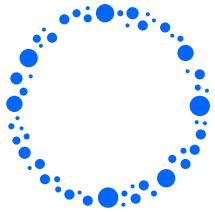
[dstl]



telicent

Extensions to IES, Mappings and Use Cases

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March 2021

MODEL FUTURES

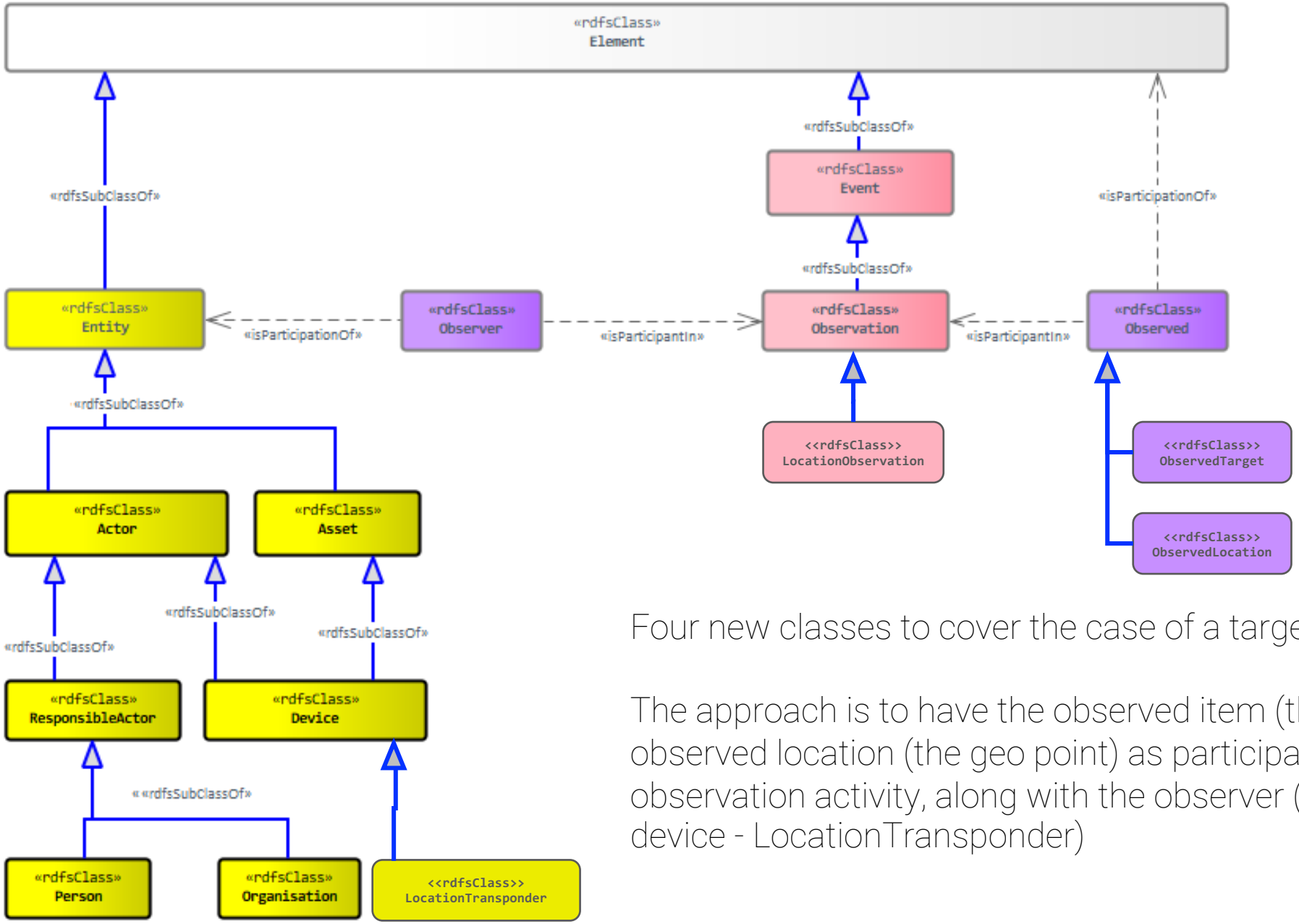
Stage 1 – Track Data

We have built a simple track provider that accumulates AIS data until it hits a user-defined threshold of data points per vessel then it pushes out an IES message containing the track information for that vessel onto the Kafka log. Users can set the throughput rate and track size as environment variables that are provided to the container (Docker).

Data is in n-triples format, zipped before being put onto Kafka. At the request of Canada, heading, course and vessel / activity type data has not been mapped (they plan to calculate it).

The slides that follow show the necessary additions to IES that were needed (LocationObservation and LocationTransponder)

Extensions to IES for Tracks



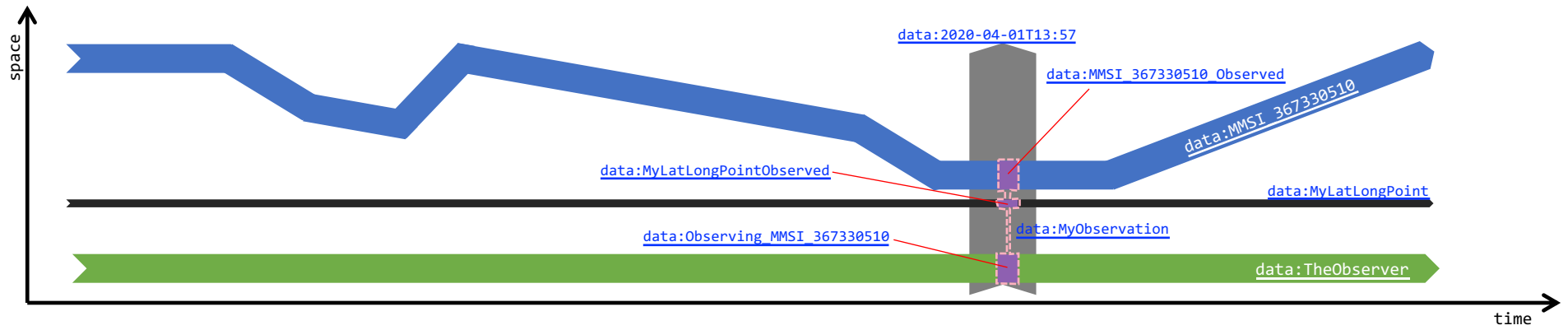
Four new classes to cover the case of a target's location.

