Testbed-11 DGIWG GMLJP2 testing results

Engineering Report

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i. Abstract
This OGC Engineering Report (ER) describes work done in OGC Testbed 11 to test GMLJP2 in terms of defining a DGIWG GMLJP2 version 1 profile.

The requirements for a DGIWG profile of GMLJP2 have been documented in the DGIWG GMLJP2 version 1 profile. The Imagery WG inside DGIWG has developed a filter to map the files produced using the previous GMLJP2 schema into the GMLJP2 version 2 schema and is about to submit a GMLJP2 2.0 profile to DGIWG.

The DGIWG implementation of the GMLJP2 profile is based on the OGC GMLJP2 v2 and other requirements are coming directly from the adoption inside the DGIWG of the new OGC GMLJP2 version 2.

This Testbed 11 activity is a response to the need of harmonization between DGIWG and OGC.

ii. Keywords
The following are keywords to be used by search engines and document catalogues.

ogcedoc, ogc document, GMLJP2, Testbed-11, JPEG2000, GMLCOV, SensorML, Grid, Metadata, imagery

iii. Preface
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Recipients of this document are requested to submit, with their comments, notification of any relevant patent claims or other intellectual property rights of which they may be aware that might be infringed by any implementation of the standard set forth in this document, and to provide supporting documentation.

iv. Business Value
The OGC GMLJP2 2.0 standard bridges an interoperability gap between data and services. This bridging is done by using GMLCOV [09-146r2] and includes GML (3.2 equivalent to ISO 19136) and JPEG2000. Further, GMLJP2 is easily implemented inside WFS-T and WCS-T thus making it easier consuming these data in OGC services. Moreover SensorML integration has been studied and demonstrated in other ERs in OGC Testbed-11. Therefore it will be possible to handle a large variety of imagery (georeferenciable) and subsequently to widen the usage of such standard. The inter-standards coordination managed during this activity demonstrate the feasibility of such format. No changes are foreseen for Sensor ML and GMLJP2 v2 but in the future the adoption of CIS 1.1 could generate a new version of the GMLJP2 or more probably a common imagery data model WG.
As JPEG2000 is widely used in many other markets (medical, film industry, etc.), this could open the door to geo-enabling, or geo-positioning geospatial imagery.

v. Future Work

Improvements in this test and document are desirable to match the new requirements for the geo-referencable imagery once this will be defined in the referenceable coverage extension specification. Moreover if new datasets should be made available this test and document should be improved.

NB: Possible future topics: Integration in Geopackage, Annotated Imagery, multiple codestreams, video encoding (Motion JPEG2000 based).

vi. Submitters

All questions regarding this submission should be directed to the editor or the submitters:

<table>
<thead>
<tr>
<th>Name</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lucio Colaiacomo</td>
<td>EUSC</td>
</tr>
<tr>
<td>Peter Baumann</td>
<td>Jacobs University</td>
</tr>
<tr>
<td>Emmanuel Devys</td>
<td>IGN</td>
</tr>
</tbody>
</table>

1. Scope

The scope of this report is to document testing the modified GDAL¹ library accommodating version 2.0 of the gmljp2 with the objective of defining DGIWG requirements. This activity was part of the Urban Climate Resilience Thread, Phase 11 of the OGC Web Service Testbed Initiative.

2. Conformance

Conformance with this proposed Profile shall be checked using all the relevant tests specified in Annex A (normative) of this document. The framework, concepts, and methodology for testing, and the criteria to be achieved to claim conformance are specified in the OGC Compliance Testing Policies and Procedures and the OGC Compliance Testing website².

¹ http://www.gdal.org/

² www.opengeospatial.org/cite
In order to conform to this profile, a software implementation shall choose to implement:

a) Any one of the conformance levels specified in Annex B (normative).

b) Any one of the Distributed Computing Platform profiles specified in Annexes TBD through TBD (normative).

All requirements-classes and conformance-classes described in this document are owned by the standard(s) identified.

3. References

The following normative documents contain provisions that, through reference in this text, constitute provisions of this document. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the normative document referred to applies.

