DIGGS Pilot Testing

TRB 2016 Annual Meeting Workshop 127

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What is DIGGS?

- GeoTechnical/Environmental Data Exchange Format
- Standard Format based on International Standards
  - eXtensible Markup Language (XML)
  - Geography Markup Language (GML)
- XML/GML GeoTechnical/Environmental Schema (structure)
- Supporting Code Lists and Dictionaries (valid data values)
- XML/GML Instance (data) Documents (files)
- Basis for Data Management and Tool Interoperability among
  - Field and Lab Data Acquisition Equipment
  - Data Analysis, Visualization and Presentation Software
  - Databases and Cloud Data Storage
- Project for Software Engineers to Implement in Tools
DIGGS Data Transfer

Data Transfer Standard (DIGGS)

KeyLAB

Excel
CSV
HoleBASE SI
In house DB
AutoCAD Civil 3D
Other
gINT

(after Keynetix, 2014)
Pilot Testing

• Multi-Phase Project
• Phase 1 Development of Schemas, Code Lists and Dictionaries 2013 – 2015, versions 1, 2.0.a, and 2.0.b
• Phase 2 Community Review of Schemas, Code Lists and Dictionaries 2015
• Phase 3 Geo Tool Vendor Implementation Development and Testing 2016
Web App Tools

• Tools
  – Conversion Tool
  – DIGGS GML Schema / Data Validator
  – Extensible Stylesheet Language Transformations (XSLT) Utility

• Uses
  – Phase 2: Used for DIGGS Schema, Code List and Dictionary development
  – Phase 3: To be used by GeoTechnical / GeoEnvironmental Tool Vendor Software Engineers to prototype, develop and test implementations of their products that can read and write DIGGS format data
DIGGS Implementation
Recommended Path

1. Write Native Geo Format to DIGGS Converter
   a) Optional: Prototype via CSV with Converter Web App

2. Test Converter Output with DIGGS Validator

3. Write DIGGS to Native Geo Format Converter
   a. Optional: Prototype with XSLT Web App

4. Test Converter Output with Native Geo Validator

5. Process Converter Output with Native Geo Tools

6. Display Converter Output with Native Geo Tools

7. Advertise DIGGS Compatibility

8. Sell DIGGS Compatible Tools
DIGGS Conversion Tool

Convert a set of DIGGS-compatible CSV files (within a single .ZIP) into DIGGS XML or vice versa.

Input File
Browse...
File to convert, either DIGGS .XML or a .ZIP containing DIGGS .CSV files

Mapping Configuration
Browse...
Optional mapping file in .CSV format

* Required

Reset Convert
Welcome

This web testing facility provides a testing service for DIGGS v2.0.0 instance documents.

It is a specialization of the open source Testing Evaluation And Measurement (TEAM) Engine web testing facility for OGC standards as part of the OGC Compliance Program (CITE).

The official OGC testing site is available [here](http://www.ogc.org/teamengine).

### Available test suites

**ASCE**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Version</th>
<th>Test Suite Revision</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Interchange for GeoTechnical and GeoEnvironmental Specialists (DIGGS)</td>
<td>2.0.0</td>
<td>r14</td>
<td>Beta</td>
</tr>
<tr>
<td>Extensible Stylesheet Language Transformations (XSLT) Utility</td>
<td>1.0</td>
<td>r1</td>
<td>Beta</td>
</tr>
</tbody>
</table>

**Login**

TEAM Engine 4.0.3

If you have any questions or suggestions, feel free to contact the [site administrator](mailto:site-administrator@OGC.org).
**Test Sessions**

<table>
<thead>
<tr>
<th>Session</th>
<th>Test suite name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>s0001</td>
<td>ASCE_Data Interchange for GeoTechnical and GeoEnvironmental Specialists (DIGGS) 2.0.b_r14</td>
<td>Test Dan Ponti Schema Mods</td>
</tr>
<tr>
<td>s0002</td>
<td>ASCE_Extensible Stylesheet Language Transformations (XSLT) Utility_1.0_r1</td>
<td>XSLT Utility demonstration: reformat DIGGS XML data</td>
</tr>
</tbody>
</table>

