AIXM Viewer Implementation

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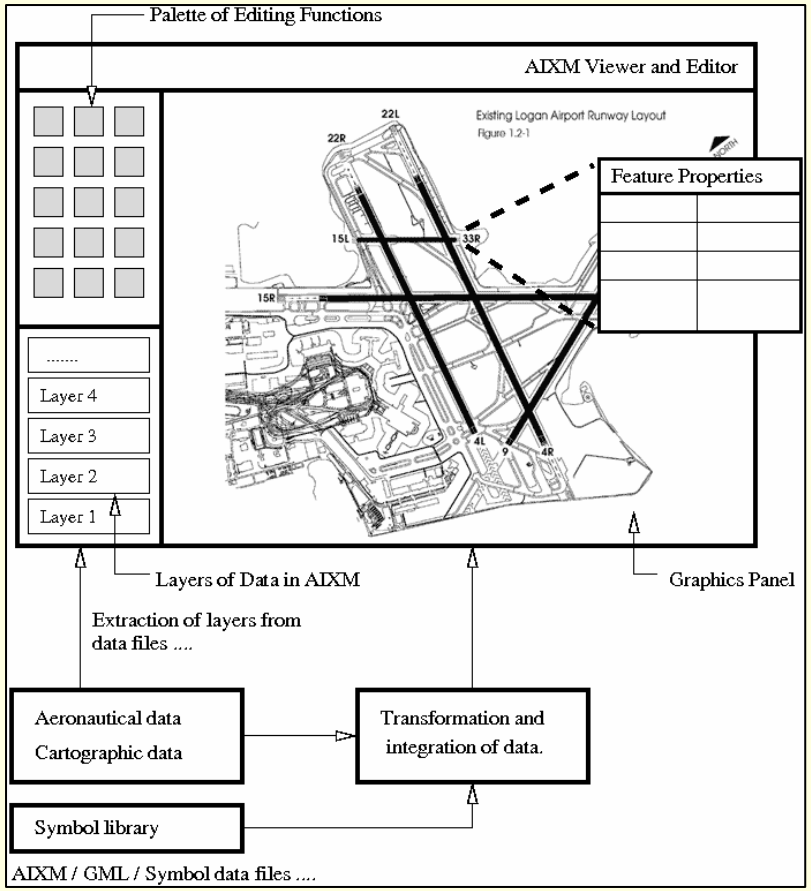
AIXM Viewer Requirements

- In practice, AIXM Viewer should be able to read xml files, display the content including the AIXM features and properties. It also must be able to manipulate that Information.
- As a first cut, the reader must read AIXM files, which are based on gml 3.x (xml format). These files have to conform to an AIXM schema.



Solutions

- Write your own parser to read in and write xml files and your own wrapper (the viewer).
- Not practical and time consuming. AIXM specification consists of thousand of objects.

- Find an automated way to read xml files based on provided XML Schema.
- More challenging.

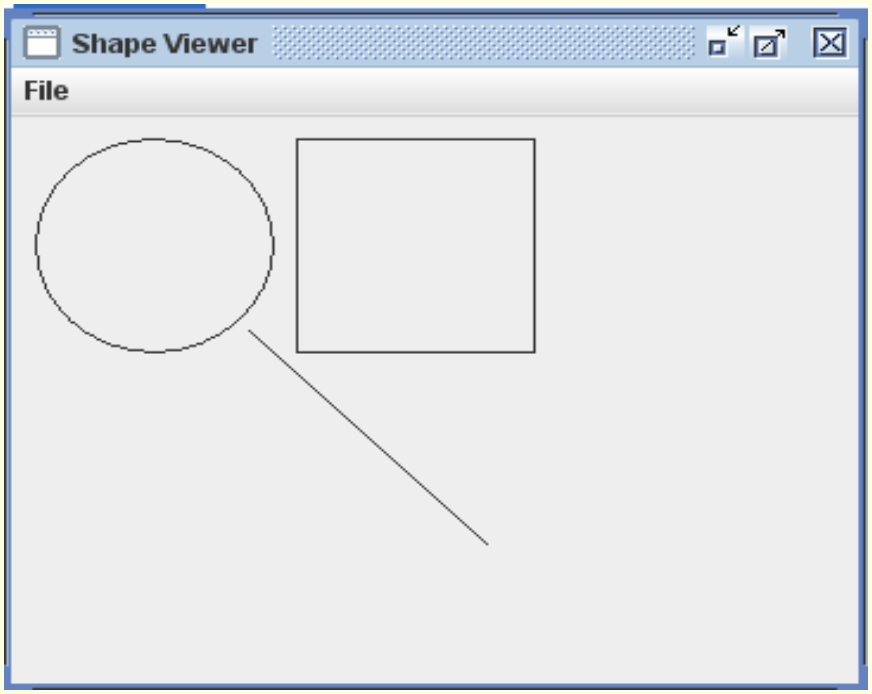
Finding the tools: JAXB

- JAXB Java Architecture for XML binding.
  - Binds XML Schema to a relevant source code. It provided several good features:
  - The Unmarshaller provides the client application the ability to convert XML data into a tree of Java content objects. As a result the programmer does not have to write all the java code for visualization of xml objects
  - The Marshaller provides the client application the ability to convert a Java content tree back into XML data. Therefore, it can automatically save java objects into the xml format.