[1] DGIWG Profile of JPEG2000 for Georeferenced Imagery 1.0.0
[2] DGIWG Profile of JPEG2000 for Georeferenced Imagery 2.0 (DRAFT)
[4] OGC 06-121r3 OGC Web Services Common Specification

4. Terms and Definitions

This document uses the terms defined in Sub-clause 5.3 of [OGC 06-121r8], which is based on the ISO/IEC Directives, Part 2, Rules for the structure and drafting of International Standards. In particular, the word “shall” (not “must”) is the verb form used to indicate a requirement to be strictly followed to conform to this standard.

For the purposes of this document, the following additional terms and definitions apply.

4.1 Rectified Grid

As per ISO 19123, “Grid for which there is an affine transformation between the grid coordinates and the coordinates of an external coordinate reference system”. A rectified grid is defined by an origin in an external coordinate reference system, and a set of offset vectors that specify the direction and distance between grid lines within that external CRS.
4.2 Referenceable Grid
As per ISO 19123, “a referenceable grid is associated with a transformation that can be used to convert grid coordinate values to values of coordinates referenced to an external coordinate reference system”

5. Conventions

This sections provides details and examples for any conventions used in the document. Examples of conventions are symbols, abbreviations, use of XML schema, or special notes regarding how to read the document.

5.1 Abbreviations
AP Application Profile
CRS Coordinate Reference System
DWG Domain Working Group
GML Geographical Markup Language
ISO International Organization for Standardization
O&M Observations and Measurements
SensorML Sensor Markup Language
SWE Sensor Web Enablement
SWG Standards Working Group
WCS Web Coverage Service

5.2 Identifiers
The normative provisions in this document are denoted by the URI

http://www.opengis.net/spec/{standard}/{m.n}

All requirements and conformance tests that appear in this document are denoted by partial URIs which are relative to this base.

6. DGIWG GMLJP2 testing results overview

6.1 Description
Items included in this testbed are:
- DGIWG GMLJP2, e.g orthoimage data and ESM GMLJP2 DTM(object of this Engineering Report
- OGC / DGIWG Georeferenceable extension for GMLJP2 and Sensor Model - Satellite and sensor imagery (future releases of this ER)
- DGIWG WCS Geo Profile for data access JPEG2000 / GMLJP2 extension (future releases of this ER).

6.2 Use cases
They cover testing of codec (georeferenced):

- high resolution optical imagery 8/16/24/32 bit encoding
- high resolution SAR images
- DEM
- Large files (> 2GB to be compressed)
- The same with georeferenceable imagery (not applicable for DEM)
- The above with annotations at the moment only for georeferenceable imagery

The library possibly has been modified to work both with hard disk usage and GPU, at the moment only working on RAM (Satcen requirement)

The following table is resuming use case testing requirements (for GMLJP2 V1 and V2)
<table>
<thead>
<tr>
<th>UC #</th>
<th>Use case</th>
<th>Initiating actor</th>
<th>Receiving actor</th>
<th>Description</th>
<th>Test Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Raster types</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Gray tone</td>
<td>Raster image</td>
<td>File</td>
<td>Raster image with a single band is compressed.</td>
<td>OK</td>
</tr>
<tr>
<td>1.2</td>
<td>RGB</td>
<td>Raster image</td>
<td>File</td>
<td>Colour raster image with three bands denoting Red, Green and Blue respectively, is compressed.</td>
<td>OK</td>
</tr>
<tr>
<td>1.3</td>
<td>Multispectral</td>
<td>Raster image</td>
<td>File</td>
<td>A multispectral image is compressed.</td>
<td>OK</td>
</tr>
<tr>
<td>1.4</td>
<td>Discrete raster</td>
<td>Raster image</td>
<td>File</td>
<td>An image with large solid colour areas is compressed (synthetic image).</td>
<td>PENDING</td>
</tr>
<tr>
<td>1.5</td>
<td>Palletized image</td>
<td>Raster image</td>
<td>File</td>
<td>An image which uses a palette for the colours, i.e. indexed colours, is compressed.</td>
<td>NO-OK</td>
</tr>
<tr>
<td>1.6</td>
<td>Elevation grid</td>
<td>Raster image</td>
<td>File</td>
<td>An elevation grid is compressed.</td>
<td>PENDING</td>
</tr>
<tr>
<td>1.7</td>
<td>Raster map</td>
<td>Raster image</td>
<td>File</td>
<td>A thematic map where the pixel values denotes different objects in the map.</td>
<td>OK</td>
</tr>
<tr>
<td>2</td>
<td>GML</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Geo-rectified</td>
<td>Photogrammetric expert</td>
<td>User</td>
<td>A geo-rectified image has its geo-rectification parameters encoded in GML.</td>
<td>PENDING</td>
</tr>
<tr>
<td>2.2</td>
<td>Ortho-rectified</td>
<td>Photogrammetric expert</td>
<td>User</td>
<td>An ortho-rectified image has its ortho-rectification parameters encoded in GML.</td>
<td>OK</td>
</tr>
</tbody>
</table>
### Metadata

