

ShEx

Shape Expressions language

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SWIB-2018

Bonn, 2018-11-26

<https://shexspec.github.io/talks/2018/11-26-swibworkshop/ShEx.pdf>

XML Schema

```
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema">

  <xsd:annotation>
    <xsd:documentation xml:lang="en">
      Purchase order schema for Example.com.
      Copyright 2000 Example.com. All rights reserved.
    </xsd:documentation>
  </xsd:annotation>

  <xsd:element name="purchaseOrder" type="PurchaseOrderType"/>

  <xsd:element name="comment" type="xsd:string"/>

  <xsd:complexType name="PurchaseOrderType">
    <xsd:sequence>
      <xsd:element name="shipTo" type="USAddress"/>
    </xsd:sequence>
  </xsd:complexType>
</xsd:schema>
```

2. Against a schema.

XML Data

```
<?xml version="1.0"?>
<purchaseOrder orderDate="1999-10-20">
  <shipTo country="US">
    <name>Alice Smith</name>
    <street>123 Maple Street</street>
    <city>Mill Valley</city>
    <state>CA</state>
    <zip>90952</zip>
  </shipTo>
  <billTo country="US">
    <name>Robert Smith</name>
    <street>8 Oak Avenue</street>
    <city>Old Town</city>
    <state>PA</state>
    <zip>95819</zip>
  </billTo>
</purchaseOrder>
```

1. Validate data.

Validation

3. To yield a validation result

D:\data\purchase_order23.xml is valid.

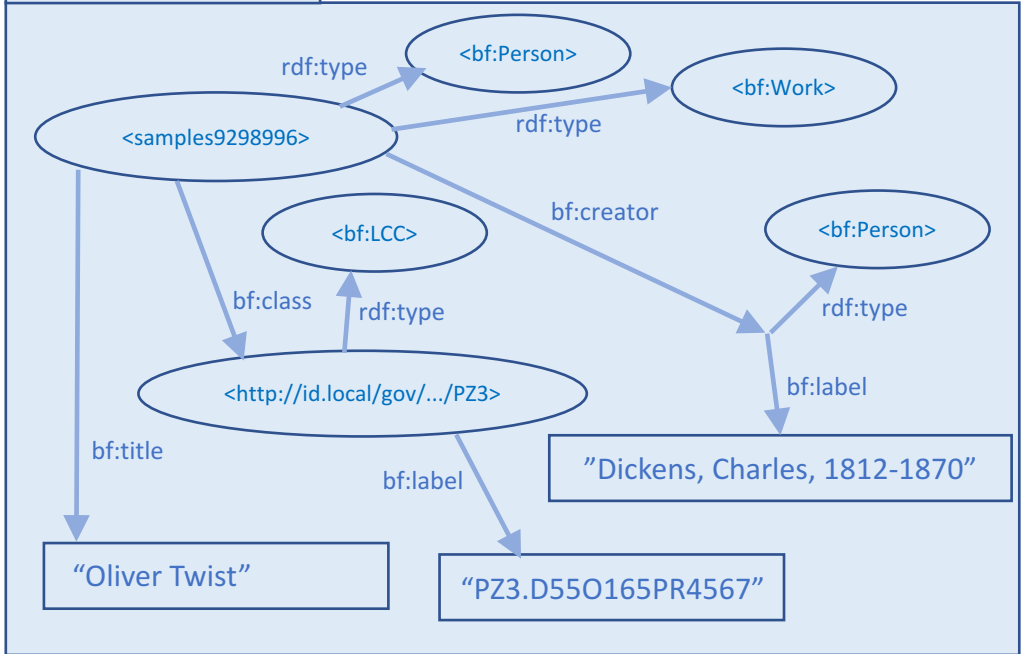
XML Schema Definition language: schema prescribes conditions to which an XML document must conform to be considered valid.

ShEx Schema [ShExC syntax]

```
<Work> EXTRA rdf:type {  
  rdf:type [bf:Work] ? ;  
  bf:title LITERAL ;  
  bf:class @<Classification> * ;  
  bf:creator @<Person> OR @<Organization> + ;  
  bf:derivedFrom IRI * ;  
}  
  
<Classification>  
  [<http://id.loc.gov/.../>~]  
AND  
  EXTRA rdf:type {  
    rdf:type [bf:LCC] ? ;  
    bf:label LITERAL ;  
  }
```

ShExC syntax is terse,
ideal for editing by
hand.