Create a new session

TEAM Engine 4.0.3

If you have any questions or suggestions, feel free to contact the site administrator.
TEAM Engine v4

Select a test suite:

<table>
<thead>
<tr>
<th>Organization</th>
<th>Specification</th>
<th>Version</th>
<th>Revision</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASCE</td>
<td>Standard</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Data Interchange for GeoTechnical and GeoEnvironmental Specialists (DIGGS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Extensible Stylesheet Language Transformations (XSLT) Utility</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Select Profile(s):

Enter Session Description (Optional):

Start a new test session

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If you have any questions or suggestions, feel free to contact the [site administrator](mailto:siteadministrator@email.com).
DIGGS Validator
Parameters Page

DIGGS Conformance Test Suite GML 3.2.1 (ISO 19136:2007), GML 3.3 (OGC 10-129r1), DIGGS 2.0.b

The DIGGS GML document is checked against the following specifications:

- ISO 19136:2007, Geographic Information - Geography Markup Language (GML) v3.2
- OGC 10-129r1, OGC Geography Markup Language (GML) v3.3 - Extended schemas and encoding rules
- DIGGS Schemas, v2.0.b International geotechnical and geoenvironmental data interchange framework based on XML and GML. Written by geotechnical professionals.

DIGGS resources (GML data document file and XML schematron business rules file)

Enter location of DIGGS GML document (http: or file: URI)

http://localhost:8000/teamengine/data/testInstance20bDemoErrors.xml

OR Upload DIGGS GML document

Browse... No file selected.

Enter location of Schematron schema defining supplementary constraints (http: or file: URI)

http://localhost:8000/teamengine/data/DIGGSbusinessRules20b.sch
Testing tns:Main type Mandatory in Retest Mode with defaultResult Pass (s0001)...
Assertion: The GML application schemas and data set satisfy all relevant constraints.
Test suite: gml-3.2.1-r14
-------- Test groups --------
All GML application schemas
   Passed: 6  |  Failed: 1  |  Skipped: 0
GML application schemas defining features and feature collections
   Passed: 2  |  Failed: 0  |  Skipped: 0
GML application schemas defining spatial geometries
   Passed: 2  |  Failed: 0  |  Skipped: 0
GML application schemas defining time
   Passed: 2  |  Failed: 0  |  Skipped: 0
GML application schemas defining spatial topologies
   Passed: 0  |  Failed: 0  |  Skipped: 2
GML Documents
   Passed: 5  |  Failed: 1  |  Skipped: 10

See detailed test report in the TE_BASE/users/DIGGS/tester/s0001/html/ directory.
Test method importFullGMLSchemas:
   Unexpected number of imported GML element declarations. The full GML schema (gml.xsd) must be imported.
Test method checkSchematronConstraints:
   3 schema validation error(s) detected.
<svrl:schematron-output xmlns:svrl="http://purl.oclc.org/dsd1/svrl"
   xmlns:grove="http://www.opengis.net/gml/3.3/irov"
   xmlns:iso="http://purl.oclc.org/dsd1/schematron"
   xmlns:xhtml="http://www.w3.org/1999/xhtml"
   xmlns:schold="http://www.ascc.net/xml/schematron"
   xmlns:xse="http://www.w3.org/2001/XMLSchema"
   xmlns:diggs="http://diggsm.org/schemas/2.0.b"
   xmlns:diggs_geo="http://diggsm.org/schemas/2.0.b/geotechnical"
   xmlns:gml="http://www.opengis.net/gml/3.2"
   xmlns:g3.3="http://www.opengis.net/gml/3.3/1r"
   xmlns:glr="http://www.opengis.net/gml/3.3/1r"
title=""
The first two errors are about result properties reported for tests.

