

ISO/IEC JTC 1/SC 24/WG 8 "Environmental representation"

Convenorship: BSI

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**Presentation on SEDRIS XML Encoding**

Document type	Related content	Document date	Expected action
Meeting / Working documents for discussion	Meeting: VIRTUAL 19 Jul 2021	2022-01-25	INFO by 2021-07-19

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

Myeong Won Lee (U. of Suwon)

Summary

- Summary of SEDRIS DRM
- XML Schema Definition for SEDRIS DRM
- XML Type Definition
- XML Group Definition
- Association Relationship
- STF to XML Conversion

SEDRIS DRM

- Basic data types and DRM classes

Types		Details	Number
Fundamental Data Types (ISO/IEC 18023-1, Clause 5)	Basic types	Integers, Floating points, Characters	13
		Enumerated data types	25
		Selection data types	54
		Set data types	6
	Structured Types	Array data types	2
		Record data types	316
	Data types from other standards	Data types from ISO/IEC 18025 (EDCS)	19
		Data types from ISO/IEC 18026 (SRM)	20
		Data types from ISO 19115 (Geographic Information Metadata)	5
DRM Classes (ISO/IEC 18023-1, Clause 6)		23 UML Diagrams	307
Total			767

XML Schema Definition for SEDRIS DRM (1)

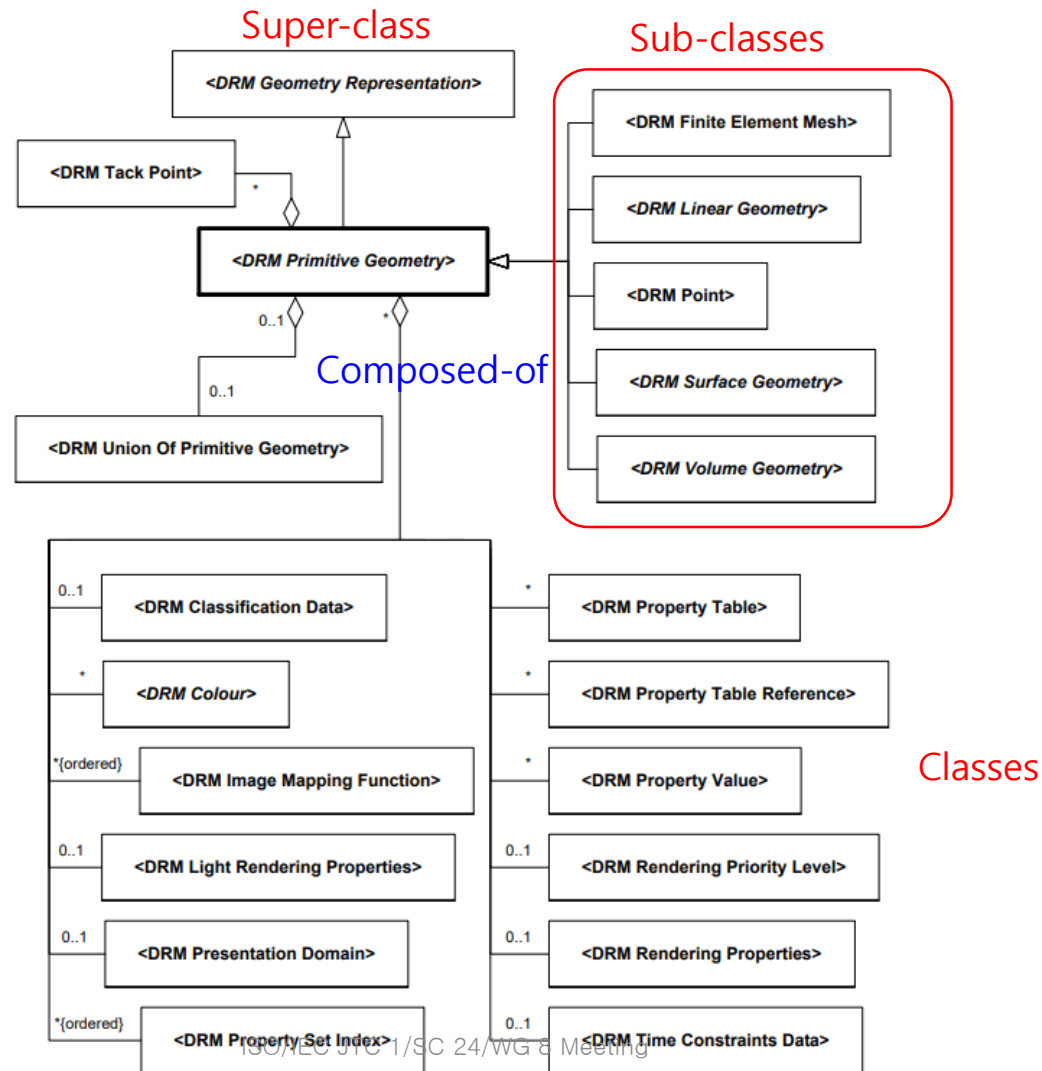
- An aggregate class is defined for each class defined in DRM
 - Define an abstract class as an abstract data type
 - Define properties or a child element for each field of a DRM class
 - Boolean and integer are represented as properties
 - Structured record types are represented as child elements
-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