The approach is to have the observed item (the vessel) and the observed location (the geo point) as participants in the observation activity, along with the observer (the AIS receiver, a device - LocationTransponder)

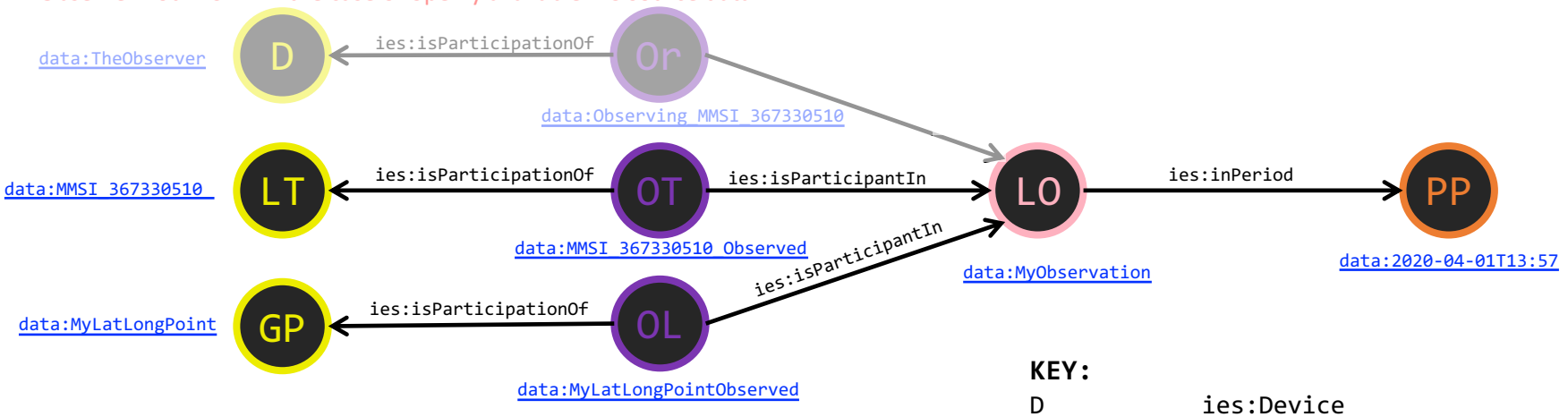
RDF Schema for Track Extensions

```
@prefix                 ies:            <http://ies.data.gov.uk/ontology/ies4#> .
@prefix                 rdf:            <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix                 rdfs:           <http://www.w3.org/2000/01/rdf-schema#> .

ies:LocationTransponder     rdf:type            rdfs:Class .
ies:LocationTransponder     rdfs:subClassOf     ies:CommunicationsDevice .
ies:LocationObservation     rdf:type            rdfs:Class .
ies:LocationObservation     rdfs:subClassOf     ies:Observation .
ies:ObservedLocation        rdf:type            rdfs:Class .
ies:ObservedLocation        rdfs:subClassOf     ies:Observed .
ies:ObservedTarget          rdf:type            rdfs:Class .
ies:ObservedTarget          rdfs:subClassOf     ies:Observed .
```

Example: Ship observed at location on 1st April at 1:57pm



Observer not known in the case of openly available AIS source data



Namespaces:

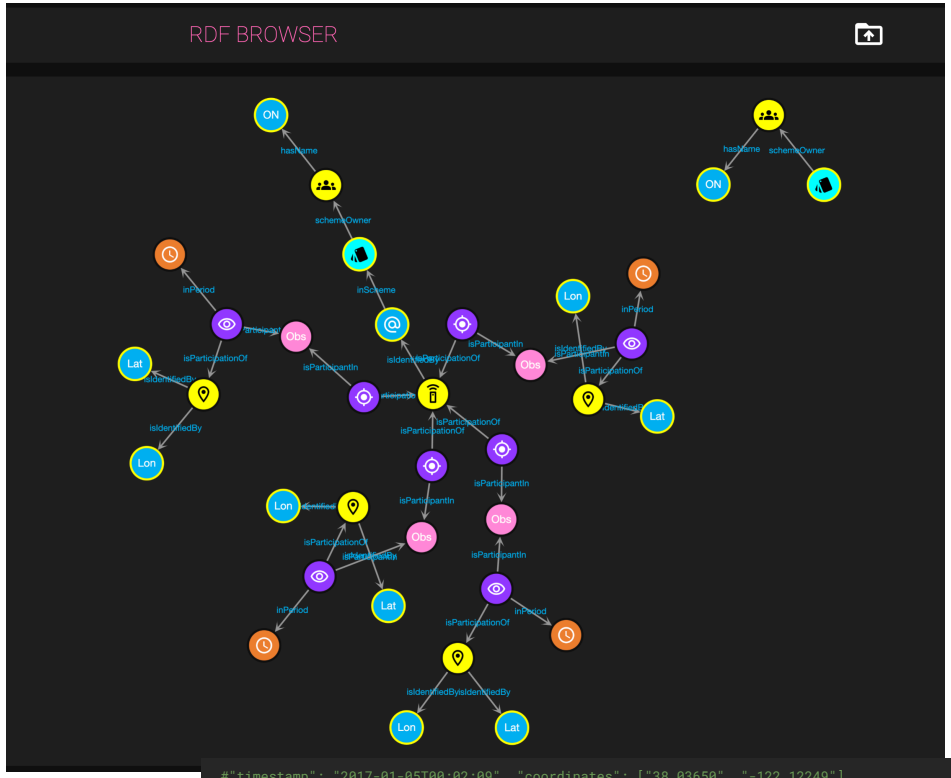
```
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix ies: <http://ies.data.gov.uk/ies4#> .
@prefix data: <http://data.gov.uk/testdata#> .
```

KEY:

D	ies:Device
GP	ies:GeoPoint
LO	ies:LocationObservation
OL	ies:ObservedLocation
OT	ies:ObservedTarget
Or	ies:Observer
PP	ies:ParticularPeriod
LT	ies:LocationTransponder (new addition to model)

Example Track Data (in RDF Turtle)

