Presentation on SEDRIS XML Encoding

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<thead>
<tr>
<th>Document type</th>
<th>Related content</th>
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<tbody>
<tr>
<td>Meeting / Working documents for discussion</td>
<td>Meeting: <strong>VIRTUAL 19 Jul 2021</strong></td>
<td>2022-01-25</td>
<td><strong>INFO</strong> by 2021-07-19</td>
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Description

Presentation on SEDRIS XML Encoding
SEDRIS XML Encoding

ISO/IEC JTC 1/SC 24 Plenary & WG Meetings
(Online Meeting)

July 12 – August 4, 2021 UTC

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Summary

- Summary of SEDRIS DRM
- XML Schema Definition for SEDRIS DRM
- XML Type Definition
- XML Group Definition
- Association Relationship
- STF to XML Conversion
### Basic data types and DRM classes

<table>
<thead>
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<th>Types</th>
<th>Details</th>
<th>Number</th>
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<tr>
<td><strong>Fundamental Data Types</strong></td>
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<tr>
<td><strong>Basic types</strong></td>
<td>Integers, Floating points, Characters</td>
<td>13</td>
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<td>Enumerated data types</td>
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<td>Selection data types</td>
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<td>Array data types</td>
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<td></td>
<td>Record data types</td>
<td>316</td>
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<td><strong>Data types from other standards</strong></td>
<td>Data types from ISO/IEC 18025 (EDCS)</td>
<td>19</td>
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<td></td>
<td>Data types from ISO/IEC 18026 (SRM)</td>
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<td></td>
<td>Data types from ISO 19115 (Geographic Information Metadata)</td>
<td>5</td>
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<tr>
<td><strong>DRM Classes</strong></td>
<td>23 UML Diagrams</td>
<td>307</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>767</td>
</tr>
</tbody>
</table>
XML Schema Definition for SEDRIS DRM (1)

- An aggregate class is defined for each class defined in DRM
  - Define an abstract class as an abstract data type
  - Define properties or a child element for each field of a DRM class
    - Boolean and integer are represented as properties
    - Structured record types are represented as child elements

- In the case that a DRM class is a subclass of another DRM class
  - Define a derived data type extended from the corresponding data type to the upper class
  - Inherit all the properties and the child elements from the base data type, and define the necessary additional properties and child elements

- In the case that a DRM class has a composed-of relationship with another DRM class
  - Define the child element corresponding to the composed-of class
  - Define the multiplicity of child elements as the same mapping cardinality of the composed-of class
  - When a link object exists with the composed-of class, define the corresponding element before the composed-of class
    - Use <link object>
XML Schema Definition for SEDRIS DRM (2)

- In the case that a DRM class has an associated-to relationship with another DRM class
  - Define child elements for representing the object reference
  - Define the types of object reference elements
    - Define the type of IDREF (save the property value of the referenced object)
    - When a link object exists with the associated-to relationship, define a child element
  - Define the name of the object reference element
    - Use the name of the referenced DRM class, or define a separate name when necessary
- Define a group for an abstract DRM class to represent polymorphism of DRM objects
  - Composition of a group: include element definitions for subclasses of an abstract class or group references
    - In the case that subclasses are concrete classes: define elements of the concrete class type
    - In the case that subclasses are abstract classes: refer to the groups for the abstract class
  - In the case that the subject of composed-of or associated-to relationship is an abstract class
    - Refer to the group for the abstract class
    - One element from all child elements included in the group can be used in XML data
XML Type Definition

- Example: `<DRM Primitive Geometry>` (DRM class)
XML Type Definition

- Example: DRMPrimitiveGeometry (define an XML data type)
XML Data Type

- Example: DRMPrimitiveGeometry (define an XML data type)

```xml
<complexType name="DRMPrimitiveGeometry" abstract="true">
  <complexContent>
    <extension base="Q1:DRMGeometryRepresentation">
      <sequence>
        <!-- composed of -->
        <group ref="Q7:colour" maxOccurs="unbounded" minOccurs="0" />
        <element name="imageMappingFunction" type="Q9:DRMImageMappingFunction"
          maxOccurs="unbounded" minOccurs="0"/>
        <element name="lightRenderingProperties" type="Q16:DRMLightRenderingProperties"
          maxOccurs="1" minOccurs="0"/>
        <element name="presentationDomain" type="tns:DRMPresentationDomain"
          maxOccurs="1" minOccurs="0"/>
        <element name="renderingPriorityLevel" type="tns:DRMRenderingPriorityLevel"
          maxOccurs="1" minOccurs="0"/>
        <element name="renderingProperties" type="tns:DRMRenderingProperties"
          maxOccurs="1" minOccurs="0"/>
        <element name="tackPoint" type="tns:DRMTackPoint" maxOccurs="unbounded" minOccurrence="0"/>
        <element name="unionOfPrimitiveGeometry" type="Q11:DRMUnionOfPrimitiveGeometry"
          maxOccurs="1" minOccurs="0"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>
```