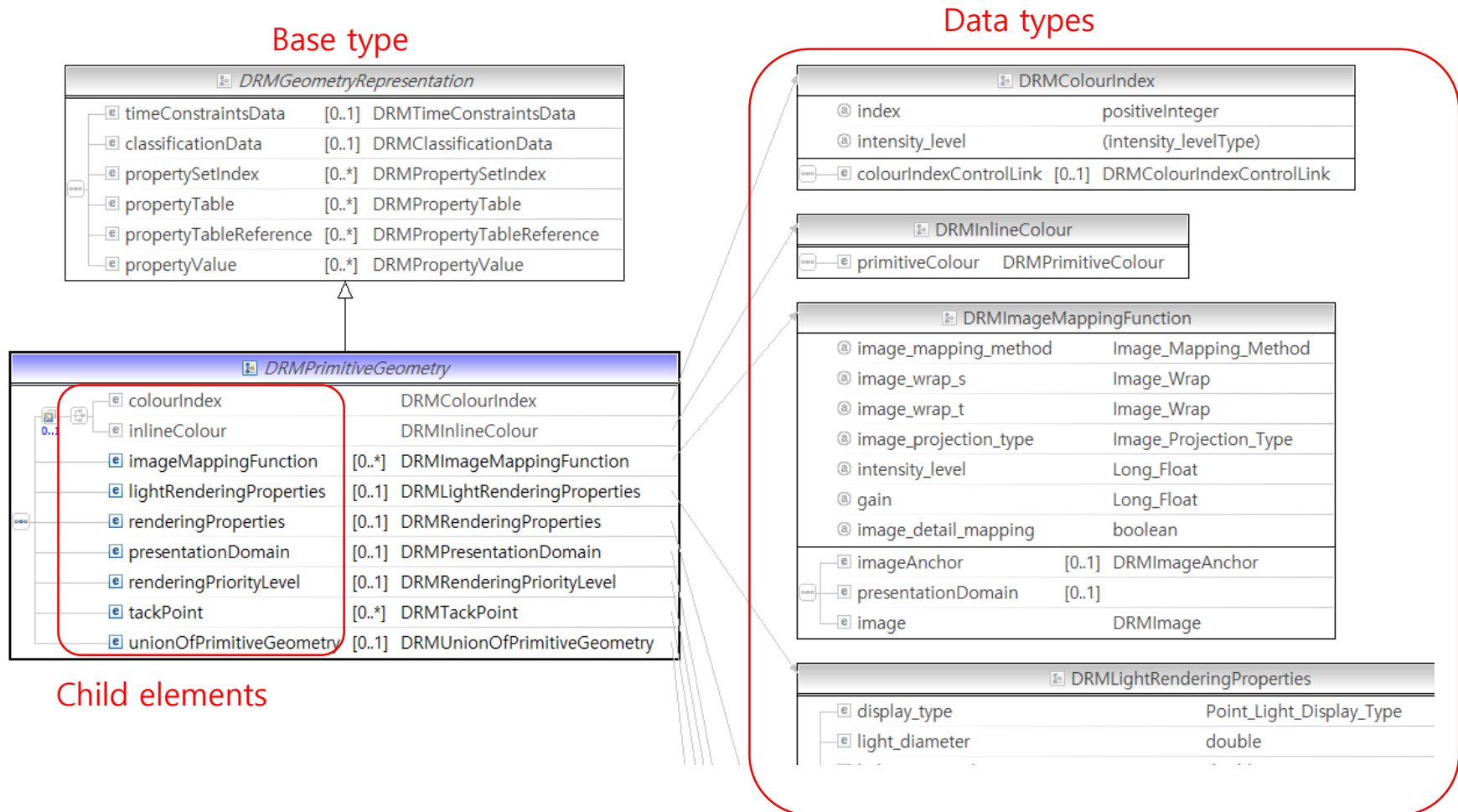
XML Type Definition

- 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)

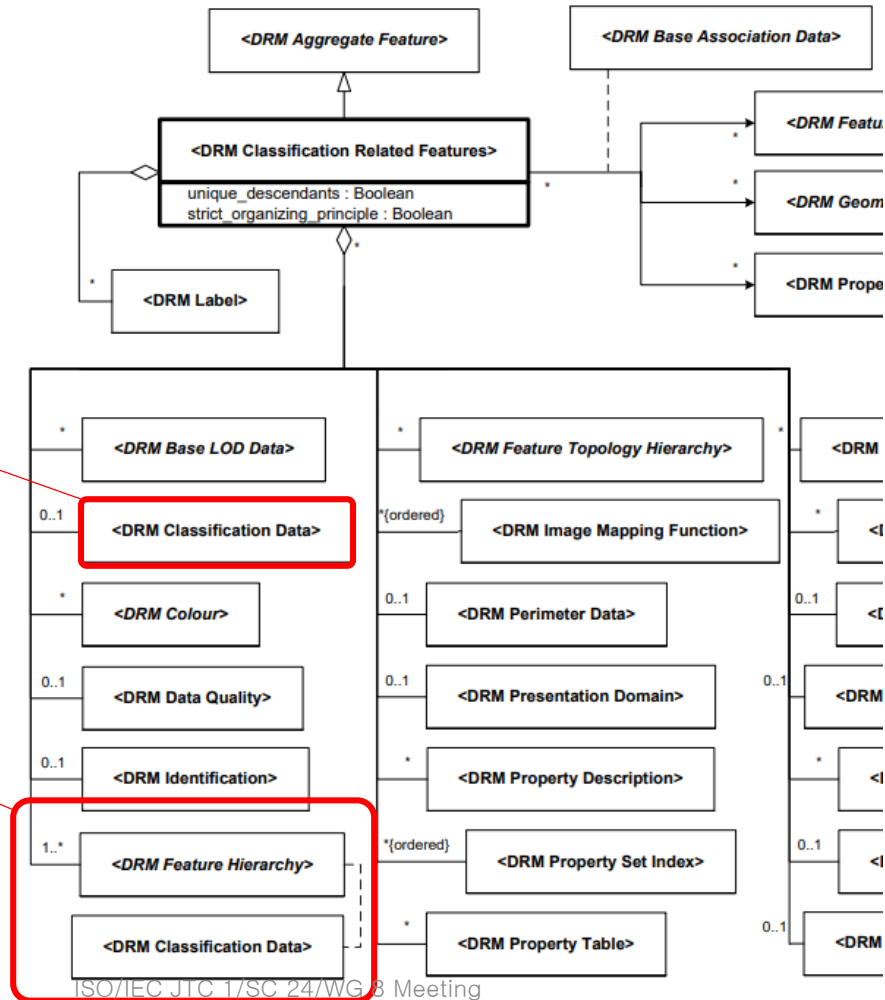
```
<complexType name="DRMPrimitiveGeometry" abstract="true">
  <complexContent>
    <extension base="Q1:DRMGeometryRepresentation">
      <sequence>
        <!-- composed of -->
        <group ref="Q7:colour" maxOccurs="unbounded" minOccurs="0" />
        <element name="imageMappingFunction" type="Q9:DRMImageMappingFunction"
          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" minOccurs="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>