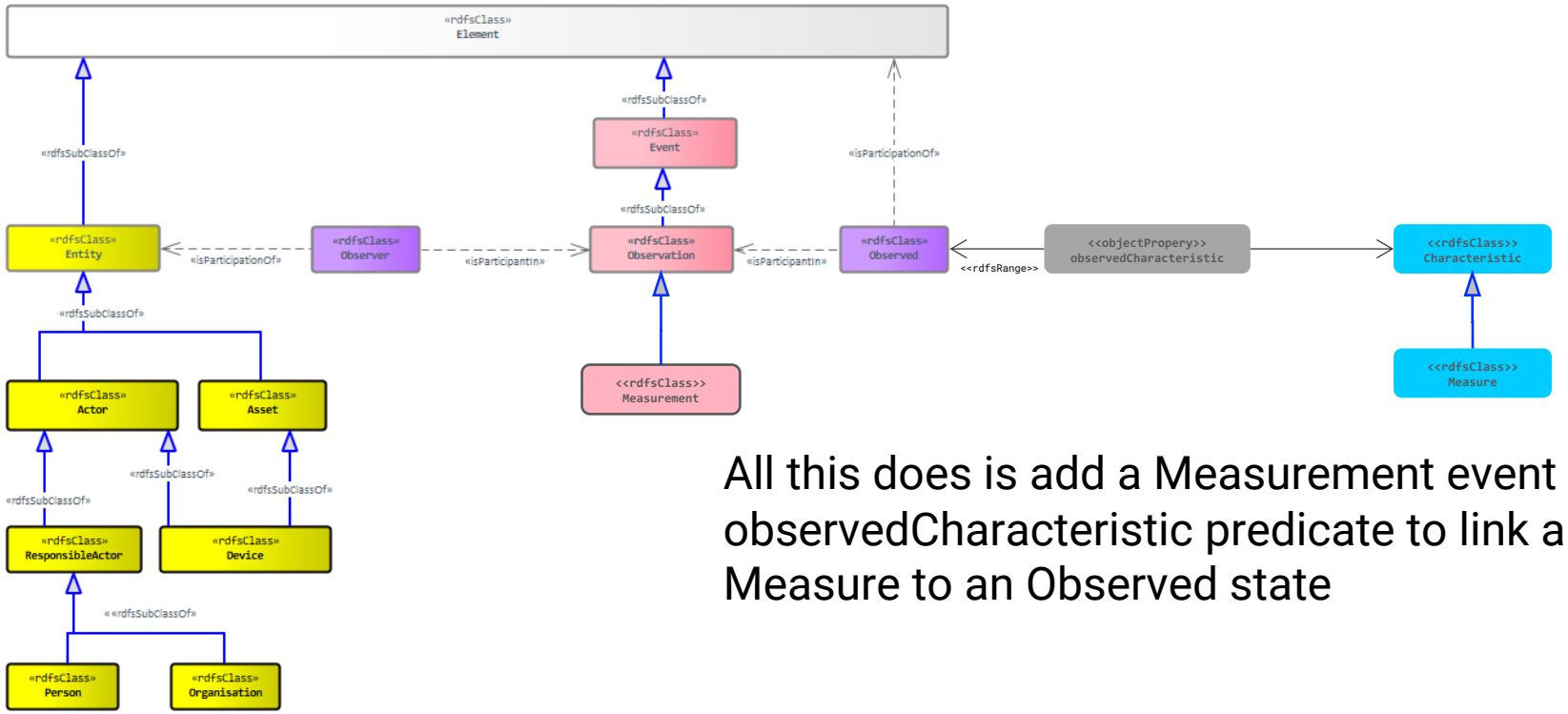
```
@prefix data: <http://ais.data.gov.uk/ais-ies-test#> .
@prefix ies: <http://ies.data.gov.uk/ontology/ies4#> .

#Boilerplate stuff - setting the naming schemes used in the data, and the owners of those schemes. This could be put in a separate RDF file and
referenced if need be
<http://imo.org> a ies:Organisation ;
  ies:hasName data:96fbe176-74a3-4dd8-ac76-adefc4c3d3d1 .
data:96fbe176-74a3-4dd8-ac76-adefc4c3d3d1 a ies:OrganisationName ;
  ies:representationValue "International Maritime Organisation" .
<http://imo.org#imo-NamingScheme> a ies:NamingScheme ;
  ies:schemeOwner <http://imo.org> .
<http://itu.int> a ies:Organisation ;
  ies:hasName data:23a814e7-4859-48d9-a91d-14218198bb70 .
data:23a814e7-4859-48d9-a91d-14218198bb70 a ies:OrganisationName ;
  ies:representationValue "International Telecommunications Union" .
<http://itu.int#mmsi-NamingScheme> a ies:NamingScheme ;
  ies:schemeOwner <http://itu.int> .

#The transponder - note, LocationTransponder was added as a new class to the IES ontology for the purposes of MIKES
data:MMSI_367330510 a ies:LocationTransponder ;
  ies:isIdentifiedBy data:7f79de9e-1307-4a8a-969a-ff683864868a .
data:7f79de9e-1307-4a8a-969a-ff683864868a a ies:CommunicationsIdentifier ;
  ies:inScheme <http://itu.int#mmsi-NamingScheme> ;
  ies:representationValue "367330510" .

#The overarching track observation (each individual LocationObservation is part of this)
data: MMSI_367330510_track_observation_0000101 a ies:Observation .

#Now the observations - note this is just using simple lat and long points from IES. We have not tried to use the EPSG stuff yet as lat and
long are already covered in the model.

#"timestamp": "2017-01-05T00:00:00", "coordinates": ["38.03654", "-122.12249"]
data:1d867d78-b763-495e-81d3-18ca7ff23d62 a ies:LocationObservation ;
  ies:isPartOf data: MMSI_367330510_track_observation_0000101 .
data:cbf8c7bf-ee6f-4089-af6d-d4b7f5043f7a a ies:ObservedLocation ;
  ies:inPeriod <http://iso.org/iso8601#2017-01-05T00%3A00%3A00> ;
  ies:isParticipantIn data:1d867d78-b763-495e-81d3-18ca7ff23d62 ;
  ies:isParticipationOf data:2953e2a9-5197-4508-87ad-7e96901a9dc3 .
<http://iso.org/iso8601#2017-01-05T00%3A00%3A00> a ies:ParticularPeriod ;
  ies:iso8601PeriodRepresentation "2017-01-05T00:00:00" .
data:2953e2a9-5197-4508-87ad-7e96901a9dc3 a ies:GeoPoint ;
  ies:isIdentifiedBy data:170a29fb-ba21-4d8a-9dbe-5ece6ee8b741,
    data:5f48dd15-c79e-4bd6-8857-4e5d38fa9a34 .
data:5f48dd15-c79e-4bd6-8857-4e5d38fa9a34 a ies:Longitude ;
  ies:representationValue "-122.12249" .
data:170a29fb-ba21-4d8a-9dbe-5ece6ee8b741 a ies:Latitude ;
  ies:representationValue "38.03654" .
data:131f4043-067b-47ad-9ef6-7983dc0689de a ies:ObservedTarget ;
  ies:isParticipantIn data:1d867d78-b763-495e-81d3-18ca7ff23d62 ;
  ies:isParticipationOf data:MMSI_367330510 .

#"timestamp": "2017-01-05T00:01:08", "coordinates": ["38.03654", "-122.12250"]
data:cdbb5fa7-1d38-4722-a10c-05635d31ab23 a ies:Observation ;
  ies:isPartOf data: MMSI_367330510_track_observation_0000101 .
data:6ea333b2-0818-45fc-934d-58767cbc5e2e a ies:ObservedLocation ;
  ies:inPeriod <http://iso.org/iso8601#2017-01-05T00%3A01%3A08> ;
  ies:isParticipantIn data:cdbb5fa7-1d38-4722-a10c-05635d31ab23 ;
  ies:isParticipationOf data:dab518fd-46b0-4064-8039-c407637b6b0d .
<http://iso.org/iso8601#2017-01-05T00%3A01%3A08> a ies:ParticularPeriod ;
  ies:iso8601PeriodRepresentation "2017-01-05T00:01:08" .
data:dab518fd-46b0-4064-8039-c407637b6b0d a ies:GeoPoint ;
  ies:isIdentifiedBy data:53a426bb-04da-421b-8934-3b562dec25a7,
    data:f32165d4-e134-402c-8646-4f684dbf70b8 .
data:53a426bb-04da-421b-8934-3b562dec25a7 a ies:Longitude ;
  ies:representationValue "-122.12250" .
data:f32165d4-e134-402c-8646-4f684dbf70b8 a ies:Latitude ;
  ies:representationValue "38.03654" .
data:5d6457cb-df4d-4def-a3f2-9529efe0e982 a ies:ObservedTarget ;
  ies:isParticipantIn data:cdbb5fa7-1d38-4722-a10c-05635d31ab23 ;
  ies:isParticipationOf data:MMSI_367330510 .
```




```
#"timestamp": "2017-01-05T00:02:09", "coordinates": ["38.03650", "-122.12249"]
data:0dcce9d6-8a80-48c1-a732-e7214da94c36 a ies:Observation ;
  ies:isPartOf data: MMSI_367330510_track_observation_0000101 .
data:e93120b6-42cf-4794-8479-dee9ec54a87f a ies:ObservedLocation ;
  ies:inPeriod <http://iso.org/iso8601#2017-01-05T00%3A02%3A09> ;
  ies:isParticipantIn data:0dcce9d6-8a80-48c1-a732-e7214da94c36 ;
  ies:isParticipationOf data:20514b92-dcbd-4e29-babb-fb5f4f61ec96 .
<http://iso.org/iso8601#2017-01-05T00%3A02%3A09> a ies:ParticularPeriod ;
  ies:iso8601PeriodRepresentation "2017-01-05T00:02:09" .
data:20514b92-dcbd-4e29-babb-fb5f4f61ec96 a ies:GeoPoint ;
  ies:isIdentifiedBy data:997fc3ab-33e4-42cd-ac8b-ccd4d297ffe8,
    data:9f5de12e-8a09-449e-b111-88d818a3a66c .
data:9f5de12e-8a09-449e-b111-88d818a3a66c a ies:Longitude ;
  ies:representationValue "-122.12249" .
data:997fc3ab-33e4-42cd-ac8b-ccd4d297ffe8 a ies:Latitude ;
  ies:representationValue "38.03650" .
data:58bda6fb-a23f-4eb1-be36-519f062b5817 a ies:ObservedTarget ;
  ies:isParticipantIn data:0dcce9d6-8a80-48c1-a732-e7214da94c36 ;
  ies:isParticipationOf data:MMSI_367330510 .

#"timestamp": "2017-01-05T00:03:10", "coordinates": ["38.03653", "-122.12245"]
data:14848579-9801-4c4d-b697-15a613519521 a ies:Observation ;
  ies:isPartOf data: MMSI_367330510_track_observation_0000101 .
data:9878c574-cf82-4180-adcd-6776ddea8450 a ies:ObservedLocation ;
  ies:inPeriod <http://iso.org/iso8601#2017-01-05T00%3A03%3A10> ;
  ies:isParticipantIn data:14848579-9801-4c4d-b697-15a613519521 ;
  ies:isParticipationOf data:5d98f40c-9360-4532-9dbf-1f8b3e5eec95 .
<http://iso.org/iso8601#2017-01-05T00%3A03%3A10> a ies:ParticularPeriod ;
  ies:iso8601PeriodRepresentation "2017-01-05T00:03:10" .
data:5d98f40c-9360-4532-9dbf-1f8b3e5eec95 a ies:GeoPoint ;
  ies:isIdentifiedBy data:88113296-79eb-4888-9622-a3513d5da541,
    data:983aba81-d6fb-4cfb-bc80-ccde5c828265 .
data:983aba81-d6fb-4cfb-bc80-ccde5c828265 a ies:Longitude ;
  ies:representationValue "-122.12245" .
data:88113296-79eb-4888-9622-a3513d5da541 a ies:Latitude ;
  ies:representationValue "38.03653" .
data:8c674432-1711-4b68-9955-fe6b27ab3d70 a ies:ObservedTarget ;
  ies:isParticipantIn data:14848579-9801-4c4d-b697-15a613519521 ;
  ies:isParticipationOf data:MMSI_367330510 .
```