| 3.1 | Embed metadata | Geodata handler | User | The image’s metadata is embedded in the image file. | OK |
| 3.2 | Extract metadata | User | User | The image’s metadata is read from the image file. | APPLICATION TOOL GDAL |

### Annotations

<p>| 4.1 | Annotate an image | Image interpreter | User | An image interpreter annotates an image. The image and its annotations are read by a user. | APPLICATION TOOL, It is possible to generate a GMLJPEG2000V2 with it. But the process of making the annotation is an application tool. (ViewIt) |
| 4.2 | Annotate a set of related images | Image interpreter | User | Image interpreters annotate a set of related images. The images and their annotations are assembled into a package. The user read the images and the annotations from the package. | PENDING |
| 4.3 | Annotate a stereo pair | Image interpreter | User | Image interpreter annotates images in a stereo pair. | |
| 4.4 | Annotate a set of images in a triangulation block | Image interpreter | User | Image interpreter annotates images in a triangulation block. | PENDING |
| 4.5 | Archive a set of images with annotations | User | DB or file archive | User archives a set of images and their annotations. | PENDING |
| 4.6 | Reproject an image with annotations in geosystem | User | File system | An image with annotations should be reprojected to a different reference system. The annotation location should be | PENDING just for DGIWG profile 1.0 |</p>
<table>
<thead>
<tr>
<th>5</th>
<th><strong>Data access</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>5.1</strong> Query WMS or WCS and getting a GMLJP2 file as a response</td>
<td>WMS- or WCS-client</td>
</tr>
<tr>
<td><strong>5.2</strong> Query metadata from a JPIP-server</td>
<td>JPIP-client</td>
</tr>
</tbody>
</table>
6.3 **Performances report**

6.3.1 **Hardware/Software configuration:**
Intel Xeon CPU E5-1620 @ 3.6 Ghz

16GB RAM

Windows 7 64 bit

GDAL library with openjpeg

6.3.2 **Average compression time**
Panchromatic image 716MB 135 sec compression factor 25

Panchromatic image 716MB 110 sec lossless

RGB 24 bit image 346MB 105 sec compression factor 25

RGB 24 bit image 346MB 75 sec lossless

6.4 **Data**

Areas on which imagery, ortho, DSM or DTM are available (why not consider previously available UV14, or future UV16 zone)

CSK (Cosmo-SkyMed) SAR satellite images provided by IT

1 SPOT6 and 1 Pleiades scene provided by Airbus D&S.

6.5 **Technical requirements**

The imagery used for this Testbed activity is orthoimagery 3 bands 8 bits each (small to large files (>2GB), 1 SAR imagery (Cosmo skymed), generic DEM. For hardware and software see 6.3.1

6.6 **Implementation**

The library was implemented using a definition file in which there is the description of the metadata to be managed (see example below Annex A. The metadata section is optional, and can consist of 0 or more metadata specification elements. Each element specifies the file path and type of the metadata (GeoEye, Pleiades, WorldView.) The type
is necessary since the driver must convert the metadata into `<gmljp2:eopMetadata>` on the fly.
Annex A: Conformance Class Abstract Test Suite (Normative)

This annex provides an abstract test suite for GMLJP2 data conforming to the DGIWG profile. Some of these tests require that the tester uses software that gives a good overview of the content in a JPEG2000 file. Annex I in DGIWG profile refer to software that can be used for the abstract test suite.