The first error, 
TestQname diggs_geo:AtterbergLimitsTest with gml:id alt1 PropertyClass 3 nosuch_property is not defined in SchematronSupportTestProperties.xml This tells us that the SchematronSupportTestProperties.xml file (a DIGGS dictionary extract optimized for use by schematron) does not contain “nosuch_property” for the test geo:AtterbergLimitsTest.

The way to fix this error is to look in SchematronSupportTestProperties.xml and see what the valid test properties are, select a valid one, and use it in the DIGGS instance document file instead of “nosuch_property”.

The second error, 
TestQname diggs_geo:ModelingProcedure with gml:id mp-1 is not defined in SchematronSupportTestProperties.xml tells us that the file does not contain test geo:ModelingProcedure.

If this test is in the DIGGS geotechnical.xsd schema, then the SchematronSupportTestProperties.xml file is out of date and needs to be updated. If not, then both the schema and xml file need to be updated. In either case, the way to fix this error is to contact DIGGS technical support.
<test procedure="diggs_geo:AggregateImpactValueTest">
  <property>aggregate_impact_value</property>
</test>

<test procedure="diggs_geo:LosAngelesAbrasionTest">
  <property>aggregate_LA_abrasion_loss</property>
  <property>aggregate_la_coefficient</property>
  <property>aggregate_la_wear_ratio</property>
</test>

<test procedure="diggs_geo:AggregatePolishedStoneValueTest">
  <property>aggregate_polished_stone_value</property>
</test>

<test procedure="diggs_geo:AggregateSlakeDurabilityTest">
  <property>slake_durability_classification</property>
  <property>slake_durability_index</property>
</test>

<test procedure="diggs_geo:AggregateWaterAbsorptionTest">
  <property>aggregate_water_absorption</property>
</test>

<test procedure="diggs_geo:AtterbergLimitsTest">
  <property>liquid_limit</property>
  <property>plastic_limit</property>
  <property>plasticity_index</property>
  <property>shrinkage_limit</property>
</test>

<test procedure="diggs_geo:ChalkCrushingValueTest">
  <property>chalk_crushing_value</property>
</test>

<test procedure="diggs_geo:CompactionTest">
  <property>max_dry_density</property>
  <property>optimum_moisture_content</property>
</test>

<test procedure="diggs_geo:CompressiveStrengthTest">
  <property>compressive_strength</property>
  <property>youngs_modulus</property>
  <property>poisson_ratio</property>
  <property>shear_modulus</property>
</test>
Error 1 in DIGGS Doc
The third error,

@srsName attribute value urn:diggs:def:crs:DIGGS:0.1:nonesuch of PointLocation with gml:id a33 or a parent element thereof must be defined in a (Vector) LinearSpatialReferenceSystem or in DIGGS_GML_CRS_DICTIONARY.xml

tells us that “urn:diggs:def:crs:DIGGS:0.1:nonesuch” is not a valid srsName attribute value.

The way to fix this error is to look in DIGGS_GML_CRS_DICTIONARY.xml for a list of valid names, as shown on the next slide.
This XML file does not appear to have any style information associated with it. The document tree is shown below.

```xml
<Dictionary gml:id="DIGGS_CompoundCRS_Dictionary" xmlns:gml="http://www.opengis.net/gml/3.2.1/gml.xsd">
  <description>
    Compound CRS definitions generated from components based on EPSG Database V7.5.8
  </description>
  <dictionaryEntry>
    <CompoundCRS gml:id="diggs-crs-63226405_5713">
      <name>WGS 72 (deg) + Canadian Vertical Datum of 1928</name>
      <domainOfValidity xlink:href="urn:ogc:def:area:EPSG::1289"/>
      <scope>Geodetic and engineering surveying.</scope>
      <componentReferenceSystem xlink:href="urn:ogc:def:crs:EPSG::5713"/>
    </CompoundCRS>
  </dictionaryEntry>
  <dictionaryEntry>
    <CompoundCRS gml:id="diggs-crs-63246405_5713">
      <name>WGS 72BE (deg) + Canadian Vertical Datum of 1928</name>
      <domainOfValidity xlink:href="urn:ogc:def:area:EPSG::1289"/>
      <scope>Geodetic and engineering surveying.</scope>
      <componentReferenceSystem xlink:href="urn:ogc:def:crs:EPSG::5713"/>
    </CompoundCRS>
  </dictionaryEntry>
  <dictionaryEntry>
    <CompoundCRS gml:id="diggs-crs-63266405_5713">
      <name>WGS 84 (deg) + Canadian Vertical Datum of 1928</name>
      <domainOfValidity xlink:href="urn:ogc:def:area:EPSG::1289"/>
      <scope>Geodetic and engineering surveying.</scope>
    </CompoundCRS>
  </dictionaryEntry>
</Dictionary>
```
Error 3 in DIGGS Doc
Or if the geometry involved is part of a (Vector)LinearSpatialReferenceSystem, to use one of the srsName values selected by the following XPath expressions applied to the DIGGS instance document file using an XML text editor. For example:

//descendant::diggs:LinearSpatialReferenceSystem/@gml:id
sr123
srw123
cptsr1

//descendant::diggs:VectorLinearSpatialReferenceSystem/@gml:id
Lsrs002

These values, when prefixed with a URI fragment identifier “#”, are also valid srsName values. For example:

<LinearExtent gml:id="bfls1" srsDimension="1" srsName="#sr123">
  <gml:posList>5 10</gml:posList>
</LinearExtent>
<linearReferencing>
  <LinearSpatialReferenceSystem gml:id="srl23">
    <gml:linearElement xlink:href="#ls"/>
    <gml:lrn>
      <gml:LinearReferencingMethod gml:id="lr123">
        <gml:name>chainage</gml:name>
        <gml:type>absolute</gml:type>
        <gml:units>m</gml:units>
      </gml:LinearReferencingMethod>
    </gml:lrn>
    <linearElementAccuracy [5 lines]
    <linearReferencingMethodAccuracy [5 lines]
  </LinearSpatialReferenceSystem>
</linearReferencing>
<totalMeasuredDepth uom="m">427.9392</totalMeasuredDepth>
<boreholePurpose>Multi-port Monitoring Well</boreholePurpose>
<backfill>
  <backfill gml:id="bfl1">
    <backfillDateTime [5 lines]
    <backfillLayer>
      <backfillLayer gml:id="bfl1"/>
    </backfillLayer>
    <backfillInterval>
      <LinearExtent gml:id="bfl1s1" srsDimension="1" srsName="wgs123">
        <gml:posList>5 10</gml:posList>
      </LinearExtent>
    </backfillInterval>
Test Results Summary

Results for session s0001

Test Suite: DIGGS 2.0.b Conformance Test Suite

Failed: Test tms:Main

Summary of results

- Best Practice: 0
- Passed: 0
- Continue: 0
- Not Tested: 0
- Warning: 0
- Skipped: 0
- Failed: 1
- Failed (Inherited): 0

See the detailed test report.

Sessions list

TEAM Engine 4.0.3

If you have any questions or suggestions, feel free to contact the site administrator.
Detailed Test Report

Suite Overview

Test suites overview

<table>
<thead>
<tr>
<th>Suite</th>
<th>Failed</th>
<th>Passed</th>
<th>Skipped</th>
</tr>
</thead>
<tbody>
<tr>
<td>gml-3.2.1-r14</td>
<td>2</td>
<td>17</td>
<td>12</td>
</tr>
<tr>
<td>All GML application schemas</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GML application schemas defining features and feature collections</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>GML application schemas defining spatial geometries</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>GML application schemas defining time</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>GML application schemas defining spatial topologies</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>GML Documents</td>
<td>1</td>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>