```
<complexType name="DRMClassificationRelatedFeatures">  
  <complexContent>  
    <extension base="tns:DRMAggregateFeature">  
      <sequence>  
        <!-- composed of -->  
        <sequence minOccurs="1" maxOccurs="unbounded">  
          <element name="linkObject">  
            <complexType>  
              <sequence>  
                <element name="classificationData"  
                  type="Q1:DRMClassificationData"/>  
              </sequence>  
            </complexType>  
          </element>  
          <group ref="tns:featureHierarchy" />  
        </sequence>  
      </sequence>  
    </extension>  
  </complexContent>  
</complexType>
```

Link Object

XML Type Definition

- Link Object

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

Link object

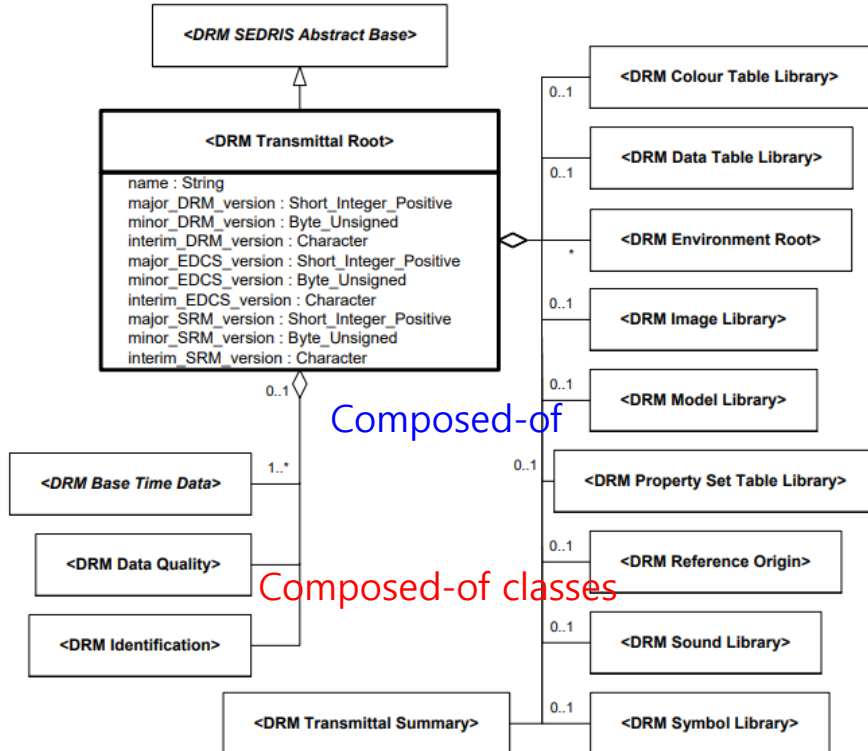
```
<linkObject>  
  <classificationData tag="1319" /> <!--  
</linkObject>
```

<DRM Feature Hierarchy> and
sub-class <DRM Union Of
Features>

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

Note: Order of DRM Composed-of Classes

- No order for DRM composed-of classes
- Example: <DRM Transmittal Root>
 - 13 composed of classes



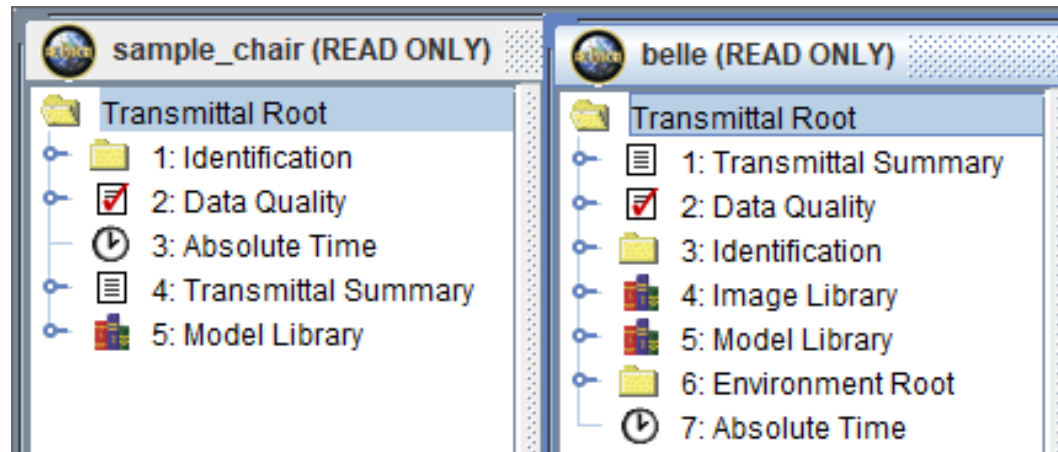
Composed-of

Composed-of classes

Composed of (two-way)	<ul style="list-style-type: none"> • one or more <DRM Base Time Data> instances • zero or one <DRM Colour Table Library> instance • zero or one <DRM Data Table Library> instance • zero or more <DRM Environment Root> instances • zero or one <DRM Image Library> instance • zero or one <DRM Model Library> instance • zero or one <DRM Property Set Table Library> instance • zero or one <DRM Reference Origin> instance • zero or one <DRM Sound Library> instance • zero or one <DRM Symbol Library> instance • one <DRM Transmittal Summary> instance
