

# Foundations of Semantic Web Technologies

## Tutorial 11

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**Exercise 11.1.** Let's play with shapes! Specifically we will focus on SHACL. Copy and paste the following RDF graph into the left window of RDF Playground (<http://rdfplayground.dcc.uchile.cl/>):

```
@prefix : <http://ex.org/data/> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>.
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#>.
@prefix xsd: <http://www.w3.org/2001/XMLSchema#>.

:AIH-SF-2021-1 a :AllIrelandHurlingSemiFinal ;
:team :LimerickSH , :WaterfordSH ;
:date "2021-08-03"^^xsd:date ;
:score [ :team :LimerickSH ; :points 0 ] , [ :team :WaterfordSH ; :points 17 ] ;
:winner :LimerickSH ;
:loser :WaterfordSH ;
:attendance 40000 .

:AIH-SF-2021-2 a :AllIrelandHurlingSemiFinal ;
:team :KilkennySH ;
:date "2021"^^xsd:gYear ;
:score [ :team :KilkennySH ; :points 35 ] , [ :team :CorkSH ; :points 40 ] ;
:winner :CorkSH ;
:loser :KilkennySH ;
:venue :CrokePark ;
:attendance 40000 .

:AIH-S-2021 a :AllIrelandHurlingFinal ;
:team :LimerickSH , :CorkSH ;
:date "2021-07-18"^^xsd:date ;
:venue :CrokePark ;
:attendance 400000 .

:AllIrelandHurlingFinal rdfs:subClassOf :AllIrelandHurlingMatch .
:AllIrelandHurlingSemiFinal rdfs:subClassOf :AllIrelandHurlingMatch .

:AllIrelandHurlingSeries2021 a :AllIrelandHurlingSeries ;
:semifinal :AIH-SF-2021-1 , :AIH-SF-2021-2 , :AIH-S-2021 ;
:final :AIH-S-2021 .

:CrokePark a :Stadium ;
:capacity 82300 .
```

Now copy and paste the following shapes graph into the SHACL tab on the right:

```
@prefix : <http://ex.org/data/> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix s: <http://ex.org/shapes/> .
@prefix sh: <http://www.w3.org/ns/shacl#> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .
```

```
s:AllIrelandHurlingMatch a sh:NodeShape ;
sh:targetClass :AllIrelandHurlingMatch ;
sh:property [ sh:path :team ; sh:minCount 2 ; sh:maxCount 2 ] .
```

Hit the **VALIDATE GRAPH** button. Below in the results window you should see a report indicating if there are any violations of the constraints. You should see one indicating that the second semi-final has only one team rather than the two expected. For each of the following questions, you should extend the shapes graph to indicate further constraints and hopefully identify further data quality issues with the RDF graph.

- (a) Extend the `s:AllIrelandHurlingMatch` shape to indicate that each targetted node should have precisely one date, and that the date should have the datatype `xsd:date`.
- (b) Extend the `s:AllIrelandHurlingMatch` shape to indicate that each targetted node has precisely one venue and that the venue must be a stadium.
- (c) Add a new shape targetting instances of `:AllIrelandHurlingSeries` to indicate that it should have precisely two semifinals, that it should have precisely one final, and that the semifinals and finals should satisfy the `s:AllIrelandHurlingMatch` shape.
- (d) Extend the `s:AllIrelandHurlingSeries` shape to state that the same match cannot be both a final and a semifinal of the series.
- (e) Add a new shape targetting instances of `:Stadium` to state that they must be IRIs and that the attendance of whatever is held there must be less than or equals its capacity.
- (f) Extend the `s:AllIrelandHurlingMatch` shape with a *SPARQL* constraint to say that the winner of a match cannot score 0 points in that match (it is okay if a score is not given).