Define elements
XML Type Definition

- Link Object
  - Example: `<DRM Classification Related Features>` Class

- `<DRM Classification Data>`
  - `<DRM Feature Hierarchy>`
  - `<DRM Classification Data>`
XML Type Definition

- **Link Object**
  - Use `<linkObject>` elements
  - Use `<sequence>`
XML Type Definition

- Link Object

```xml
<classificationRelatedFeatures>
  unique_descendants="true"
  strict_organizing_principle="false">
</classificationRelatedFeatures>

<linkObject>
  <classificationData tag="1319" />
</linkObject>

<unionOfFeatures>
  unique_descendants="false"
  strict_organizing_principle="true"
  union_reason="1" ordering_reason="1">
...
</unionOfFeatures>

<DRM Feature Hierarchy> and sub-class <DRM Union Of Features>
Note: Order of DRM Composed-of Classes

- No order for DRM composed-of classes
- Example: `<DRM Transmittal Root>`
  - 13 composed of classes
Note: Order of DRM Composed-of Classes

- Example: <DRM Transmittal Root> in Chair and Belle STFs
Note: Order of DRM Composed-of Classes

- XML schema has the order of child elements
  - `<sequence>`
  - Example

```xml
<complexType name="DRMTransmittalRoot">
  <complexContent>
    <extension base="Q6:DRMSEDRIAbstractBase">
      <sequence>
        <element name="dataQuality" type="Q4:DRMDataQuality" />
        <element name="identification" type="Q4:DRMIdentification" />
        <group ref="Q4:baseTimeData" maxOccurs="unbounded" minOccurs="1">
          <element name="colourTabellaLibrary" type="Q11:DRMColourTableLibrary" />
          <element name="dataTabellaLibrary" type="Q11:DRMDataTableLibrary" />
          <element name="environmentRoot" type="tns:DRMEnvironmentRoot" maxOccurs="unbounded" minOccurs="1">
            <element name="imagelibrary" type="Q11:DRMImageLibrary" maxOccurs="1" />
            <element name="modellibrary" type="Q9:DRMModellibrary" maxOccurs="1" />
            <element name="propeySetTableLibrary" type="Q11:DRMPropertySetTableLibrary" maxOccurs="1" />
            <element name="referenceroorigin" type="tns:DRMReferenceOrigin" maxOccurs="1" />
            <element name="soundLibrary" type="Q11:DRMSoundLibrary" maxOccurs="1" />
            <element name="symbolLibrary" type="Q11:DRMSymbolLibrary" maxOccurs="1" />
            <element name="transmittalSummary" type="Q4:DRMTransmittalSummary" maxOccurs="1" />
          </element>
        </group>
      </sequence>
    </extension>
  </complexContent>
</complexType>
```

Should have this order
XML Group Definition

- XML group definition for DRM abstract classes
- Example: `<DRM Primitive Geometry>` class

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class</td>
<td>- <code>&lt;DRM Primitive Geometry&gt;</code></td>
</tr>
<tr>
<td>Superclass</td>
<td>- <code>&lt;DRM Geometry Representation&gt;</code></td>
</tr>
</tbody>
</table>
| Subclass  | - `<DRM Finite Element Mesh>`
|          | - `<DRM Linear Geometry>`
|          | - `<DRM Point>`
|          | - `<DRM Surface Geometry>`
|          | - `<DRM Volume Geometry>` |
| Class    | - `<DRM Linear Geometry>` |
| Superclass | - `<DRM Primitive Geometry>` |
| Subclass  | - `<DRM Arc>`
|          | - `<DRM Line>` |
| Class    | - `<DRM Surface Geometry>` |
| Superclass | - `<DRM Primitive Geometry>` |
| Subclass  | - `<DRM Ellipse>`
|          | - `<DRM Polygon>` |
| Class    | - `<DRM Volume Geometry>` |
| Superclass | - `<DRM Primitive Geometry>` |
| Subclass  | - `<DRM Polyhedron>`
|          | - `<DRM Volume Object>` |
XML Group Definition

- XML group for <DRM Primitive Geometry> class