AIXM Viewer with JAXB

- The steps for creating an AIXM Viewer would include:
- Converting AIXM Schema into java source classes and objects with JAXB.
- Creating wrapping classes for visualization and manipulation of the AIXM messages.
- Incorporating GML viewer's functionality.

Shape Viewer Prototype




```
<?xml version="1.0" encoding="UTF-8"?>

<shapes
xmlns:xsi='http://www.w3.org/2001/XMLSchema-instance'

xsi:noNamespaceSchemaLocation='file:/C:/FAA/shapevie
wer/src/shapeviewer/shapes/Shapes.xsd'>

   <shape name = "circle" id ="1">
      <x1>10</x1>
      <y1>10</y1>
      <x2>100</x2>
      <y2>100</y2>
   </shape>

   <shape name = "square" id ="3">
      <x1>120</x1>
      <y1>10</y1>
      <x2>100</x2>
      <y2>100</y2>
   </shape>

   <shape name = "line" id="2">
      <x1>100</x1>
      <y1>100</y1>
      <x2>200</x2>
      <y2>200</y2>
   </shape>

</shapes>
```

Unmarshalling

```
<?xml version="1.0" encoding="UTF-8"?>

<xsd:schema
xmlns:xsd="http://www.w3.org/2001/XMLSchema">
   <xsd:element name="shapes" type = "shapesType"/>
   <xsd:complexType name = "shapesType">
      <xsd:sequence>
         <xsd:element name ="shape"
maxOccurs="unbounded">
            <xsd:complexType>
               <xsd:sequence>
                  <xsd:element name ="x1" type ="xsd:int"/>
                  <xsd:element name ="y1" type ="xsd:int"/>
                  <xsd:element name ="x2" type ="xsd:int"/>
                  <xsd:element name ="y2" type ="xsd:int"/>
               </xsd:sequence>
               <xsd:attribute name = "name" type="xsd:string"/>
               <xsd:attribute name = "id" type="xsd:int"/>
            </xsd:complexType>
         </xsd:element>
      </xsd:sequence>
   </xsd:complexType>

</xsd:schema>
```

```
public static class Shape {

      protected int x1;
      protected int y1;
      protected int x2;
      protected int y2;
      @XmlAttribute
      protected Integer id;
      @XmlAttribute
      protected String name;

public int getX1() {
         return x1;
      }

public void setX1(int value) {
         this.x1 = value;
      }

public int getY1() {
         return y1;
      }

public void setY1(int value) {
         this.y1 = value;
      }
...
...
...
```

Unmarshalling

- Opening an XML file requires three easy steps.

```
// After the source files are generated from the schema,
// unmarshall them into a memory tree
JAXBContext jc = JAXBContext.newInstance("shapeviewer.shapes.generated");
 Unmarshaller u = jc.createUnmarshaller();

 // Get objects from the tree
JAXBElement element = (JAXBElement) u.unmarshal(file);
ShapesType shapes = (ShapesType)element.getValue();

// Pass objects into the panel for drawing
shapeList = shapes.getShape();
panel.setShapeList(shapeList);
```

Challenges

- AIXM Schema needs to be changed in order to be compatible with JAXB technology.
- Huge XML files are usually a problem.
- How to convert a small prototype into a full feature application.

Schema Incompatibility

- Conversion of the schema specifications into java classes imposes programming challenges.
- For example: JAXB does not know how to handle objects derived by extension from objects derived by restriction.
- This is a logical problem that can be fixed only by restructuring the schema.

AIXM Schema

```
<complexType name="AbstractAIXMFeatureBaseType" abstract="true">
<complexContent>
        <restriction base="gml:DynamicFeatureType">
            <sequence>
                <element ref="gml:description" minOccurs="0"></element>
                <element ref="gml:name" minOccurs="0" maxOccurs="unbounded"></element>
                <element ref="gml:boundedBy" minOccurs="0"></element>
            </sequence>
            <attribute ref="gml:id" use="required"></attribute>
        </restriction>
    </complexContent>
  </complexType>

  <complexType name="AbstractAIXMFeatureType" abstract="true">
  <complexContent>
        <extension base="aixm:AbstractAIXMFeatureBaseType">
            <sequence>
                <group ref="aixm:StandardAIXMFeatureProperties"></group>
                <group ref="aixm:DynamicFeatureProperties"></group>
                <element name="featureMetadata" type="aixm:FeatureMetadataPropertyType"
                        minOccurs="0"></element>
            </sequence>
        </extension>
    </complexContent>
  </complexType>
```