RDF Graph



2. Against a schema.

1. Validate graph.

Validation

3. To yield a validation result

```
✓<samples9298996>@<Work>  
  
validating samples9298996bad as Work:  
  validating http://...oliverTwist:  
    Error validating http://...oliverTwist  
    as nodeKind literal:  
      iri found when literal expected  
  
✗<samples9298996bad>@!<Work>
```

Shape Expressions language (ShEx): schema
prescribes conditions to which an RDF
graph must conform to be considered
valid.

ShEx Schema [ShExC syntax]

```
<Work> EXTRA rdf:type {  
  rdf:type [bf:Work] ? ;  
  bf:title LITERAL ;  
  bf:class @<Classification> * ;  
  bf:creator @<Person> OR @<Organization> + ;  
  bf:derivedFrom IRI * ;  
}  
  
<Classification>  
  [<http://id.loc.gov/>~]  
AND  
  EXTRA rdf:type {  
    rdf:type [bf:LCC] ? ;  
    bf:label LITERAL ;  
  }
```

ShExC syntax looks
alot like RDF Turtle
syntax, with parts to
be validated replaced
by keywords and by
placeholders for
values.

RDF Data [Turtle syntax]

```
<samples9298996>  
  rdf:type bf:Text ;  
  rdf:type bf:Work ;  
  bf:title "Oliver Twist." ;  
  bf:class <id.loc.gov/.../PZ3> ;  
  bf:creator [  
    rdf:type bf:Person ;  
    bf:label "Dickens, Charles, 1812-1870." ;  
  ] .  
  
<id.loc.gov/.../PZ3>  
  rdf:type bf:LCC ;  
  bf:label "PZ3.D55O165PR4567" .
```

2. Against a schema.

1. Validate data.

Validation

3. To yield a validation result

```
✓<samples9298996>@<Work>  
  
validating samples9298996bad as Work:  
  validating http://...oliverTwist:  
    Error validating http://...oliverTwist  
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        iri found when literal expected  
  
✗<samples9298996bad>@!<Work>
```

**Shape Expressions language (ShEx): schema
prescribes conditions to which RDF
data must conform to be considered
valid.**

ShEx Schema [ShExC syntax]

```
<Work> EXTRA rdf:type {  
  rdf:type [bf:Work] ? ;  
  bf:title LITERAL ;  
  bf:class @<Classification> * ;  
  bf:creator @<Person> OR @<Organization> + ;  
  bf:derivedFrom IRI * ;  
}
```

Labels and references
to those labels...

```
<Classification>  
  [<http://id.loc.gov/>~]  
AND  
  EXTRA rdf:type {  
    rdf:type [bf:LCC] ? ;  
    bf:label LITERAL ;  
  }
```

RDF Data [Turtle syntax]

```
<samples9298996>  
  rdf:type bf:Text ;  
  rdf:type bf:Work ;  
  bf:title "Oliver Twist." ;  
  bf:class <id.loc.gov/.../PZ3> ;  
  bf:creator [  
    rdf:type bf:Person ;  
    bf:label "Dickens, Charles, 1812-1870." ;  
  ] .  
  
<id.loc.gov/.../PZ3>  
  rdf:type bf:LCC ;  
  bf:label "PZ3.D55O165PR4567" .
```

2. Against a schema.

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ShEx Schema [ShExC syntax]

```
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<Classification>  
  [<http://id.loc.gov/>~]  
AND  
EXTRA rdf:type {  
  rdf:type [bf:LCC] ? ;  
  bf:label LITERAL ;  
}
```

Keywords, some with arguments.