Composed of (two-way metadata) (inherited)	<ul style="list-style-type: none"> • None.
Composed of (two-way metadata)	<ul style="list-style-type: none"> • one <DRM Data Quality> instance • one <DRM Identification> instance

Note: Order of DRM Composed-of Classes

- Example: <DRM Transmittal Root> in Chair and Belle STFs



Chair STF

Belle STF

Note: Order of DRM Composed-of Classes


- XML schema has the order of child elements

- <sequence>

- Example

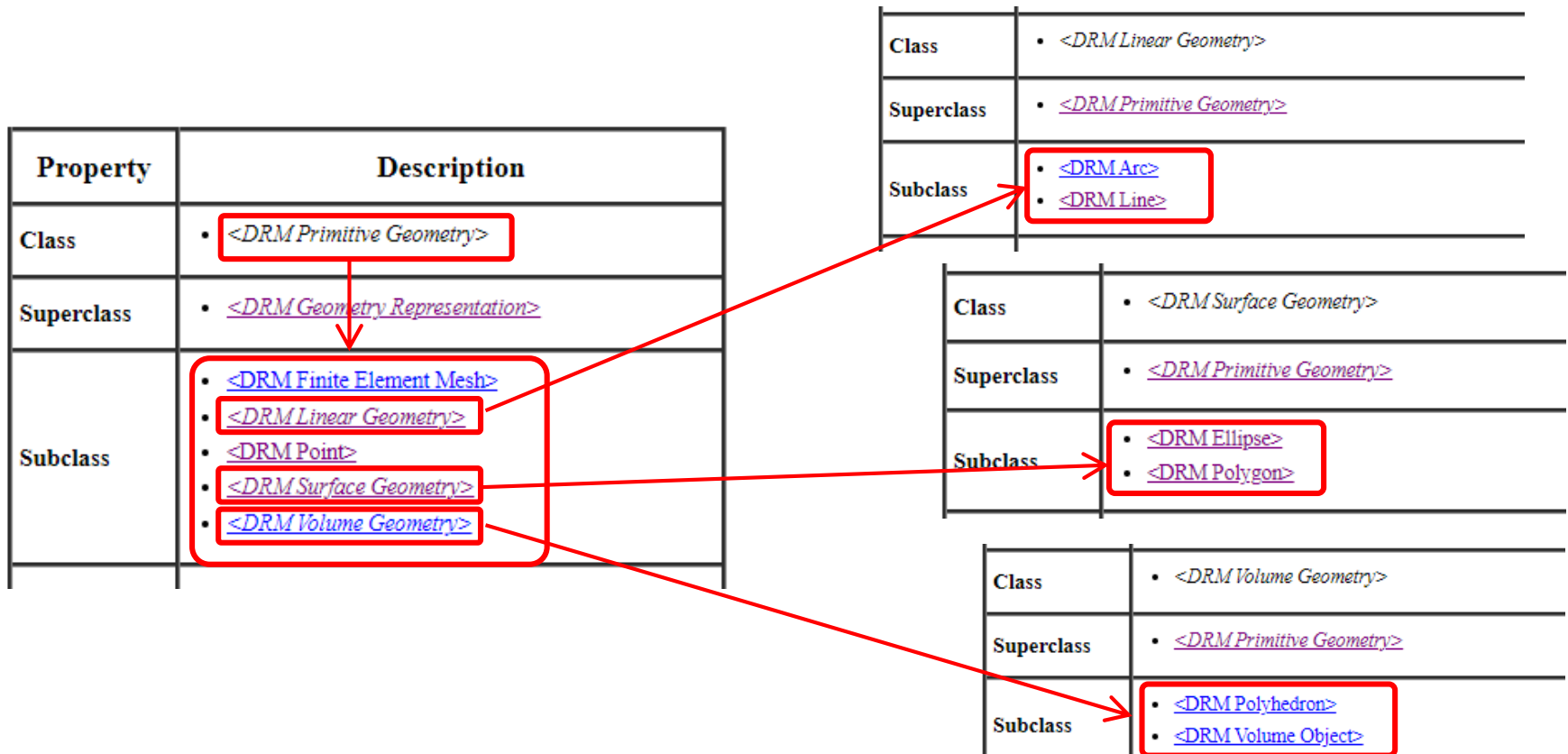
```
<complexType name="DRMTransmittalRoot">
  <complexContent>
    <extension base="Q6:DRMSEDRISAbstractBase">
      <sequence>
        <element name="dataQuality" type="Q4:DRMDataQuality" />
        <element name="identification" type="Q4:DRMIdentification" />
        <group ref="Q4:baseTimeData" maxOccurs="unbounded" minOccurs="1">
          <element name="colourTableLibrary" type="Q11:DRMColourTableLibrary" />
          <element name="dataTableLibrary" 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="propertySetTableLibrary" type="Q11:DRMPropertySetTableLibrary" />
          <element name="referenceOrigin" type="tns:DRMReferenceOrigin" />
          <element name="soundLibrary" type="Q11:DRMSoundLibrary" maxOccurs="1" />
          <element name="symbolLibrary" type="Q11:DRMSymbolLibrary" maxOccurs="1" />
          <element name="transmittalSummary" type="Q4:DRMTransmittalSummary" />
        </group>
      </sequence>
    </extension>
  </complexContent>
</complexType>
```

Should have
this order



XML Group Definition

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



XML Group Definition

- XML group for <DRM Primitive Geometry> class