```xml
<group name="primitiveGeometry">
  <choice>
    <element name="finiteElementMesh" type="Q6:DRMFiniteElementMesh" />
    <group ref="tns:linearGeometry" />
    <element name="point" type="tns:DRMPoint" />
    <group ref="tns:surfaceGeometry" />
    <group ref="tns:volumeGeometry" />
  </choice>
</group>
<group name="linearGeometry">
  <choice>
    <element name="Line" type="tns:DRMLine"></element>
    <element name="arc" type="tns:DRMArc"></element>
  </choice>
</group>
<group name="surfaceGeometry">
  <choice>
    <element name="ellipse" type="tns:DRMEllipse"></element>
    <element name="polygon" type="tns:DRMPolygon"></element>
  </choice>
</group>
<group name="volumeGeometry">
  <choice>
    <element name="volumeObject" type="tns:DRMVolumeObject"></element>
    <element name="polyhedron" type="tns:DRMPolyhedron"></element>
  </choice>
</group>
```

Refer to another group
## XML Group Definition

- Example of the use of XML groups
  - `<DRM Union Of Primitive Geometry>` class

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class</td>
<td><code>&lt;DRM Union Of Primitive Geometry&gt;</code></td>
</tr>
<tr>
<td>Superclass</td>
<td><code>&lt;DRM Union Of Geometry&gt;</code></td>
</tr>
<tr>
<td>Subclass</td>
<td>None.</td>
</tr>
<tr>
<td>Definition</td>
<td>An instance of this DRM class is a <code>&lt;DRM Union Of Geometry&gt;</code> instances that is composed solely of <code>&lt;DRM Primitive Geometry&gt;</code> instances.</td>
</tr>
<tr>
<td>Class diagram</td>
<td><a href="#">Figure 6.369 — DRM_Union_Of_Primitive_Geometry</a></td>
</tr>
<tr>
<td>Inherited field elements</td>
<td></td>
</tr>
<tr>
<td>Field name</td>
<td>Range</td>
</tr>
<tr>
<td>unique_descendants</td>
<td>Boolean</td>
</tr>
<tr>
<td>strict_organizing_principle</td>
<td>Boolean</td>
</tr>
<tr>
<td>union_reason</td>
<td>Union_Reason</td>
</tr>
<tr>
<td>ordering_reason</td>
<td>Ordering_Reason</td>
</tr>
<tr>
<td>Field elements</td>
<td></td>
</tr>
<tr>
<td>Field name</td>
<td>Range</td>
</tr>
<tr>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Composed of (two-way)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>one or more {ordered} <code>&lt;DRMPrimitive Geometry&gt;</code> instances</td>
</tr>
</tbody>
</table>
XML Group Definition

- XML type definition

```xml
<complexType name="DRMUnionOfPrimitiveGeometry">
  <complexContent>
    <extension base="tns:DRMUnionOfPrimitiveGeometry">
      <sequence>
        <group ref="Q5:primitiveGeometry" maxOccurs="unbounded" minOccurs="1"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>
```

Elements included in a group

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XML Group Definition

- XML data

```xml
<geometryModel id="ID_0_0_65">
  <unionOfPrimitiveGeometry
    unique_descendants="true"
    strict_organizing_principle="true"
    union_reason="3" ordering_reason="1">
    <propertyValue apply_property_inheritance="true">
      <collisionVolume/>
    </propertyValue>
  </unionOfPrimitiveGeometry>

  <!-- <polygon> #1 -->
  <polygon polygon_flags="COLLIDIBLE DECAL HAT_TEST PI
  
  <!-- <polygon> #2 ~ #28 생략 -->
  </unionOfPrimitiveGeometry>
</geometryModel>
```
Association Relationship

- Association relationship between DRM objects

![Diagram showing association relationships between DRM objects]
Association Relationship

- Belle STF

Depth output

Focus output
Association Relationship

- Belle STF

Focus output
Association Relationship

- XML schema design

**DRMFeatureEdge type**

**DRMLinearFeature type**
Association Relationship

- XML type definition

```xml
<complexType name="Association">
  <attribute name="to" type="IDREF" use="required"/>
</complexType>

<complexType name="AssociationWithEdgeDirection">
  <complexContent>
    <extension base="Q4:Association">
      <sequence>
        <element name="edgeDirection" type="tns:DRMEdgeDirection" />
      </sequence>
    </extension>
  </complexContent>
</complexType>

<complexType name="DRMLinearFeature">
  <complexContent>
    <extension base="tns:DRMPrimitiveFeature">
      <sequence>
        <!-- Associated with -->
        <element name="featureEdge" type="tns:AssociationWithEdgeDirection" maxOccurs="unbounded" minOccurs="1">
          <!-- refer to DRMFeatureEdge instance -->
        </element>
      </sequence>
    </extension>
  </complexContent>
</complexType>
```
Association Relationship

- XML data
STF to XML Conversion

- STF to XML conversion using SEDRIS XML Schema
Conclusions

- **STF to XML encoding**
  - Define SEDRIS XML schema
  - Convert STF to SEDRIS XML data using the SEDRIS XML schema

- **Implementation**
  - SEDRIS XML Viewer
  - SEDRIS XML data examples based on SEDRIS XML schema

- **NWIP preparation**