

Defining and Managing Tests

FROM THE FRAMEWORK TO THE TEST CASE

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IES Test Management in IHE Gazelle

IES Integrating
the
Energy System

Test Case Definition

Step Index	Initiator Role	Responder Role	Transaction	Secured	Message Type	Option	Description
10	TPKTIInitiator_FSC	TPKTResponder_FSC	SPS-01	<input type="checkbox"/>	SPS-01_SchdIntv_Units	Required	Send Unit from Schedule Interval
Input and Output Contextual Information (0 - 0)							
15	TPKTIInitiator_FSC	TPKTResponder_FSC	SPS-01	<input type="checkbox"/>	SPS-01_ValASG_Unit	Required	Write the physical unit of the ValASG message SHALL be sent multiple times
Input and Output Contextual Information (0 - 0)							
20	TPKTIInitiator_FSC	TPKTResponder_FSC	SPS-01	<input type="checkbox"/>	SPS-01_NumEnt_StdVal	Required	Communicate the number of values (p
Input and Output Contextual Information (0 - 0)							
30	TPKTIInitiator_FSC	TPKTResponder_FSC	SPS-01	<input type="checkbox"/>	SPS-01_SchdIntv_StdVal	Required	Information about the schedule interval
Input and Output Contextual Information (0 - 0)							
40	TPKTIInitiator_FSC	TPKTResponder_FSC	SPS-01	<input type="checkbox"/>	SPS-01_ValASG_SetMag_multipleTimes	Required	Based on the number communicated in NumEnt, SetMag SHALL be sent multiple times. SetMag SHALL be a FLOAT32
Input and Output Contextual Information (0 - 0)							
50	TPKTIInitiator_FSC	TPKTResponder_FSC	SPS-01	<input type="checkbox"/>	SPS-01_StrTm_SetCal	Required	Set start time of the schedule
Input and Output Contextual Information (0 - 0)							
60	TPKTIInitiator_FSC	TPKTResponder_FSC	SPS-01	<input type="checkbox"/>	SPS-01_InvPer_StdVal	Required	StdVal for the period interval. 0 means no repetition of the schedule. SHALL be 0
Input and Output Contextual Information (0 - 0)							
70	TPKTIInitiator_FSC	TPKTResponder_FSC	SPS-01	<input type="checkbox"/>	SPS-01_SchdReuse_stdVal	Required	Defines whether the schedule is reusable. stdVal SHALL be 0
Input and Output Contextual Information (0 - 0)							
80	TPKTIInitiator_FSC	TPKTResponder_FSC	SPS-01	<input type="checkbox"/>	SPS-01_ValReq	Required	Sending the Validate Request (Oper. type "Oper_Boolean", with cVal = true, origin or Cal = XX, origin orient = "testname", cNum = 0, T = currentTime, Test = false, Check = XX

Technical Framework
Virtual Power Plant

Vol. 1

Version 00.10

Technical Framework
Virtual Power Plant

Vol. 2

Version 00.10

Specifications

Validation Tools

Schematron

Schematron - ID 93

Label:

Keyword:

Version:

Author:

Type:

Description:

Path:

XSD Path:

XSD Version:

Object Type:

Need dafodil transformation? ☒

DFOL schema Keyword:

Available: ☒

Need report generation transformation? ☒

```

1 <?xml version="1.0" encoding="UTF-8"?>
2 <schema xmlns="http://purl.oclc.org/dsdl/schematron"
3   queryBinding="xslt2"
4   xmlns:sqf="http://www.schematron-quickfix.com/validator/process">
5
6   <pattern id="test">
7     <!-- Checking all elements called Type -->
8     <rule context="confirmed-RequestPDU/invokeID/type">
9       <!-- Taking their value -->
10      <let name="value" value="number(.)"/>
11      <!-- Is the value integer? -->
12      <assert test="floor(.) = $value">
13        The Type value is not an integer.
14      </assert>
15      <!-- Is the value between 0 to 50 -->
16      <assert test="$value >= 0 and $value <= 50">
17        The Type must be integer between 0 to 50.
18      </assert>
19    </rule>
  
```

Validation

- Gazelle's validation is mainly based on XML
- 3 steps for XML validation
 - Well-formedness of XML
 - Conformance to a schema (structure)
 - Conformance to a Schematron (business rules)
- IEC 61850 (MMS) and IEC 104 use binary format for communication

Validation

- Transformation from binary format to XML format needed for validation
- → Daffodil transformation based on rules written in DFDL (Data Format Description Language)
- → specify the schema file
- → specify the Schematron file