RDF Data [Turtle syntax]

```
<samples9298996>  
  rdf:type bf:Text ;  
  rdf:type bf:Work ;  
  bf:title "Oliver Twist." ;  
  bf:class <id.loc.gov/.../PZ3> ;  
  bf:creator [  
    rdf:type bf:Person ;  
    bf:label "Dickens, Charles, 1812-1870." ;  
  ] .  
  
<id.loc.gov/.../PZ3>  
  rdf:type bf:LCC ;  
  bf:label "PZ3.D55O165PR4567" .
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2. Against a schema.

1. Validate data.

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✓<samples9298996>@<Work>

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  bf:class @<Classification> * ;  
  bf:creator @<Person> OR @<Organization> + ;  
  bf:derivedFrom IRI * ;  
}  
  
<Classification>  
  [<http://id.loc.gov/>~]  
AND  
  EXTRA rdf:type {  
    rdf:type [bf:LCC] ? ;  
    bf:label LITERAL ;  
  }
```

Value sets...

RDF Data [Turtle syntax]

```
<samples9298996>  
  rdf:type bf:Text ;  
  rdf:type bf:Work ;  
  bf:title "Oliver Twist." ;  
  bf:class <id.loc.gov/.../PZ3> ;  
  bf:creator [  
    rdf:type bf:Person ;  
    bf:label "Dickens, Charles, 1812-1870." ;  
  ] .  
  
<id.loc.gov/.../PZ3>  
  rdf:type bf:LCC ;  
  bf:label "PZ3.D55O165PR4567" .
```

2. Against a schema.

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✓<samples9298996>@<Work>

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validating samples9298996bad as Work:  
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Error validating http://...oliverTwist  
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✗<samples9298996bad>@!<Work>

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```
<Work> EXTRA rdf:type {  
  rdf:type [bf:Work] ? ;  
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}  
  
<Classification>  
  [<http://id.loc.gov/>~]  
AND  
  EXTRA rdf:type {  
    rdf:type [bf:LCC] ? ;  
    bf:label LITERAL ;  
  }
```

Cardinality markers.

RDF Data [Turtle syntax]

```
<samples9298996>  
  rdf:type bf:Text ;  
  rdf:type bf:Work ;  
  bf:title "Oliver Twist." ;  
  bf:class <id.loc.gov/.../PZ3> ;  
  bf:creator [  
    rdf:type bf:Person ;  
    bf:label "Dickens, Charles, 1812-1870." ;  
  ] .  
  
<id.loc.gov/.../PZ3>  
  rdf:type bf:LCC ;  
  bf:label "PZ3.D55O165PR4567" .
```

2. Against a schema.

1. Validate data.

Validation

3. To yield a validation result

```
✓<samples9298996>@<Work>  
  
validating samples9298996bad as Work:  
  validating http://...oliverTwist:  
    Error validating http://...oliverTwist  
      as nodeKind literal:  
        iri found when literal expected  
  
✗<samples9298996bad>@!<Work>
```

Shape Expressions language (ShEx): schema prescribes conditions to which RDF data must conform to be considered valid.

ShEx Schema [ShExJ syntax]

```
{
  "type": "Schema",
  "shapes": [
    {
      "id": "https://rawgit.com/shexSpec/shex.js/master/doc/Work",
      "type": "Shape",
      "expression": {
        "type": "EachOf",
        "expressions": [
          {
            "type": "TripleConstraint",
            "predicate": "http://www.w3.org/1999/02/22-rdf-syntax-ns#type",
            "valueExpr": {
              "type": "NodeConstraint",
              "values": [
                "http://bibframe.org/vocab/Work" ... ..
              ]
            }
          }
        ]
      }
    }
  ]
}
```

ShExJ syntax is verbose,
ideal for processing by
machines.

Helps in understanding
structure of ShEx

RDF Data [Turtle syntax]

```
<samples9298996>
  rdf:type bf:Text ;
  rdf:type bf:Work ;
  bf:title "Oliver Twist." ;
  bf:class <id.loc.gov/.../PZ3> ;
  bf:creator [
    rdf:type bf:Person ;
    bf:label "Dickens, Charles, 1812-1870." ;
  ] .