The test classes refer to the conformance classes that are described in Annex B of reference [1]

A.1. Tests

A.1.1. Georeferenced with GML according to GMLJP2

a) Test purpose: Verify that the GMLJP2 file is georeferenced with GML according to the GMLJP2 standard.

b) Test method: Inspect that the GML georeference exists at its proper location. The required GML structure is labeled “gml.root-instance”.

c) Reference: OGC 05-047r3 - GML in JPEG 2000 for Geographic Imagery (GMLJP2) Encoding

d) Test type: Basic

A.1.2. GML code passes XML schema validation

a) Test purpose: Verify that the GML code referencing the JPEG2000 data is valid according to the XML schema that the DGIWG profile provides. This validation is capable of catching a number of errors.

b) Test method: Extract the GML georeference and validate the code with the xml schema provided by this profile, DGIWGGmlJP2Profile.xsd, which is described by Annex F.2.1.

c) Reference: DGIWG GMLJP2 Profile, Annex F and A.5

d) Test type: Basic.
A.1.3. **GML code has RectifiedGridCoverage**

a) Test purpose: Verify that the GML code has a feature that is a `RectifiedGridCoverage`. The `RectifiedGridCoverage` is the only coverage that is allowed to be used as a georeference in GMLJP2.

b) Test method: Inspect the GML reference. There should be a `RectifiedGridCoverage` at following XPath:

```
/gml:FeatureCollection/gml:featureMember/gml:FeatureCollection/gml:featureMember/gml:RectifiedGridCoverage
```

c) Reference: OGC 05-047r3 - GML in JPEG 2000 for Geographic Imagery (GMLJP2) Encoding. An additional description is in this profile (DGIWG GMLJP2: D.2.1).

d) Test type: Basic.

A.1.4. **The RectifiedGrid contains all required content**

a) Test purpose: Verify that the RectifiedGrid contains all mandatory attributes and elements.

b) Test method: Inspect the GML reference. Inspect the `RectifiedGrid` at following XPath:

```
```

Following elements and attributes should exist:

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>limits</td>
<td>XML element</td>
</tr>
<tr>
<td>origin</td>
<td>XML element</td>
</tr>
<tr>
<td>offsetVector</td>
<td>XML element. Two elements are required.</td>
</tr>
<tr>
<td>axisName</td>
<td>XML element. Two elements are required.</td>
</tr>
<tr>
<td>srsName</td>
<td>XML attribute</td>
</tr>
</tbody>
</table>
c) Reference: OGC 05-047r3 - GML in JPEG 2000 for Geographic Imagery (GMLJP2) Encoding and this profile (DGIWG GMLJP2: D.2.2.1.2).

d) Test type: Basic.

A.1.5. The number of grid cells is the same as the number of pixels

a) Test purpose: Verify that the GML grid have the same number of grid cells as the raster data it is supposed to describe. The raster is interpreted as a grid. That means the RectifiedGrid is a description of the geometric properties of the raster.

b) Test method: Check the actual dimensions of the image. In the GML georeference, check the following XPath:

\[
\]

where the number of grid cells is given as min- and max-coordinates in a coordinate system \((\text{width}, \text{height})\) with its origin at the upper left corner. This system spans from \((0,0)\) to \((\text{raster dimension size} - 1)\). Verify that this is the case.


d) Test type: Basic.
A.1.6. Coordinate lists in GML, have sufficient number of coordinates

a) Test purpose: Verify that the GML code has sufficient number of coordinates at certain places in the GML georeference. GML uses the XML Schema Language type list for allowing more than one coordinate in one element. The XML Schema Language doesn’t allow a schema to put any restrictions on the number of coordinates when using the list type. This means an XML schema validation will not catch that error. Therefore the number of coordinates has to be verified manually in the GML code. Typically, there should be at least two coordinates in one element, but the gml:Point and the gml:offsetVector could have three coordinates in the case of 3D data.

b) Test method: Check that there are at least two coordinates in the GML code at following XPaths:


c) Reference: OGC 05-047r3 - GML in JPEG 2000 for Geographic Imagery (GMLJP2) Encoding

d) Test type: Basic.
A.1.7. The RectifiedGrid refers to a reference system

a) Test purpose: Verify that the reference system is given by the attribute srsName in the RectifiedGrid element.