Observation of measures / characteristics

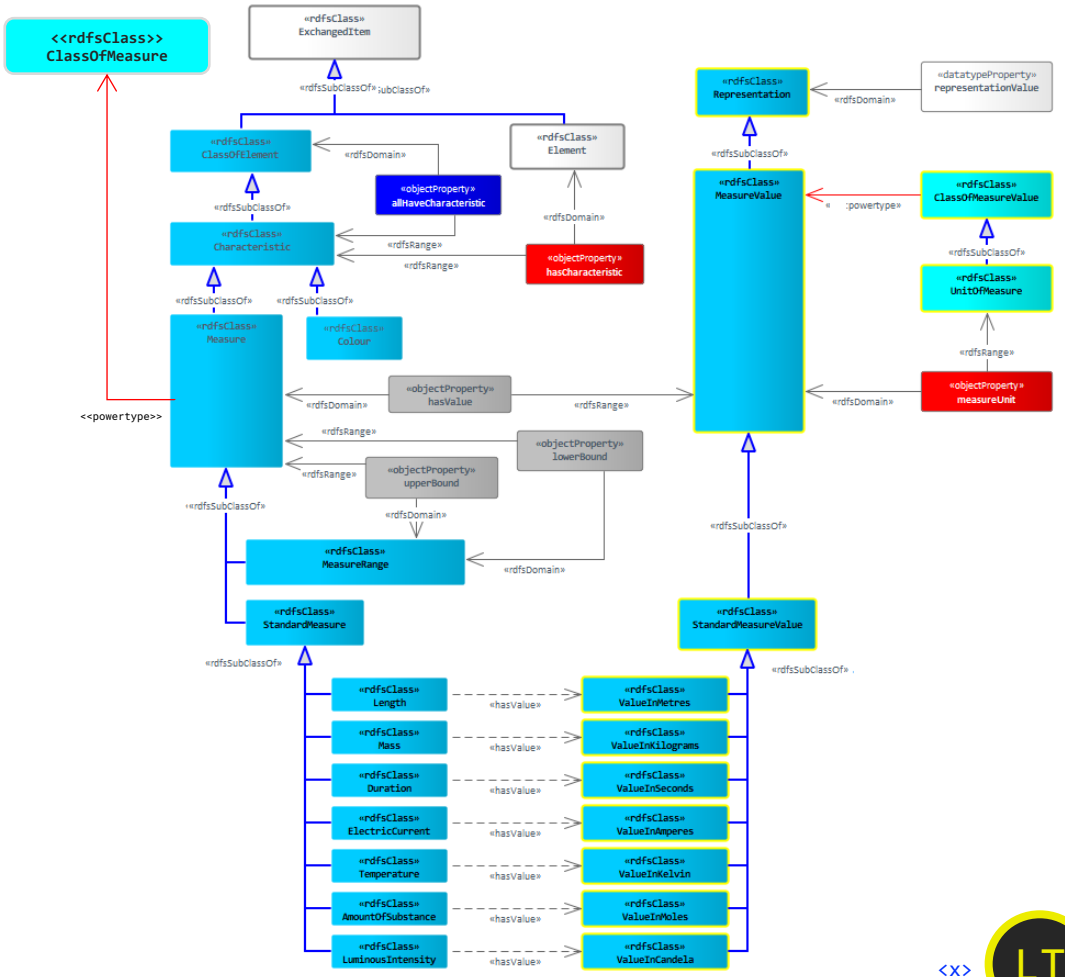
DRAFT – Not Approved by Dstl Yet



All this does is add a Measurement event class and an observedCharacteristic predicate to link a characteristic or Measure to an Observed state