```
<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

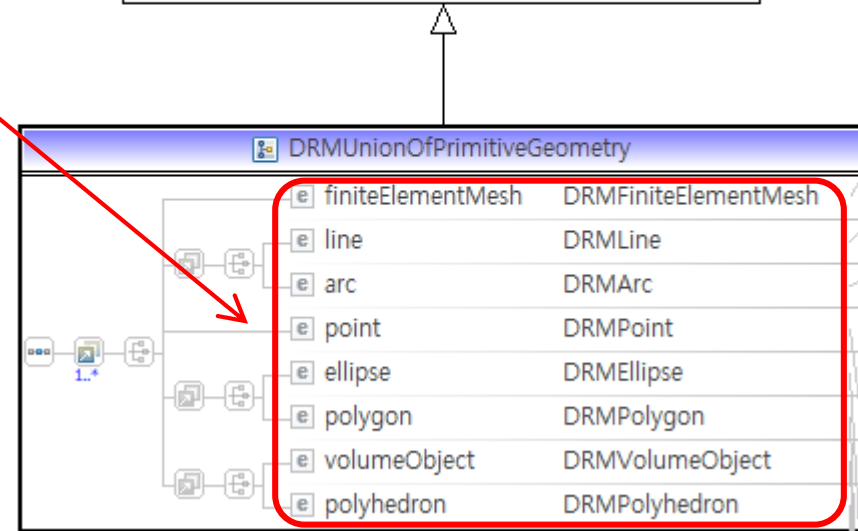
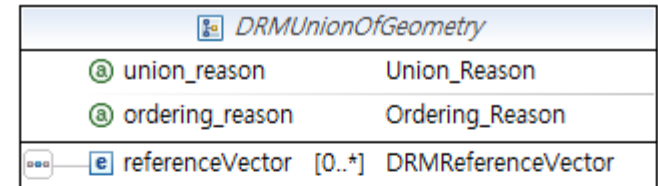
- Example of the use of XML groups
 - <DRM Union Of Primitive Geometry> class

Property	Description															
Class	<ul style="list-style-type: none"> • <DRM Union Of Primitive Geometry> 															
Superclass	<ul style="list-style-type: none"> • <DRM Union Of Geometry> 															
Subclass	<ul style="list-style-type: none"> • None. 															
Definition	An instance of this DRM class is a <DRM Union Of Geometry> instances that is composed solely of <DRM Primitive Geometry> instances.															
Class diagram	Figure 6.369 — DRM_Union_Of_Primitive_Geometry															
Inherited field elements	<table border="1"> <thead> <tr> <th>Field name</th> <th>Range</th> <th>Field data type</th> </tr> </thead> <tbody> <tr> <td>unique_descendants</td> <td></td> <td>Boolean</td> </tr> <tr> <td>strict_organizing_principle</td> <td></td> <td>Boolean</td> </tr> <tr> <td>union_reason</td> <td></td> <td>Union_Reason</td> </tr> <tr> <td>ordering_reason</td> <td></td> <td>Ordering_Reason</td> </tr> </tbody> </table>	Field name	Range	Field data type	unique_descendants		Boolean	strict_organizing_principle		Boolean	union_reason		Union_Reason	ordering_reason		Ordering_Reason
Field name	Range	Field data type														
unique_descendants		Boolean														
strict_organizing_principle		Boolean														
union_reason		Union_Reason														
ordering_reason		Ordering_Reason														
Field elements	<table border="1"> <thead> <tr> <th>Field name</th> <th>Range</th> <th>Field data type</th> </tr> </thead> <tbody> <tr> <td>None</td> <td></td> <td></td> </tr> </tbody> </table>	Field name	Range	Field data type	None											
Field name	Range	Field data type														
None																
Composed of (two-way)	<ul style="list-style-type: none"> • one or more {ordered} <DRM Primitive Geometry> instances 															