<id.loc.gov/.../PZ3>
  rdf:type bf:LCC ;
  bf:label "PZ3.D55O165PR4567" .
```

2. Against a schema.

1. Validate data.

Validation

3. To yield a validation result

```
✓<samples9298996>@<Work>

validating samples9298996bad as Work:
  validating http://...oliverTwist:
    Error validating http://...oliverTwist
      as nodeKind literal:
        iri found when literal expected

✗<samples9298996bad>@!<Work>
```

ShExJ syntax, interchangeable with ShExC.

ShEx Schema [ShExC syntax]

```
<Work> EXTRA rdf:type {  
  rdf:type [bf:Work] ? ;  
  bf:title LITERAL ;  
  bf:class @<Classification> * ;  
  bf:creator @<Person> OR @<Organization> + ;  
  bf:derivedFrom IRI * ;  
}  
  
<Classification>  
  [<http://id.loc.gov/.../>~]  
AND  
  EXTRA rdf:type {  
    rdf:type [bf:LCC] ? ;  
    bf:label LITERAL ;  
  }
```

2. Against a schema.

RDF Data [Turtle syntax]

```
<samples9298996>  
  rdf:type bf:Text ;  
  rdf:type bf:Work ;  
  bf:title "Oliver Twist." ;  
  bf:class <id.loc.gov/.../PZ3> ;  
  bf:creator [  
    rdf:type bf:Person ;  
    bf:label "Dickens, Charles, 1812-1870." ;  
  ] .  
  
<id.loc.gov/.../PZ3>  
  rdf:type bf:LCC ;  
  bf:label "PZ3.D55O165PR4567" .
```

1. Validate data.

A resource in RDF data matching the “Work” shape¹

Validation

3. To yield a validation result

```
✓<samples9298996>@<Work>  
  
validating samples9298996bad as Work:  
  validating http://...oliverTwist:  
    Error validating http://...oliverTwist  
    as nodeKind literal:  
      iri found when literal expected  
  
✗<samples9298996bad>@!<Work>
```

¹ Note: a pre-processing step uses the ShEx ShapeMap language to associate an RDF nodes with ShEx shapes, here: **<samples9298996>@<Work>**. Associations can be enumerated (in “fixed shape maps”) or generated automatically (in “query shape maps”) depending on the degree of control desired.

ShEx Schema [ShExC syntax]

```
<Work> EXTRA rdf:type {  
  rdf:type [bf:Work] ? ;  
  bf:title LITERAL ;  
  bf:class @<Classification> * ;  
  bf:creator @<Person> OR @<Organization> + ;  
  bf:derivedFrom IRI * ;  
}  
  
<Classification>  
  [<http://id.loc.gov/.../>~]  
AND  
  EXTRA rdf:type {  
    rdf:type [bf:LCC] ? ;  
    bf:label LITERAL ;  
  }
```

2. Against a schema.

RDF Data [Turtle syntax]

```
<samples9298996>  
  rdf:type bf:Text ;  
  rdf:type bf:Work ;  
  bf:title "Oliver Twist." ;  
  bf:class <id.loc.gov/.../PZ3> ;  
  bf:creator [  
    rdf:type bf:Person ;  
    bf:label "Dickens, Charles, 1812-1870." ;  
  ] .  
  
<id.loc.gov/.../PZ3>  
  rdf:type bf:LCC ;  
  bf:label "PZ3.D55O165PR4567" .
```

1. Validate data.

A resource in RDF data matching the “Work” shape
Has zero or one “rdf:type bf:Work” statements

Validation

3. To yield a validation result

```
✓<samples9298996>@<Work>  
  
validating samples9298996bad as Work:  
  validating http://...oliverTwist:  
    Error validating http://...oliverTwist  
      as nodeKind literal:  
        iri found when literal expected  
  
✗<samples9298996bad>@!<Work>
```

ShEx Schema [ShExC syntax]

```
<Work> EXTRA rdf:type {  
  rdf:type [bf:Work] ? ;  
  bf:title LITERAL ;  
  bf:class @<Classification> * ;  
  bf:creator @<Person> OR @<Organization> + ;  
  bf:derivedFrom IRI * ;  
}  
  
<Classification>  
  [<http://id.loc.gov/.../>~]  
AND  
  EXTRA rdf:type {  
    rdf:type [bf:LCC] ? ;  
    bf:label LITERAL ;  
  }
```

2. Against a schema.

RDF Data [Turtle syntax]

```
<samples9298996>  
  rdf:type bf:Text ;  
  rdf:type bf:Work ;  
  bf:title "Oliver Twist." ;  
  bf:class <id.loc.gov/.../PZ3> ;  
  bf:creator [  
    rdf:type bf:Person ;  
    bf:label "Dickens, Charles, 1812-1870." ;  
  ] .  
  