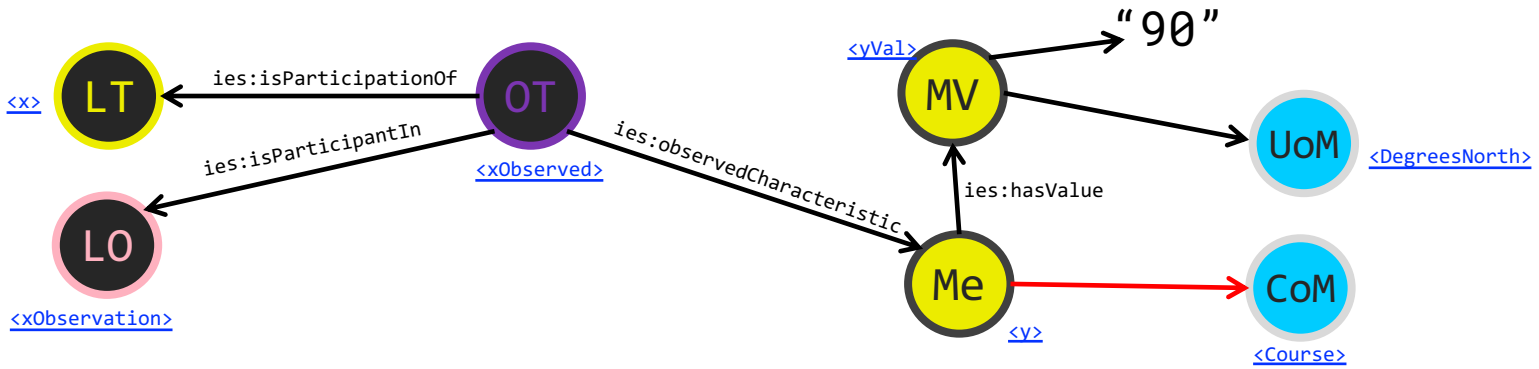
Course over Ground, Speed over Ground

DRAFT – Not Approved by Dstl Yet

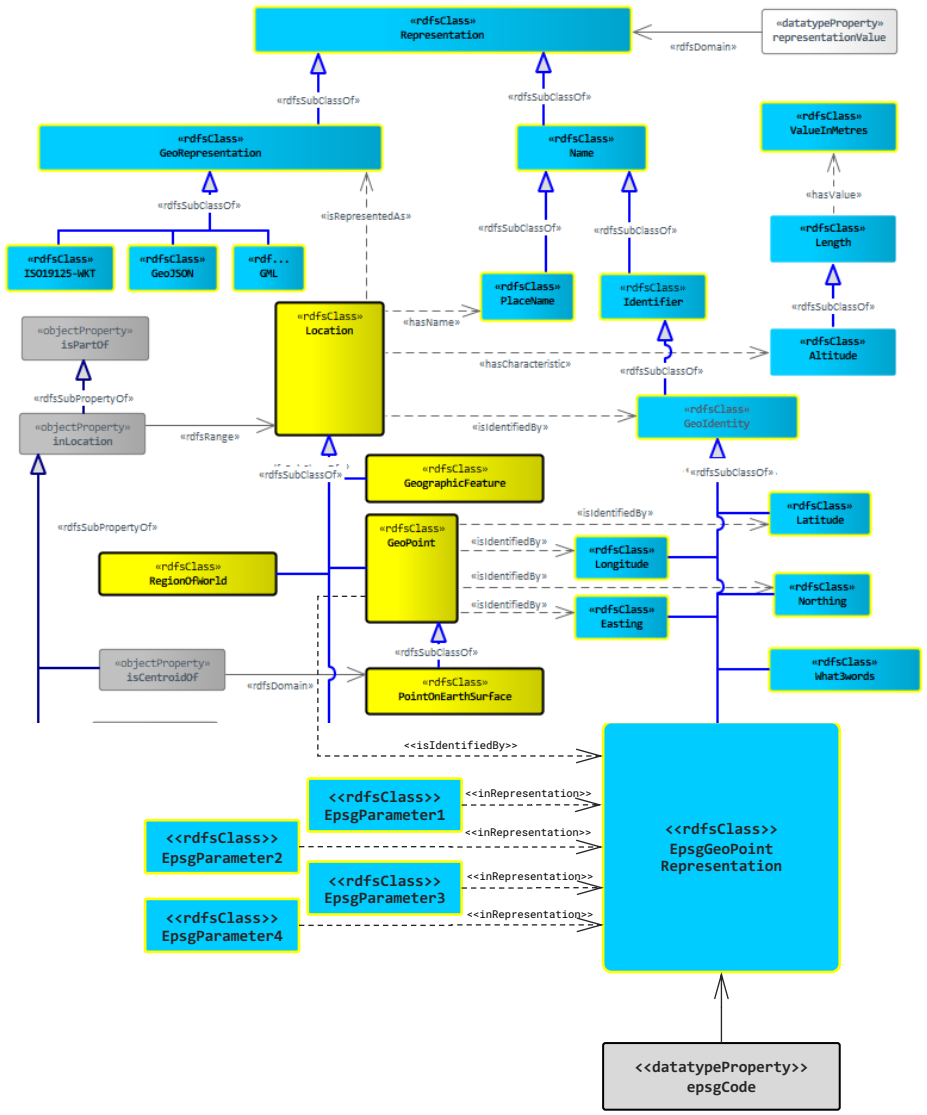


Addition of ClassOfMeasure powertype allows for new measures to be added without having to use subtype in your data. In the case of course and speed, there is no need to add them to the model (unless someone decides they need to be standard measures). Example would be:

```
<degreesNorth>      rdf:type                    ies:UnitOfMeasure .
<course>            rdf:type                    ies:ClassOfMeasure .

<x>                 rdf:type                    ies:LocationTransponder .
<xObserved>         rdf:type                    ies:ObservedTarget .
<xObserved>         ies:isParticipationOf       <x> .
<xObserved>         ies:isParticipationIn       <xObservation>
<xObserved>         ies:observedCharacteristic  <y> .
<y>                 rdf:type                    <course> .
<y>                 ies:hasValue                <yVal> .
<yVal>              rdf:type                    ies:MeasureValue .
<yVal>              ies:representationValue     “90” .
<yVal>              ies:measureUnit             <degNorth>.
```