b) Test method: Inspect that the attribute srsName is used at appropriate place in the GML, i.e. the RectifiedGrid. There are a few places where this attribute can be used. This profile require that this attribute is used at this location:

/gml:FeatureCollection/gml:featureMember/gml:FeatureCollection
/gml:featureMember/gml:RectifiedGridCoverage/gml:rectifiedGridDomain/gml:RectifiedGrid@srsName

c) Reference: OGC 05-047r3 - GML in JPEG 2000 for Geographic Imagery (GMLJP2) Encoding and DGIWG GMLJP2 – D.2.3

d) Test type: Basic

A.1.8. Left-hand order coordinate system is used for WGS84 LL coordinates

a) Test purpose: This profile prescribes that the axis order for WGS84 LL should follow standard practice, i.e., use left-hand order axis (latitude, longitude). This test is not applicable for UTM/WGS84, which uses right-hand order axis.
b) Test method: It is not advisable to test this by inspecting the image in GIS software, because that might instead highlight the axis handling in the software. One important part of the problem is that both types of axis orders are common in the software. This profile tries to achieve unification in the handling of axis orders, which is in line with the recommendation of GML 3.2.1. Therefore inspect the coordinates directly in the GML code at following XPaths:

   While using WGS84-LL, the axis order shall be left-handed.

   While using WGS84-LL, the axis order shall be left-handed.

c) Reference: DGIWG GMLJP2 Profile – D.2.2.1.3 and 6.3 for an illustration

d) Test type: Basic

A.1.9. **Image coordinate system gives the coordinates in the correct order**

a) Test purpose: The image coordinates does not follow the same rule as the ground coordinates. The image coordinates shall always be given in following order (width, height).

   The axis order shall be given as width and height in that order. This can only be inspected in a test case there the image is not square.

c) Reference: DGIWG GMLJP2 Profile – D.2.2.1.3

d) Test type: Basic
A.1.10. Metadata extent is coherent with the GML extent

a) Test purpose: Verify that the extent information in the metadata is coherent with the `RectifiedGridCoverage` that gives the extent of the GMLJP2 file.

b) Test method: Inspect the GML reference and the metadata extent information. The extent should be the same area. The `RectifiedGridCoverage` is at following Xpath in the GML georeference:

```
/gml:FeatureCollection/gml:featureMember/gml:FeatureCollection/gml:featureMember/gml:RectifiedGridCoverage
```

The metadata extent is at following Xpath:

```
/gmd:MD_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification/gmd:extent
```

if ISO/IEC 19139 is used.

c) Reference: DGIWG GMLJP2 Profile – 6.6.1

d) Test type: Basic.

A.1.11. Security classification in metadata

a) Test purpose: Verify that the security classification is recorded in the metadata.

b) Test method: Inspect the metadata to see if there is a security classification.

a. The metadata is embedded at the following XPath:

```
```

b. In the metadata, the security classification is found at following XPath:

```
/gmd:MD_Metadata/gmd:identificationInfo/gmd:MD_DataIdentification
/gmd:resourceConstraints/gmd:MD_SecurityConstraints/gmd:classification
```

c) Reference: ISO 19115
d) Test type: Basic.

**A.1.12. Security classification in Intellectual property rights box**

a) Test purpose: If the file is classified in a security class more restricted than unclassified, the classification shall be recorded in an Intellectual property rights box in order to secure that information in case the metadata is lost in some way.

b) Test method: Inspect the ‘jp2i’-box (the Intellectual property rights box). The box shall contain an IPR element. The security classification shall be stored at following XPath:

```
/jp:IPR/jp:IPR_EXPLOITATION/jp:IPR_USE_RESTRICTION
```

c) Reference: DGIWG GMLJP2 Profile – C.1.5

d) Test type: Basic.

**A.1.13. References to embedded codestreams and XML instances are valid**

a) Test purpose: The GML code uses GMLJP2 URI addresses to refer to different embedded parts of the file. These parts can be either codestreams or XML blocks within the gml.data structure. Codestreams are addressed by their order in the file beginning with number zero. XML blocks are addressed by their accompanying label boxes.
b) Test method: Inspect that existing GMLJP2 URI:s refers to existing parts of the file.

a. One GMLJP2 URI in particular, is essential:
   This element refers to the codestream that the GML code is georeferencing. This element shall always exist and refer to an existing codestream.

b. There can be other GMLJP2 URI:s for referring to XML instances, like SVG symbols. These will occur in the annotations. This part of the test is only required for class A and class XA files.

c) Reference: OGC 05-047r3 - GML in JPEG 2000 for Geographic Imagery (GMLJP2) Encoding

d) Test type: Basic.