<id.loc.gov/.../PZ3>  
  rdf:type bf:LCC ;  
  bf:label "PZ3.D55O165PR4567" .
```

1. Validate data.

Validation

3. To yield a validation result

✓<samples9298996>@<Work>

validating samples9298996bad as Work:
validating http://...oliverTwist:
Error validating http://...oliverTwist
as nodeKind literal:
iri found when literal expected

✗<samples9298996bad>@!<Work>

A resource in RDF data matching the “Work” shape:
Has zero or one “rdf:type bf:Work” statements
Optionally has an extra “rdf:type” statement

ShEx Schema [ShExC syntax]

```
<Work> EXTRA rdf:type {  
  rdf:type [bf:Work] ? ;  
  bf:title LITERAL ;  
  bf:class @<Classification> * ;  
  bf:creator @<Person> OR @<Organization> + ;  
  bf:derivedFrom IRI * ;  
}  
  
<Classification>  
  [<http://id.loc.gov/.../>~]  
AND  
  EXTRA rdf:type {  
    rdf:type [bf:LCC] ? ;  
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  }
```

2. Against a schema.

RDF Data [Turtle syntax]

```
<samples9298996>  
  rdf:type bf:Text ;  
  rdf:type bf:Work ;  
  bf:title "Oliver Twist." ;  
  bf:class <id.loc.gov/.../PZ3> ;  
  bf:creator [  
    rdf:type bf:Person ;  
    bf:label "Dickens, Charles, 1812-1870." ;  
  ] .  
  
<id.loc.gov/.../PZ3>  
  rdf:type bf:LCC ;  
  bf:label "PZ3.D55O165PR4567" .
```

1. Validate data.

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```
✓<samples9298996>@<Work>  
  
validating samples9298996bad as Work:  
  validating http://...oliverTwist:  
    Error validating http://...oliverTwist  
      as nodeKind literal:  
        iri found when literal expected  
  
✗<samples9298996bad>@!<Work>
```

A resource in RDF data matching the “Work” shape:
Has zero or one “rdf:type bf:Work” statements
Optionally has an extra “rdf:type” statement
Has exactly one “bf:title” statement with literal value

ShEx Schema [ShExC syntax]

```
<Work> EXTRA rdf:type {  
  rdf:type [bf:Work] ? ;  
  bf:title LITERAL ;  
  bf:class @<Classification> * ;  
  bf:creator @<Person> OR @<Organization> + ;  
  bf:derivedFrom IRI * ;  
}  
  
<Classification>  
  [<http://id.loc.gov/.../>~]  
AND  
  EXTRA rdf:type {  
    rdf:type [bf:LCC] ? ;  
    bf:label LITERAL ;  
  }
```

2. Against a schema.

RDF Data [Turtle syntax]

```
<samples9298996>  
  rdf:type bf:Text ;  
  rdf:type bf:Work ;  
  bf:title "Oliver Twist." ;  
  bf:class <id.loc.gov/.../PZ3> ;  
  bf:creator [  
    rdf:type bf:Person ;  
    bf:label "Dickens, Charles, 1812-1870." ;  
  ] .  
  
<id.loc.gov/.../PZ3>  
  rdf:type bf:LCC ;  
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```

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✓<samples9298996>@<Work>  
  
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    Error validating http://...oliverTwist  
      as nodeKind literal:  
        iri found when literal expected  
  
✗<samples9298996bad>@!<Work>
```

A resource in RDF data matching the “Work” shape:
Has zero or one “rdf:type bf:Work” statements
Optionally has an extra “rdf:type” statement
Has exactly one “bf:title” statement with literal value
Has zero or more “bf:class” statements taking objects that match the “Classification” shape

ShEx Schema [ShExC syntax]

```
<Work> EXTRA rdf:type {  
  rdf:type [bf:Work] ? ;  
  bf:title LITERAL ;  
  bf:class @<Classification> * ;  
  bf:creator @<Person> OR @<Organization> + ;  
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<id.loc.gov/.../PZ3>  
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✗<samples9298996bad>@!<Work>
```