Alternate Coordinate Systems – using EPSG codes



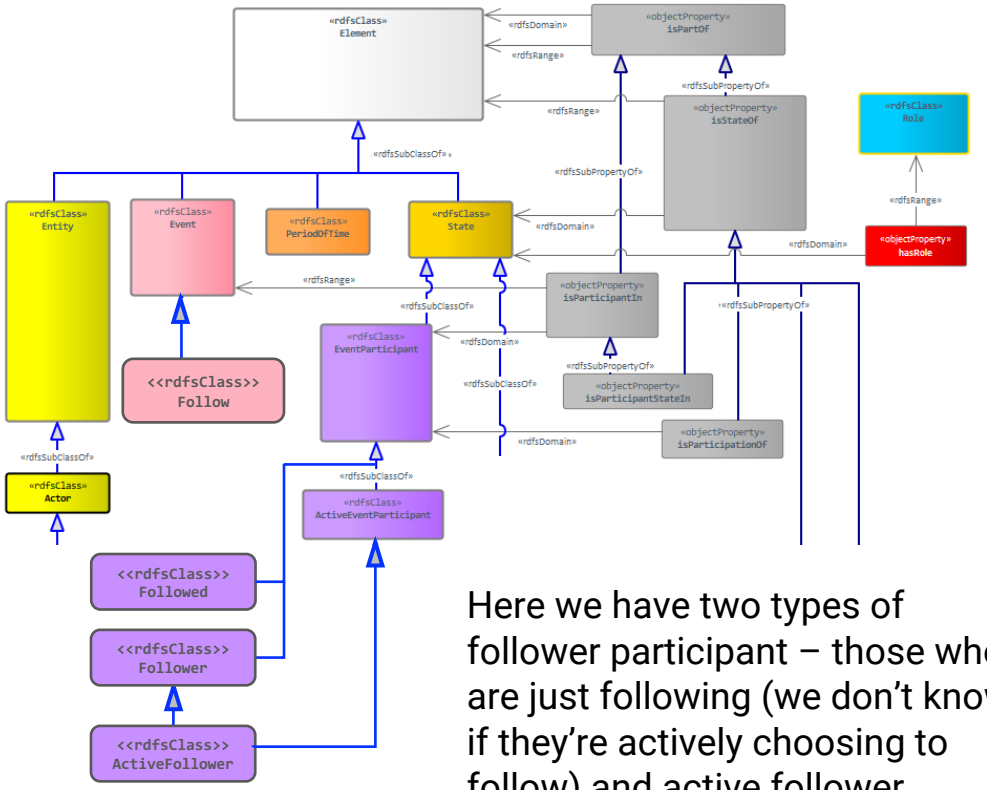
DRAFT – Not Approved by Dstl Yet

Some of the track analytics apps use varying coordinate systems. EPSG has categorised a huge number of these coordinate systems and mapped them onto between 2 and 4 parameters, so we are proposing to capture this in IES.

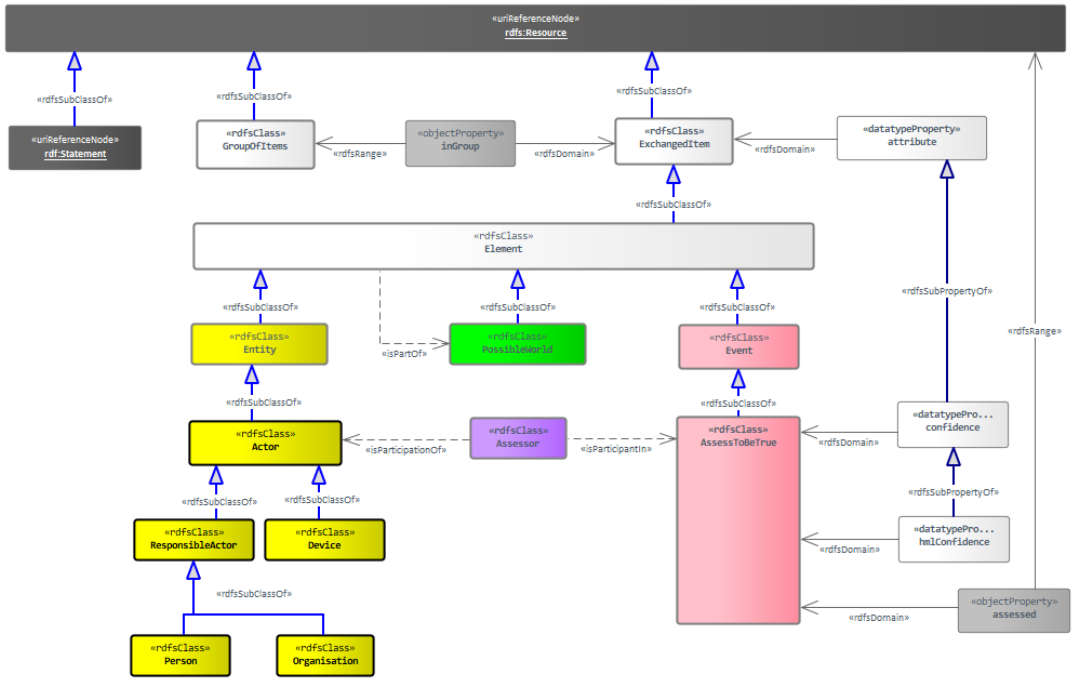
```
@prefix      ies:                    <http://ies.data.gov.uk/ontology/ies4#> .
@prefix      rdf:                    <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix      rdfs:                   <http://www.w3.org/2000/01/rdf-schema#> .

ies:EpsgGeoPointRepresentation       rdf:type                 rdfs:Class .
ies:LocationTransponder              rdfs:subClassOf          ies:GeoIdentity .
ies:epsgCode                         rdf:type                 owl:datatypeProperty .
ies:epsgCode                         rdfs:subPropertyOf       ies:attribute .
ies:epsgCode                         rdfs:domain              ies:EpsgGeoPointRepresentation .
ies:EpsgParameter1                   rdf:type                 rdfs:Class .
ies:EpsgParameter1                   rdfs:subClassOf          ies:Representation .
ies:EpsgParameter2                   rdf:type                 rdfs:Class .
ies:EpsgParameter2                   rdfs:subClassOf          ies:Representation .
ies:EpsgParameter3                   rdf:type                 rdfs:Class .
ies:EpsgParameter3                   rdfs:subClassOf          ies:Representation .
ies:EpsgParameter4                   rdf:type                 rdfs:Class .
ies:EpsgParameter4                   rdfs:subClassOf          ies:Representation .
```

Extensions to IES for “following”

In this approach, we simply use what’s already in IES, with the only required extensions are to create a Following event, and the necessary EventParticipant roles for the follower and the followed.



Here we have two types of follower participant – those who are just following (we don’t know if they’re actively choosing to follow) and active follower.



The possible worlds model does not need to change, and we can use it in the usual IES fashion with AssessToBeTrue. The Assessor could then be a System (e.g. Odysseus, Wisdom)

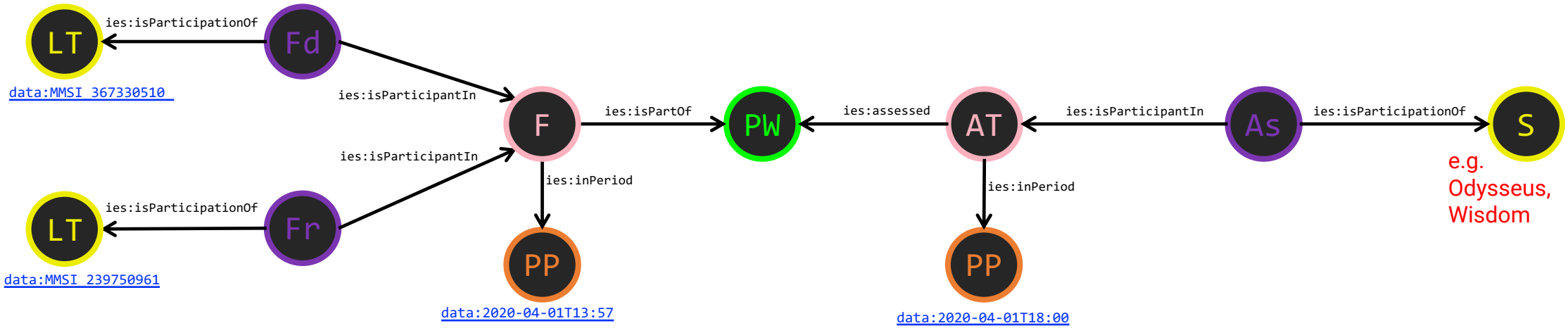
The confidence could be expressed using the UK Govt PHIA Probability Yardstick - https://www.app.college.police.uk/app-content/intelligence-management/analysis/delivering-effective-analysis/

Probably also need to add AssessToBeFalse (again with the same confidence criteria).