XML Group Definition

- XML type definition

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



Elements included in a group

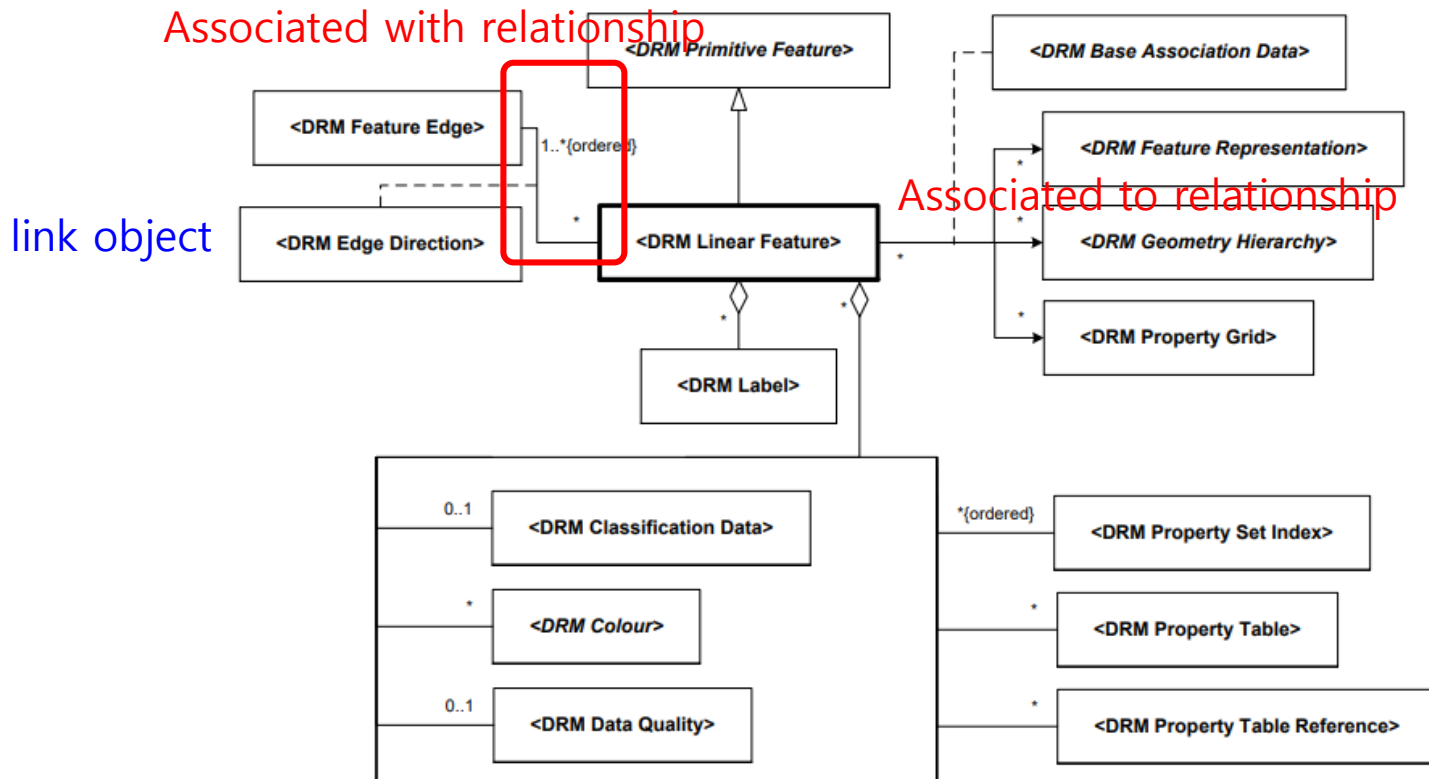
XML Group Definition

- XML data

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

Association Relationship

- Association relationship between DRM objects

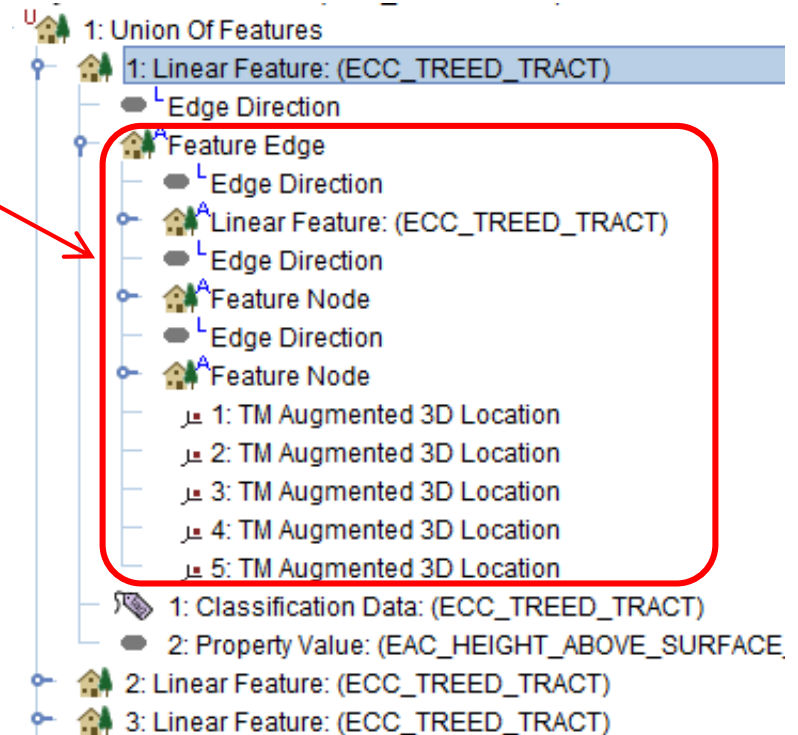


Association Relationship

- Belle STF

- [95F91E60:0,57,234] Union Of Features
- [95F91E60:0,57,236] Linear Feature
- (associated to [95F91E60:0,57,240] Feature Edge through [95F91E60:0,57,241] Edge Direction)
- + - [95F91E60:0,57,241] Edge Direction
- ***
- [95F91E60:0,57,237] Classification Data
- [95F91E60:0,57,238] Property Value
- [95F91E60:0,57,255] Linear Feature
- (associated to [95F91E60:0,58,3] Feature Edge through [95F91E60:0,58,4] Edge Direction)
- + - [95F91E60:0,58,4] Edge Direction
- ***
- [95F91E60:0,58,0] Classification Data
- [95F91E60:0,58,1] Property Value