Passed (55%)  
Skipped (38%)
<table>
<thead>
<tr>
<th>TestNG Results</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Groups for suite: gml-3.2.1-r14</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>data</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PropertyValueTests.validateLocationName() [p=0, instance org.spongix.cite.iso19136.data.PropertyValueTests@2e34a6f]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PropertyValueTests.validateLocationReference() [p=0, instance org.spongix.cite.iso19136.data.PropertyValueTests@2e34a6f]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SchemaTests.checkDeprecatedXMLElements() [p=0, instance org.spongix.cite.iso19136.data.SchemaTests@73a3bcb]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SchemaTests.checkXMLSchemaConstraints() [p=0, instance org.spongix.cite.iso19136.data.SchemaTests@73a3bcb]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>XMLSchemaValidationTests.isXMLSchemaValid() [p=0, instance org.spongix.cite.iso19136.data.XMLSchemaValidationTests@20175d1]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>feature</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FeatureComponentTests.substitutesForAbstractFeature() [p=0, instance org.spongix.cite.iso19136.components.FeatureComponentTests@9a0ba88]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FeatureComponentTests.verifyFeatureMemberProperties() [p=0, instance org.spongix.cite.iso19136.components.FeatureComponentTests@9a0ba88]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>general</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ComplexPropertyTests.validateMembersOfGroupObjectCollection() [p=0, instance org.spongix.cite.iso19136.general.ComplexPropertyTests@68a22da]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ComplexPropertyTests.validateMetadataProperties() [p=0, instance org.spongix.cite.iso19136.general.ComplexPropertyTests@68a22da]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GeneralSchemaTests.declaresTargetNamespace() [p=0, instance org.spongix.cite.iso19136.general.GeneralSchemaTests@7946c07]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GeneralSchemaTests.declaresXMLObject() [p=0, instance org.spongix.cite.iso19136.general.GeneralSchemaTests@7946c07]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GeneralSchemaTests.importsXMLSchema() [p=0, instance org.spongix.cite.iso19136.general.GeneralSchemaTests@7946c07]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ModelAndSyntaxTests.verifyXMLObjectPropertyPattern() [p=0, instance org.spongix.cite.iso19136.general.ModelAndSyntaxTests@380b21f]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>geometry</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GeometryComponentTests.substitutesForGMLGeometry() [p=0, instance org.spongix.cite.iso19136.components.GeometryComponentTests@9252703]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GeometryComponentTests.validateImplicitGeometryProperty() [p=0, instance org.spongix.cite.iso19136.components.GeometryComponentTests@9252703]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>time</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TemporalComponentTests.substitutesForAbstractTimeObject() [p=0, instance org.spongix.cite.iso19136.components.TemporalComponentTests@3000a0e]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TemporalComponentTests.validateImplicitTemporalProperty() [p=0, instance org.spongix.cite.iso19136.components.TemporalComponentTests@3000a0e]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>topology</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TopologyComponentTests.substitutesForGMLTopology() [p=0, instance org.spongix.cite.iso19136.components.TopologyComponentTests@420c259]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TopologyComponentTests.validateImplicitTopologyProperty() [p=0, instance org.spongix.cite.iso19136.components.TopologyComponentTests@420c259]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>xmlschema</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>XMLSchemaTests.compileXMLSchema(org.testing.TestContext) [p=0, instance org.spongix.cite.iso19136.general.XMLSchemaTests@5f8032e]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
All Methods in the GML Test Suite