Framework2Testcase

Technical Framework

Control Field	4 Byte	ASDU format, control field
DU identifier	4 Byte	type (8 Bits) number of objects (8 Bits) COT (8 Bits) CA (8 Bits)
ASDU Addr	2 Byte	
IOA	3 Byte	plant type (8 Bits) plant number (4 Bits) code point (12 Bits)
Content	4 Byte	content (31 Bits), test criteria (1 Bit)
Timestamp	7 Byte	UTC time in seconds per year

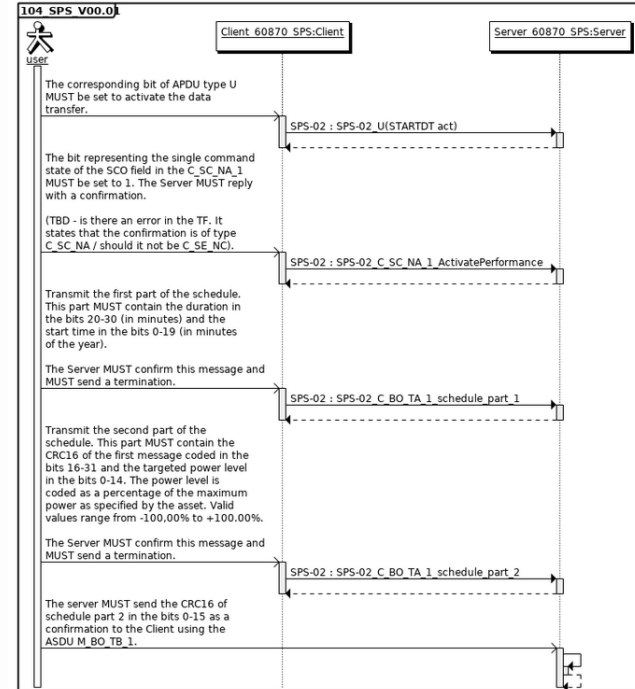
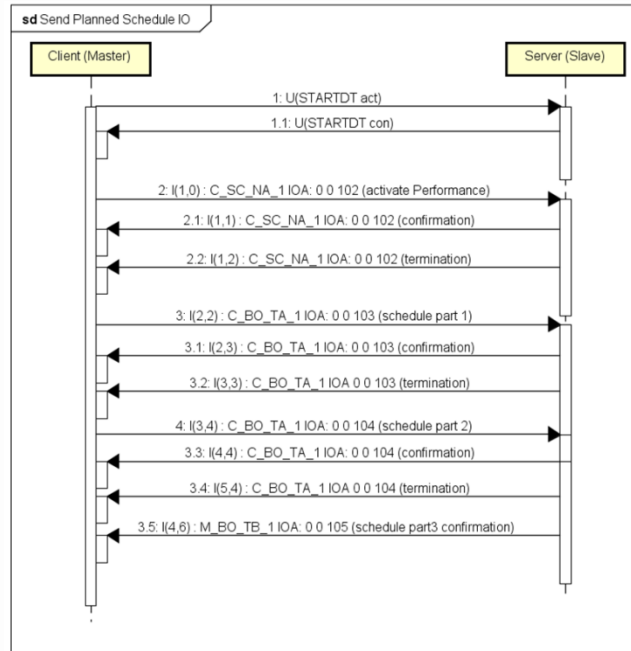
```
<xs:complexType name="APDU">
  <xs:sequence>
    <xs:element name="APCI" type="ex:APCI"/>
    <xs:choice>
      <xs:element name="ASDU" type="ex:ASDU"
        maxOccurs="unbounded" dfdl:occursCountKind="implicit"
        minOccurs="0">
        <xs:annotation>
          <xs:appinfo source="http://www.ogf.org/dfdl/">
            <dfdl:discriminator message="ASDU Type I"
              test="{ (../APCI/APDULength gt 5)}" />
          </xs:appinfo>
        </xs:annotation>
      </xs:element>
    </xs:choice>
  </xs:sequence>
</xs:complexType>
```

Daffodil Transformation

Schematron Assertions

```
</rule>
<rule context="IOA3">
  <let name="ioa3Value" value="number(.)"></let>
  <assert test=". = $ioa3Value and floor(.) = $ioa3Value
    &gt; 0 and $ioa3Value &lt;= 253">
    The content of the element <name/> must be an positive integer, in the range
    of 1-253 . Content = <value-of select="$ioa3Value"/>
  </assert>
</rule>
```

Test Cases in Gazelle



Get in Contact

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