A.1.14. The Reader Requirement box signals the use of GML

a) Test purpose: The use of GML shall be signaled by the reader requirement box.

b) Test method: Inspect the file with some software that understands the reader requirement box. The flag with number 67 must be among the standard flags.

c) Reference: ISO/IEC 15444-2 and DGIWG GMLJP2 Profile: C.1.3.

d) Test type: Basic.

A.1.15. Precinct partition size

a) Test purpose: The precinct partition size is restricted to be a power of two.
b) Test method: Inspect the codestreams markers COD and COC. The COC information overrides the COD information. COD and COC for a tile, overrides the COD and COC for the whole codestream.


d) Test type: Basic.

A.1.16. Brand field

a) Test purpose: GMLJP2 files uses extensions from JPEG2000 Part 2, must use a file suffix which reflect the file type that is used.

b) Test method: Inspect the brand field in the file type box. The brand field must use the value ‘jpx\040’.


d) Test type: Basic.

A.1.17. Compatibility list

a) Test purpose: The compatibility list contains a list about which standards and profiles the file conforms to.

b) Test method: Inspect the compatibility list in the file type box. If none of the Part 2 options for opacity is used, the compatibility list shall contain ‘jp2\040’. All files shall contain ‘jpx\040’.

d) Test type: Basic.

**A.1.18. File suffix**

a) Test purpose: A GMLJP2 file must use a file suffix which reflects the file type that is used.

b) Test method: Inspect the compatibility list in the file type box and the filename. If the compatibility list contains ‘jp2 | 040’, the file suffixes ‘.jp2’ and ‘.jpf’ are allowed. Otherwise only ‘.jpf’ is allowed.


d) Test type: Basic.

**A.2. Class A tests**

Class A is described in B.3.2.

**A.1.0. Allowed style elements**

a) Test purpose: Class A files contains annotations which can be styled. It has to be relevant styling elements for each of the annotations. A Label annotation can be styled with a LabelStyle element, but not with a GeometryStyle element.
b) Test method: Inspect the GML code that contains the annotations. Inspect the
  ) defaultStyle elements in annotations. Relative to the defaultStyle element, there can be
two types of style elements, geometryStyle and labelStyle:
  
  a. gml:defaultStyle/gml:Style/gml:featureStyle/gml:FeatureStyle
     /gml:geometryStyle
  b. gml:defaultStyle/gml:Style/gml:featureStyle/gml:FeatureStyle/gml:labelStyle

The labelStyle element is used only when defaultStyle is a child element of the
annotation content type Label. All other annotation types shall use geometryStyle. If they
have labels, the labels are in their annotation content as a Label element, which can have
a LabelStyle element.

c) Reference: DGIWG GMLJP2 Profile – D.3.4.1
)

d) Test type: Class A
)

A.1.2. References to embedded symbols are valid

a) Test purpose: Class A files can contain annotations which uses symbols in
SVG format embedded in the JPEG2000 file in xml boxes.

b) Test method: Inspect all elements of type gml:symbol. The attribute xlink:href
shall use a valid GMLJP2 URI for referring to the SVG symbol, which should
be embedded in the gml:data structure in the file.

c) Reference: DGIWG GMLJP2 Profile – D.1.3.2 and D.3.4.1.3

d) Test type: Class A
A.3. Class XA tests

Class XA is described in B.3.3.

A.1.0. References to embedded images and video streams are valid

a) Test purpose: Class XA files contain DGIWGJP2 URI references to embedded images and video. These parts can be either ‘uuid’-boxes or ‘moov’-boxes. They shall in both cases be in an Annotation structure.

b) Test method: Inspect that the DGIWGJP2 URI addresses refers to actual boxes in the Annotation structure.

c) Reference: DGIWG GMLJP2 Profile – C.2 and D.1.4

d) Test type: Class XA
Annex B Revision history

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