<table>
<thead>
<tr>
<th>Name</th>
<th>Started</th>
<th>Duration</th>
<th>Exception</th>
</tr>
</thead>
<tbody>
<tr>
<td>importFullGMLSchema()</td>
<td>12:32:07</td>
<td>0 ms</td>
<td>java.lang.AssertionError: Unexpected number of imported GML element declarations. The full GML schema (gml.xsd) must be imported. expected [414] but found []</td>
</tr>
</tbody>
</table>
DIGGS Test Results

```
<parameters>
  <!-- <dataValues ce="", te="", decimal="." -->
  0.1300,0.40,0.0000,0.0013,0.2400,0.40,0.1000,0.0078,0.5200,0.40,0.0045,0.0128,0.6890,0.40,0.0070,0.0017,0.7890,0.30,0.0120,0.0121,0.9090,0.30,0.0125,0.0161,0.9660,0.40,0.0200,0.0191,1.0400,0.40,0.0240,0.0121,1.1090,0.30,0.0267,0.0129,1.1990,0.30,0.0010,0.0123,1.2500,0.40,0.0350,0.0176,1.2500,0.30,0.0450,0.0124,1.2800,0.40,0.0450,0.0083,1.2600,0.30,0.0550,0.0083,1.0810,0.40,0.0450,0.0161,1.0000,0.40,0.0450,0.0161,1.7200,0.40,0.0450,0.0161,1.7200,0.40,0.0450,0.0161,1.2000,0.40,0.0450,0.0161,1.2700,0.40,0.0450,0.0161,1.2700,0.40,0.0450,0.0161
  0.7600,0.40,0.0250,0.0059,0.9490,0.40,0.0420,0.0069,0.7000,0.40,0.0230,0.0064,0.6950,0.40,0.0220,0.0049,0.6200,0.40,0.0100,0.0049,0.6000,0.40,0.0100,0.0049,0.5990,0.40,0.0100,0.0049,0.5990,0.40,0.0100,0.0049,0.5300,0.40,0.0100,0.0049,0.5300,0.40,0.0100,0.0049,0.5000,0.40,0.0100,0.0049,0.5000,0.40,0.0100,0.0049,0.5000,0.40,0.0100,0.0049,0.5000,0.40,0.0100,0.0049,0.5000,0.40,0.0100,0.0049
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```
```
ReformatDiggsResults.xslt

XSLT Stylesheet
Contains Declarative Specification of Transform to be Performed
Results for session s0002

Test Suite: DIGGS XSLT Utility

Test tns:Main (View Details): Passed
Test tns:xslt-transform (View Details): Passed

Summary of results

Best Practice  Passed  Continue  Not Tested  Warning  Skipped  Failed  Failed (Inherited)
0   2   0   0   0   0   0   0

Execute this session again  Delete this session  Download log Files  Create execution log report file  Download XSLT output file

Sessions list

TEAM Engine 4.0.3

If you have any questions or suggestions, feel free to contact the site administrator.
Open or Download XSLT Output File

Results for session s0002

Test Suite: DIGGS XSLT Utility

- ☑️ Test ins:Main (View Details): Passed
- ☑️ Test ins:xslt-transform (View Details): Passed

Summary of results

- Best Practice: 0
- Passed: 2
- Continue: 0
- Not Tested: 0
- Warning: 0
- Skipped: 0
- Failed: 0
- Failed (Inherited): 0

Execute this session again | Delete this session | Download log Files | Create execution log report file | Download XSLT output file

Sessions list

TEAM Engine 4.0.3

If you have any questions or suggestions, feel free to contact the site administrator.
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    <dataRecords>
      <Record>
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        <sleeve_friction index="2">0.40</sleeve_friction>
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DIGGS Implementation
Software Resources

- eXtensible Markup Language (XML)
- Geography Markup Language (GML)
- XML Path Language (XPath)
- Extensible Stylesheet Language Transformations (XSLT)
- Document Object Module (DOM)
- Programming Language: C / C++ / C# / Java
- Java Architecture for XML Binding (JAXB)
- Apache Xerces XML Parser / Validator
- Apache Xalan XSLT Processor
- Saxon XSLT / XPath / XQuery Processor
- Oxygen XML Editor
- Eclipse Integrated Development Environment
Technical References

Ron Lake initiated GML. David Burggraf helped design the DIGGS Schemas.

Michael Kay, member of the W3C XSLT and XPath Working Groups, wrote the Saxon XSLT / XPath / XQuery processor.
Questions?

DIGGS Pilot Testing

- TRB 2016 Annual Meeting Workshop 127

Paul Daisey
Sr. Software Architect

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