A resource in RDF data matching the “Work” shape:
Has zero or one “rdf:type bf:Work” statements
Optionally has an extra “rdf:type” statement
Has exactly one “bf:title” statement with literal value
Has zero or more “bf:class” statements taking objects
that match the “Classification” shape
**Has one or more “bf:creator” statements taking objects
that match either the “Person” or the “Organization”
shape**

ShEx Schema [ShExC syntax]

```
<Work> EXTRA rdf:type {  
  rdf:type [bf:Work] ? ;  
  bf:title LITERAL ;  
  bf:class @<Classification> * ;  
  bf:creator @<Person> OR @<Organization> + ;  
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<Classification>  
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    bf:label "Dickens, Charles, 1812-1870." ;  
  ] .  
  
<id.loc.gov/.../PZ3>  
  rdf:type bf:LCC ;  
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```

A resource in RDF data matching the “Work” shape:
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Optionally has an extra “rdf:type” statement
Has exactly one “bf:title” statement with literal value
Has zero or more “bf:class” statements taking objects
that match the “Classification” shape
Has one or more “bf:creator” statements taking objects
that match either the “Person” or the “Organization”
Shape
**And zero or more “bf:derivedFrom” statements taking
an IRI as object.**

ShEx Schema [ShExC syntax]

```
<Work> EXTRA rdf:type {  
  rdf:type [bf:Work] ? ;  
  bf:title LITERAL ;  
  bf:class @<Classification> * ;  
  bf:creator @<Person> OR @<Organization> + ;  
  bf:derivedFrom IRI * ;  
}
```

```
<Classification>  
[<http://id.loc.gov/.../>~]  
AND  
EXTRA rdf:type {  
  rdf:type [bf:LCC] ? ;  
  bf:label LITERAL ;  
}
```

RDF Data [Turtle syntax]

```
<samples9298996>  
  rdf:type bf:Text ;  
  rdf:type bf:Work ;  
  bf:title "Oliver Twist." ;  
  bf:class <id.loc.gov/.../PZ3> ;  
  bf:creator [  
    rdf:type bf:Person ;  
    bf:label "Dickens, Charles, 1812-1870." ;  
  ] .
```

```
<id.loc.gov/.../PZ3>  
  rdf:type bf:LCC ;  
  bf:label "PZ3.D55O165PR4567" .
```

2. Against a schema.

1. Validate data.

A resource matching the "Classification" shape:

Validation

3. To yield a validation result

```
✓<samples9298996>@<Work>
```

```
validating samples9298996bad as Work:  
validating http://...oliverTwist:  
Error validating http://...oliverTwist  
as nodeKind literal:  
iri found when literal expected
```

```
✗<samples9298996bad>@!<Work>
```

ShEx Schema [ShExC syntax]

```
<Work> EXTRA rdf:type {  
  rdf:type [bf:Work] ? ;  
  bf:title LITERAL ;  
  bf:class @<Classification> * ;  
  bf:creator @<Person> OR @<Organization> + ;  
  bf:derivedFrom IRI * ;  
}  
  
<Classification>  
[<http://id.loc.gov/~>]  
AND  
EXTRA rdf:type {  
  rdf:type [bf:LCC] ? ;  
  bf:label LITERAL ;  
}
```

2. Against a schema.

A resource matching the “Classification” shape:
is identified with an IRI starting with “id.loc.gov”

RDF Data [Turtle syntax]

```
<samples9298996>  
  rdf:type bf:Text ;  
  rdf:type bf:Work ;  
  bf:title "Oliver Twist." ;  
  bf:class <id.loc.gov/.../PZ3> ;  
  bf:creator [  
    rdf:type bf:Person ;  
    bf:label "Dickens, Charles, 1812-1870." ;  
  ] .  
  