Depth output

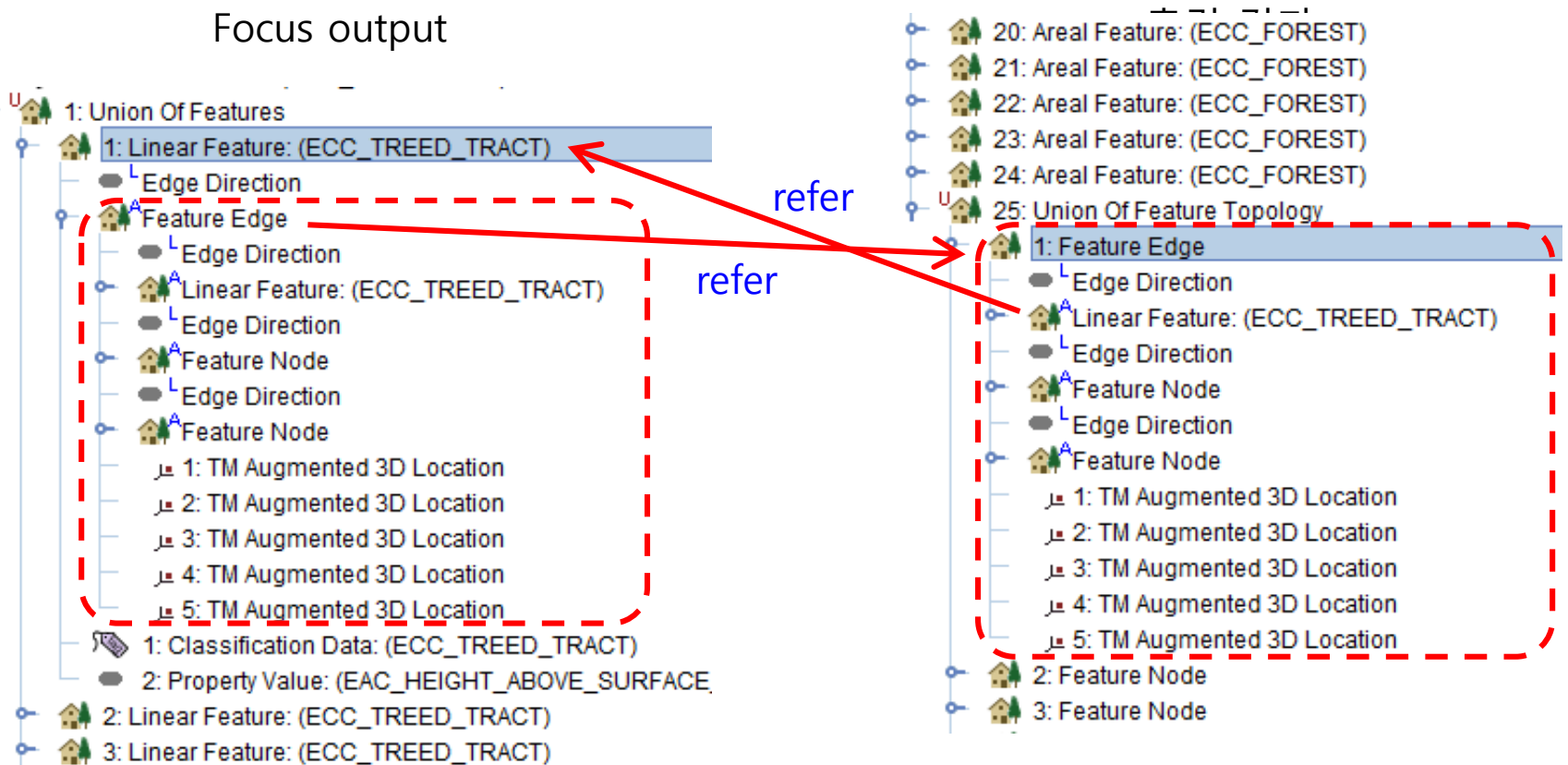


Focus output

Association Relationship

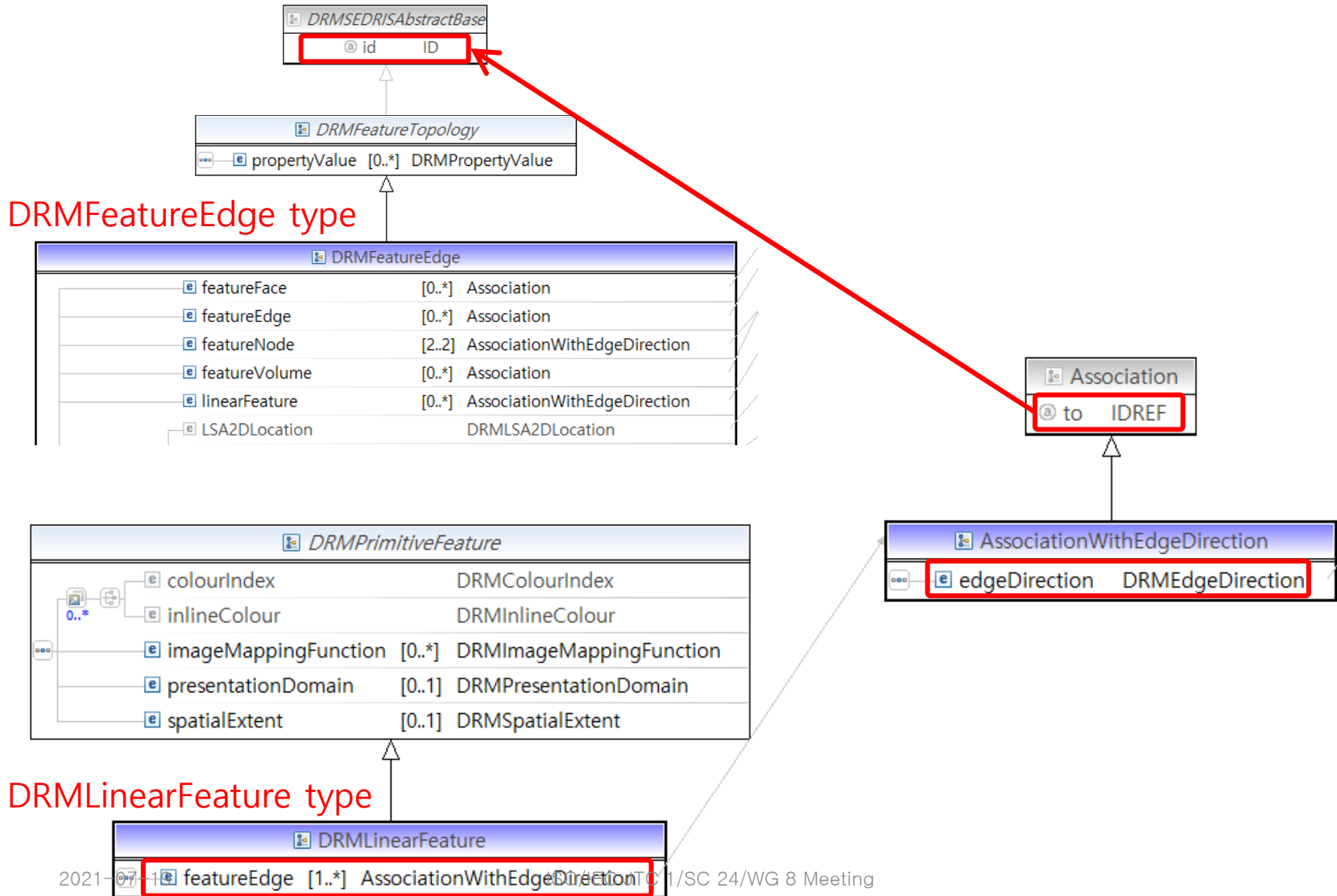
- Belle STF

Focus output



Association Relationship

- XML schema design



Association Relationship

- XML type definition

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

IDREF type property

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

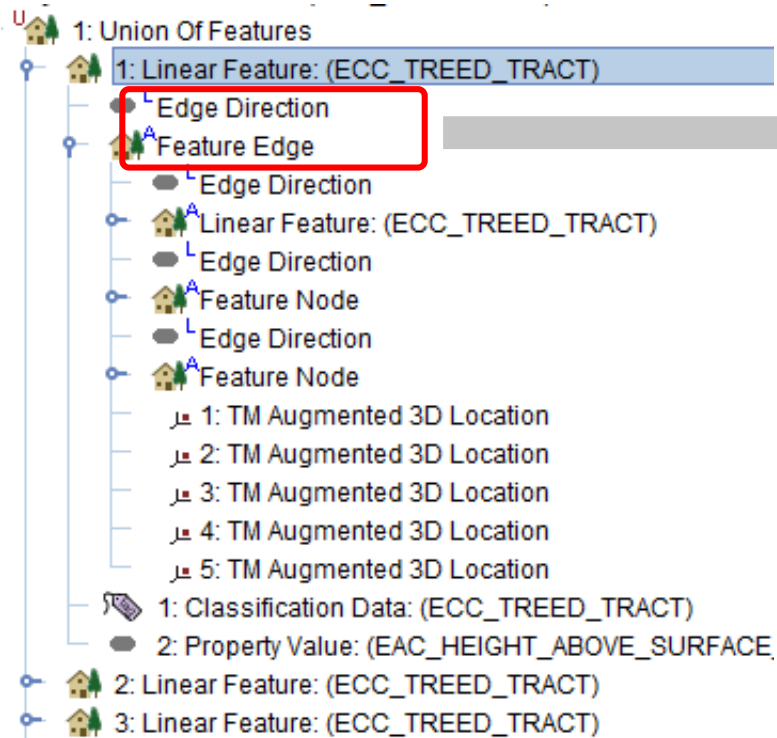
Link Object

```
<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 for DRMFeatureEdge

Association Relationship

- XML data



```
<linearFeature id="ID_0_57_236">
  <classificationData tag="1282" /> <!-- ECC_TREED_TRACT -->
  <propertyValue[]
  <featureEdge to="ID_0_57_240">
    <edgeDirection forwards="true" />
  </featureEdge>
</linearFeature>
```

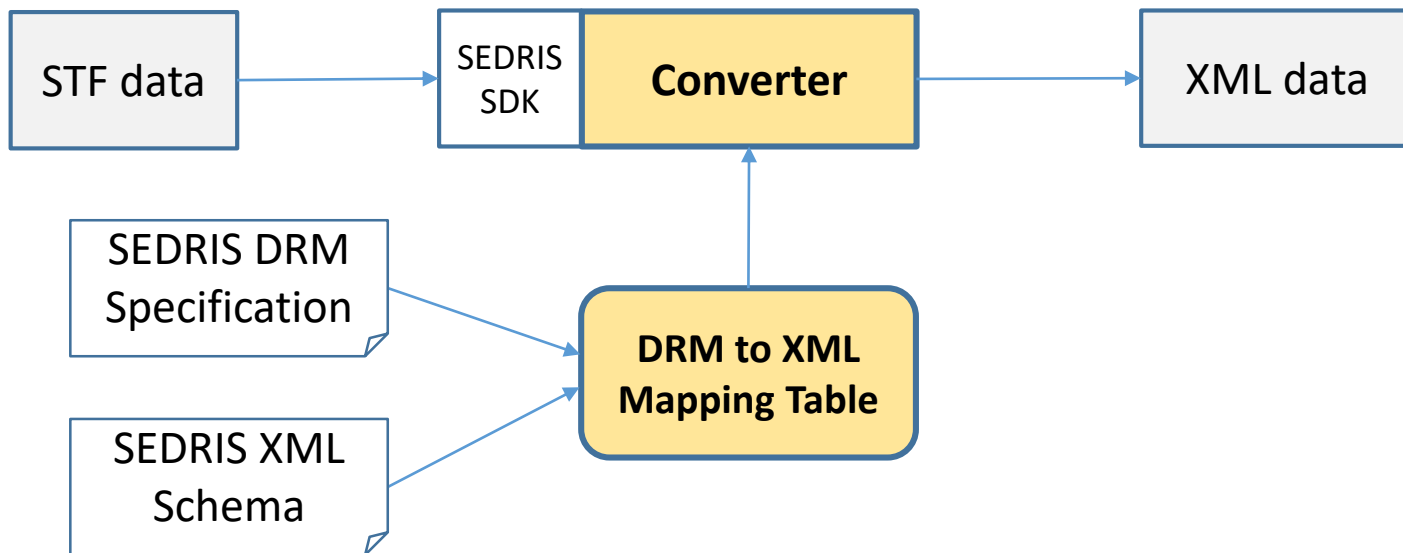
Refer to featureEdge

Refer to linearFeature

```
<unionOfFeatureTopology>
  <featureEdge id="ID_0_57_240">
    <featureNode to="ID_0_57_248">
      <edgeDirection forwards="true" />
    </featureNode>
    <featureNode to="ID_0_57_252">
      <edgeDirection forwards="true" />
    </featureNode>
    <linearFeature to="ID_0_57_236">
      <edgeDirection forwards="true" />
    </linearFeature>
    <TMAugmented3DLocation>
      <coordinate easting="560733.009766"
        northing="5265346.211914"
        ellipsoidal_height="14.363200" />
    </TMAugmented3DLocation>
    <TMAugmented3DLocation>
      <coordinate easting="560587.378906"
        northing="5265346.211914"
        ellipsoidal_height="14.363200" />
    </TMAugmented3DLocation>
  </featureEdge>
</unionOfFeatureTopology>
```

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**