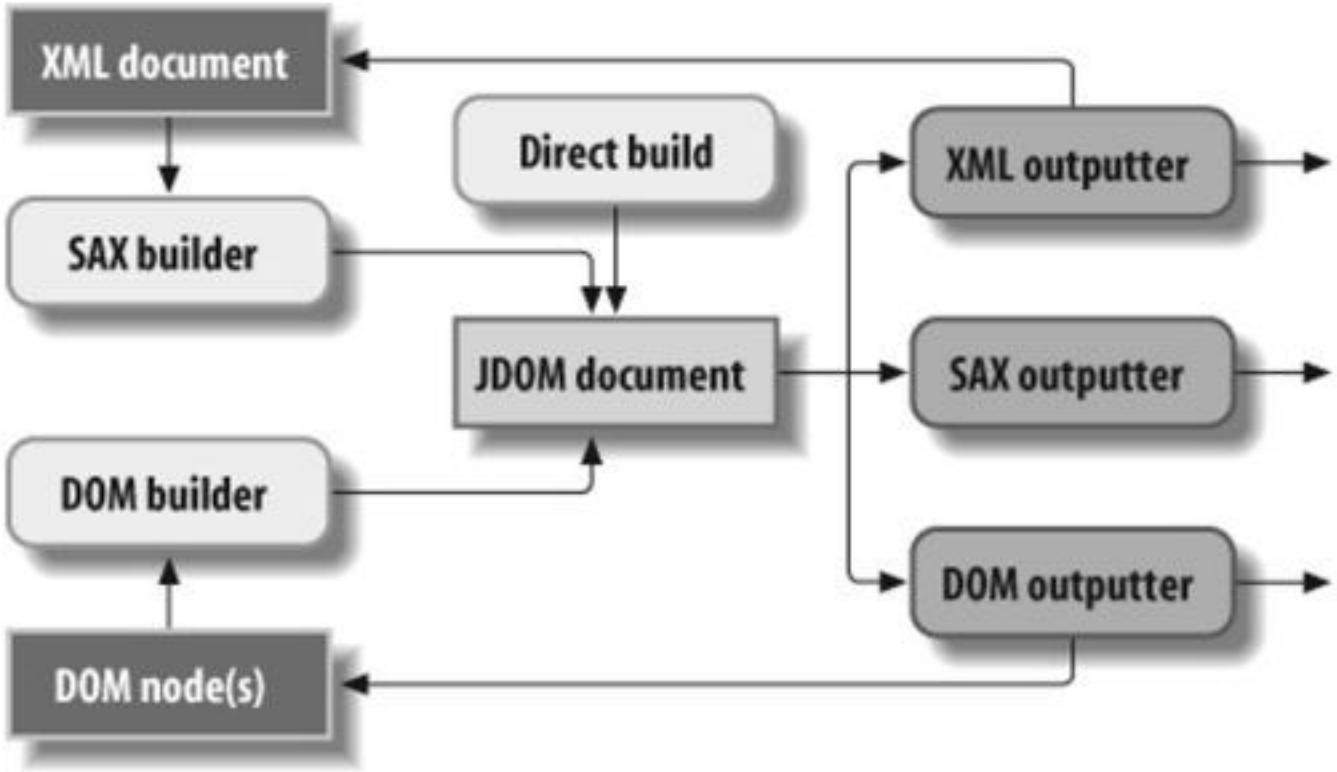
# StAX – создание документа

```
import javax.xml.stream.XMLOutputFactory;
import javax.xml.stream.XMLStreamWriter;

public class SimpleStreamOutput {
    public static void main(String[] args) throws Exception
    {
        XMLOutputFactory outputFactory = XMLOutputFactory.newInstance( );
        XMLStreamWriter writer = outputFactory.createXMLStreamWriter(System.out);

        writer.writeStartDocument("1.0");
        writer.writeStartElement("person");
        writer.writeStartElement("name");
        writer.writeStartElement("first_name");
        writer.writeCharacters("Alan");
        writer.writeEndElement( );
        writer.writeEndElement( );
        writer.writeEndElement( );
        writer.writeEndDocument( );
        writer.flush( );
    }
}
```

# JDOM

- **Java представление XML модели.**
- **Не является парсером.**
- **Основан на классах.**
- **Имеет поддержку Xpath.**
- **Поддерживает XSLT трансформацию с помощью своего класса унаследованного от TrAX API Template класса.**

# JDOM



# JDOM

## Создание JDOM модели из SAX events и DOM модели

```
SAXBuilder builder = new SAXBuilder( );
Document doc = builder.build(new FileInputStream("contents.xml"));

DOMBuilder builder = new DOMBuilder( );
Document doc = builder.build(myDomDocumentObject);
```

## Преобразование JDOM в DOM и в SAX events

```
DOMOutputter outputter = new DOMOutputter( );
org.w3c.dom.Document domDoc = outputter.output(myJDOMDocumentObject);

SAXOutputter outputter = new SAXOutputter( );
outputter.setContentHandler(myContentHandler);
outputter.setErrorHandler(myErrorHandler);
outputter.output(myJDOMDocumentObject);
```

## Вывод JDOM

```
XMLOutputter outputter = new XMLOutputter( );
outputter.output(jdomDocumentObject, new FileOutputStream("results.xml"));
```

# dom4j

- Java представление XML модели
- Не является парсером
- Часть API похожа с JDOM
- Основан на интерфейсах
- Имеет поддержку Xpath
- Интегрируется с JAXP для XSLT

# dom4j

**Чтение документа**

```
File file = new File(path);
SAXReader reader = new SAXReader( );
Document doc = reader.read(file);
```

**Создание документа**

```
DocumentFactory factory = DocumentFactory.getInstance( );
Document doc = factory.createDocument( );
```

**или**

```
Document doc = DocumentHelper.createDocument( );
```

**Добавление элемента**

**долгий способ**

```
Element myElement = factory.createElement("name");
doc.add(myElement);
```

**быстрый способ**

```
doc.addElement("name");
```

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