<https://id.loc.gov/authorities/classification/PZ3>  
  rdf:type bf:LCC ;  
  bf:label "PZ3.D55O165PR4567" .
```

1. Validate data.

Validation

3. To yield a validation result

```
✓<samples9298996>@<Work>  
  
validating samples9298996bad as Work:  
  validating http://...oliverTwist:  
    Error validating http://...oliverTwist  
    as nodeKind literal:  
      iri found when literal expected  
  
✗<samples9298996bad>@!<Work>
```

ShEx Schema [ShExC syntax]

```
<Work> EXTRA rdf:type {  
  rdf:type [bf:Work] ? ;  
  bf:title LITERAL ;  
  bf:class @<Classification> * ;  
  bf:creator @<Person> OR @<Organization> + ;  
  bf:derivedFrom IRI * ;  
}  
  
<Classification>  
  [<http://id.loc.gov/.../>~]  
AND  
  EXTRA rdf:type {  
    rdf:type [bf:LCC] ? ;  
    bf:label LITERAL ;  
  }
```

2. Against a schema.

A resource matching the “Classification” shape:
is identified with an IRI starting with “id.loc.gov”
has zero or one “rdf:type bf:LOC” statements

RDF Data [Turtle syntax]

```
<samples9298996>  
  rdf:type bf:Text ;  
  rdf:type bf:Work ;  
  bf:title "Oliver Twist." ;  
  bf:class <id.loc.gov/.../PZ3> ;  
  bf:creator [  
    rdf:type bf:Person ;  
    bf:label "Dickens, Charles, 1812-1870." ;  
  ] .  
  
<id.loc.gov/.../PZ3>  
  rdf:type bf:LCC ;  
  bf:label "PZ3.D55O165PR4567" .
```

1. Validate data.

Validation

3. To yield a validation result

✓<samples9298996>@<Work>

```
validating samples9298996bad as Work:  
validating http://...oliverTwist:  
Error validating http://...oliverTwist  
as nodeKind literal:  
iri found when literal expected
```

✗<samples9298996bad>@!<Work>

ShEx Schema [ShExC syntax]

```
<Work> EXTRA rdf:type {  
  rdf:type [bf:Work] ? ;  
  bf:title LITERAL ;  
  bf:class @<Classification> * ;  
  bf:creator @<Person> OR @<Organization> + ;  
  bf:derivedFrom IRI * ;  
}  
  
<Classification>  
  [<http://id.loc.gov/.../>~]  
AND  
EXTRA rdf:type {  
  rdf:type [bf:LCC] ? ;  
  bf:label LITERAL ;  
}
```

2. Against a schema.

A resource matching the “Classification” shape:
is identified with an IRI starting with “id.loc.gov”
has zero or one “rdf:type bf:LOC” statements
optionally has an additional “rdf:type” statement

RDF Data [Turtle syntax]

```
<samples9298996>  
  rdf:type bf:Text ;  
  rdf:type bf:Work ;  
  bf:title "Oliver Twist." ;  
  bf:class <id.loc.gov/.../PZ3> ;  
  bf:creator [  
    rdf:type bf:Person ;  
    bf:label "Dickens, Charles, 1812-1870." ;  
  ] .  
  
<id.loc.gov/.../PZ3>  
  rdf:type bf:LCC ;  
  bf:label "PZ3.D55O165PR4567" .
```

1. Validate data.

Validation

3. To yield a validation result

```
✓<samples9298996>@<Work>  
  
validating samples9298996bad as Work:  
  validating http://...oliverTwist:  
    Error validating http://...oliverTwist  
      as nodeKind literal:  
        iri found when literal expected  
  
✗<samples9298996bad>@!<Work>
```

ShEx Schema [ShExC syntax]

```
<Work> EXTRA rdf:type {  
  rdf:type [bf:Work] ? ;  
  bf:title LITERAL ;  
  bf:class @<Classification> * ;  
  bf:creator @<Person> OR @<Organization> + ;  
  bf:derivedFrom IRI * ;  
}  
  
<Classification>  
  [<http://id.loc.gov/.../>~]  
AND  
  EXTRA rdf:type {  
    rdf:type [bf:LCC] ? ;  
    bf:label LITERAL ;  
  }
```

2. Against a schema.

A resource matching the “Classification” shape:
is identified with an IRI starting with “id.loc.gov”
has zero or one “rdf:type bf:LOC” statements
optionally has an additional “rdf:type” statement
has exactly one “bf:label” statement with a literal value

RDF Data [Turtle syntax]

```
<samples9298996>  
  rdf:type bf:Text ;  
  rdf:type bf:Work ;  
  bf:title "Oliver Twist." ;  
  bf:class <id.loc.gov/.../PZ3> ;  
  bf:creator [  
    rdf:type bf:Person ;  
    bf:label "Dickens, Charles, 1812-1870." ;  
  ] .  
  
<id.loc.gov/.../PZ3>  
  rdf:type bf:LCC ;  
  bf:label "PZ3.D55O165PR4567" .
```

1. Validate data.

Validation

3. To yield a validation result

```
✓<samples9298996>@<Work>  
  
validating samples9298996bad as Work:  
  validating http://...oliverTwist:  
    Error validating http://...oliverTwist  
      as nodeKind literal:  
        iri found when literal expected  
  
✗<samples9298996bad>@!<Work>
```

ShEx Schema [ShExC syntax]

```
<Work> EXTRA rdf:type {  
  rdf:type [bf:Work] ? ;  
  bf:title LITERAL ;  
  bf:class @<Classification> * ;  
  bf:creator @<Person> OR @<Organization> + ;  
  bf:derivedFrom IRI * ;  
}  
  
<Classification>  
  [<http://id.loc.gov/.../>~]  
AND  
  EXTRA rdf:type {  
    rdf:type [bf:LCC] ? ;  
    bf:label LITERAL ;  
  }
```

2. Against a schema.

RDF Data [Turtle syntax]

```
<samples9298996>  
  rdf:type bf:Text ;  
  rdf:type bf:Work ;  
  bf:title "Oliver Twist." ;  
  bf:class <id.loc.gov/.../PZ3> ;  
  bf:creator [  
    rdf:type bf:Person ;  
    bf:label "Dickens, Charles, 1812-1870." ;  
  ] .  
  
<id.loc.gov/.../PZ3>  
  rdf:type bf:LCC ;  
  bf:label "PZ3.D55O165PR4567" .
```

1. Validate data.

Validation

3. To yield a validation result

✓<samples9298996>@<Work>

```
validating samples9298996bad as Work:  
validating http://...oliverTwist:  
Error validating http://...oliverTwist  
as nodeKind literal:  
iri found when literal expected
```

✗<samples9298996bad>@!<Work>

Shapes can combine constraints with AND, OR, NOT, and parentheses.

Terminology summarized

- A **ShEx Schema** holds a collection of...
 - **Shape Expressions**, which logically combine...
 - **Node Constraints**, which match **nodes in RDF Data**, and...
 - **Shapes**, which match **triples in RDF Data** as specified in...
 - **Triple constraints**, which match triples touching a given **node in RDF Data** in terms of...
 - Predicates
 - Direction
 - Cardinality
 - Value

Active and friendly development community

- W3C Shape Expressions Community Group (ShEx CG)
 - <https://www.w3.org/community/shex> CG homepage
 - <http://shex.io> ShEx homepage
 - <http://shex.io/shex-primer/> primer
 - <http://shex.io/shex-semantic/> main specification
 - <https://rawgit.com/shexSpec/shex.js/master/doc/shex-simple.html> validator

Focus Node and Neighborhood of a Node

- **Focus Node** = node that is being validated (here **:alice**)
- **Neighborhood of a node** = set of incoming/outgoing triples

```
:alice      schema:name      "Alice";  
            schema:follows   :bob;  
            schema:worksFor   :OurCompany .  
  
:bob        foaf:name        "Robert" ;  
            schema:worksFor   :OurCompany .  
  
:carol      schema:name      "Carol" ;  
            schema:follows    :alice .  
  
:dave       schema:name      "Dave" .  
  
:OurCompany schema:founder :dave ;  
            schema:employee :alice, :bob .
```

```
Neighbourhood of :alice = {  
  (:alice,      schema:name,      "Alice")  
  (:alice,      schema:follows,   :bob),  
  (:alice,      schema:worksFor,   :OurCompany),  
  (:carol,      schema:follows,    :alice),  
  (:OurCompany, schema:employee,   :alice)  
}
```