RDF Schema for “Following” Use-Case Extensions

```
@prefix                 ies:            <http://ies.data.gov.uk/ontology/ies4#> .
@prefix                 rdf:            <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix                 rdfs:           <http://www.w3.org/2000/01/rdf-schema#> .

ies:Follow              rdf:type        rdfs:Class .
ies:Follow              rdfs:subClassOf ies:Event .
ies:Followed            rdf:type        rdfs:Class .
ies:Followed            rdfs:subClassOf ies:EventParticipant .
ies:Follower            rdf:type        rdfs:Class .
ies:Follower            rdfs:subClassOf ies:EventParticipant .
ies:ActiveFollower      rdf:type        rdfs:Class .
ies:ActiveFollower      rdfs:subClassOf ies:Follower .
ies:ActiveFollower      rdfs:subClassOf ies:ActiveEventParticipant .
```

Option One Example – A following B



Note time of following event and time of assessment may be different

Namespaces:

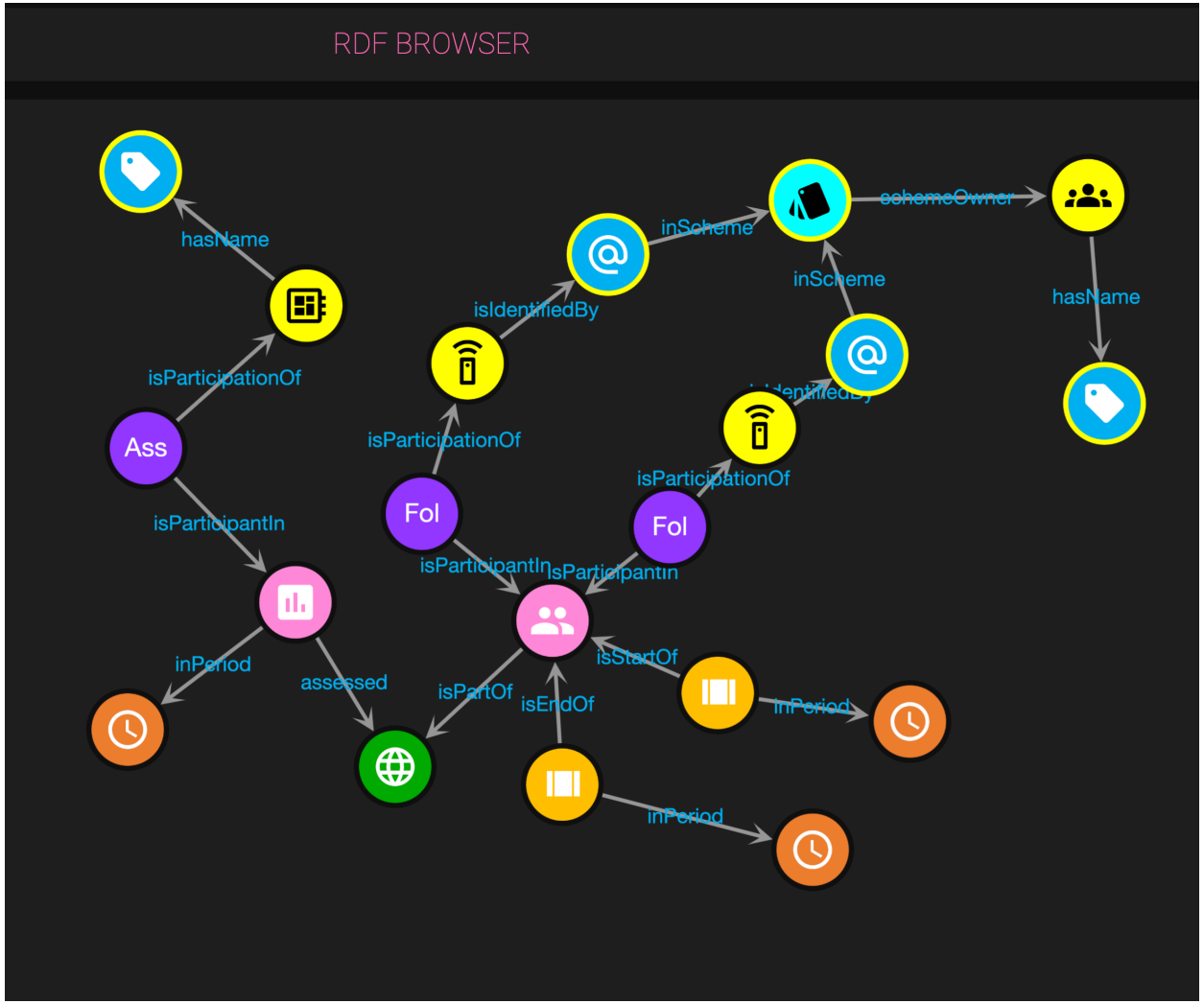
```
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix ies: <http://ies.data.gov.uk/ies4#> .
@prefix data: <http://data.gov.uk/testdata#> .
```

KEY:

As	ies:Assessor
AT	ies:AssessToBeTrue
F	ies:Follow
Fd	ies:Followed
Fr	ies:Follower
LT	ies:LocationTransponder
PP	ies:ParticularPeriod
PW	ies:PossibleWorld
S	ies:System

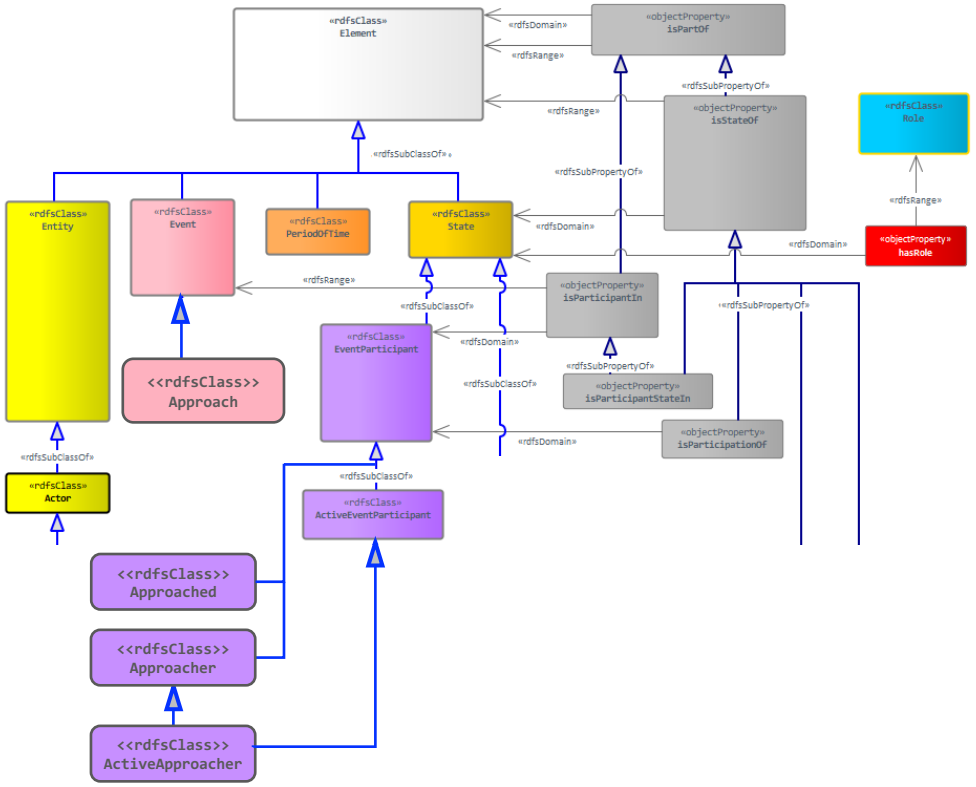
Example “Following” Data:

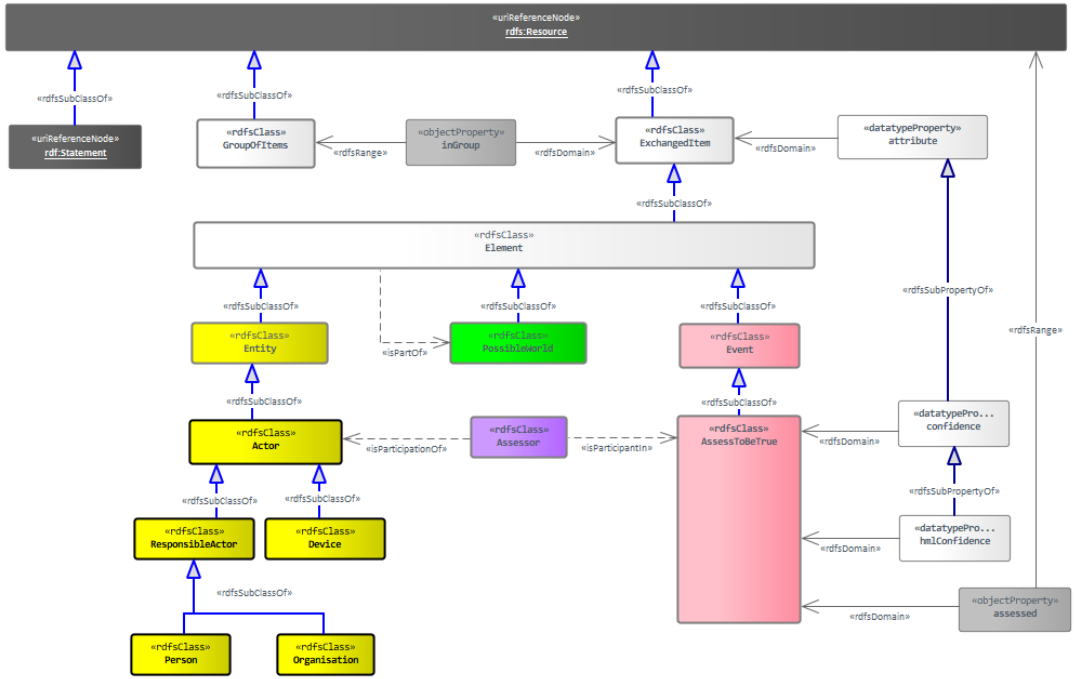
```
@prefix data: <http://ais.data.gov.uk/ais-ies-test#> .
@prefix ies: <http://ies.data.gov.uk/ontology/ies4#> .
@prefix iso8601: <http://iso.org/iso8601#> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .

data:0edbd5f1-1c3b-4e59-b296-b4781313edff a ies:Assessor ;
ies:isParticipantIn data:528acb27-8877-4965-995d-ba6f72f3363a ;
ies:isParticipationOf data:a4da7459-b746-4a85-aedf-27fc21649013 .

data:196be3f6-8dd6-4d31-8807-9802714f94f3 a ies:BoundingState ;
ies:inPeriod iso8601:2007-01-01T00:00:09 ;
ies:isStartOf data:f89a179d-29e6-44aa-b3db-65921a98d30e .

data:d9e26359-258d-46d3-9383-4e3ae959160a a ies:Follower ;
ies:isParticipantIn data:f89a179d-29e6-44aa-b3db-65921a98d30e ;
ies:isParticipationOf data:MMSI_367000150 .

data:da95c036-d980-4b98-934f-16373d38eabe a ies:BoundingState ;
ies:inPeriod iso8601:2007-01-01T00:05:40 ;
ies:isEndOf data:f89a179d-29e6-44aa-b3db-65921a98d30e .

data:dac815eb-06a7-45c7-a208-e38fbfe3d5c7 a ies:Followed ;
ies:isParticipantIn data:f89a179d-29e6-44aa-b3db-65921a98d30e ;
ies:isParticipationOf data:MMSI_366952890 .

data:05560c92-c9fb-4c6d-a342-d8ff127f41ea a ies:Name ;
ies:representationValue "HAL"^^xsd:string .

data:528acb27-8877-4965-995d-ba6f72f3363a a ies:Assess ;
ies:assessed data:3c23fd87-227b-41bf-8211-e12bc8d4f492 .

data:7989b8b8-0847-4799-88fd-d5ba50b08cc6 a ies:Name ;
ies:representationValue "International Telecommunications Union"^^xsd:string .

data:MMSI_366952890 a ies:LocationTransponder ;
ies:isIdentifiedBy data:MMSI_366952890_idObj .

data:MMSI_366952890_idObj a ies:CommunicationsIdentifier ;
ies:inScheme <http://itu.int#mmsi-NamingScheme> ;
ies:representationValue "366952890"^^xsd:string .

data:MMSI_367000150 a ies:LocationTransponder ;
ies:isIdentifiedBy data:MMSI_367000150_idObj .

data:MMSI_367000150_idObj a ies:CommunicationsIdentifier ;
ies:inScheme <http://itu.int#mmsi-NamingScheme> ;
ies:representationValue "367000150"^^xsd:string .

data:a4da7459-b746-4a85-aedf-27fc21649013 a ies:System ;
ies:hasName data:05560c92-c9fb-4c6d-a342-d8ff127f41ea .

iso8601:2007-01-01T00:00:09 a ies:ParticularPeriod .

iso8601:2007-01-01T00:05:40 a ies:ParticularPeriod .

<http://itu.int> a ies:Organisation ;
ies:hasName data:7989b8b8-0847-4799-88fd-d5ba50b08cc6 .

data:3c23fd87-227b-41bf-8211-e12bc8d4f492 a ies:PossibleWorld .

<http://itu.int#mmsi-NamingScheme> a ies:NamingScheme ;
ies:schemeOwner <http://itu.int> .

data:f89a179d-29e6-44aa-b3db-65921a98d30e a ies:Follow ;
ies:isPartOf data:3c23fd87-227b-41bf-8211-e12bc8d4f492 .
```



Extensions to IES for “approaching”

This extension follows exactly the same pattern as the “following” use-case. It even includes the idea of deliberate / active approaching

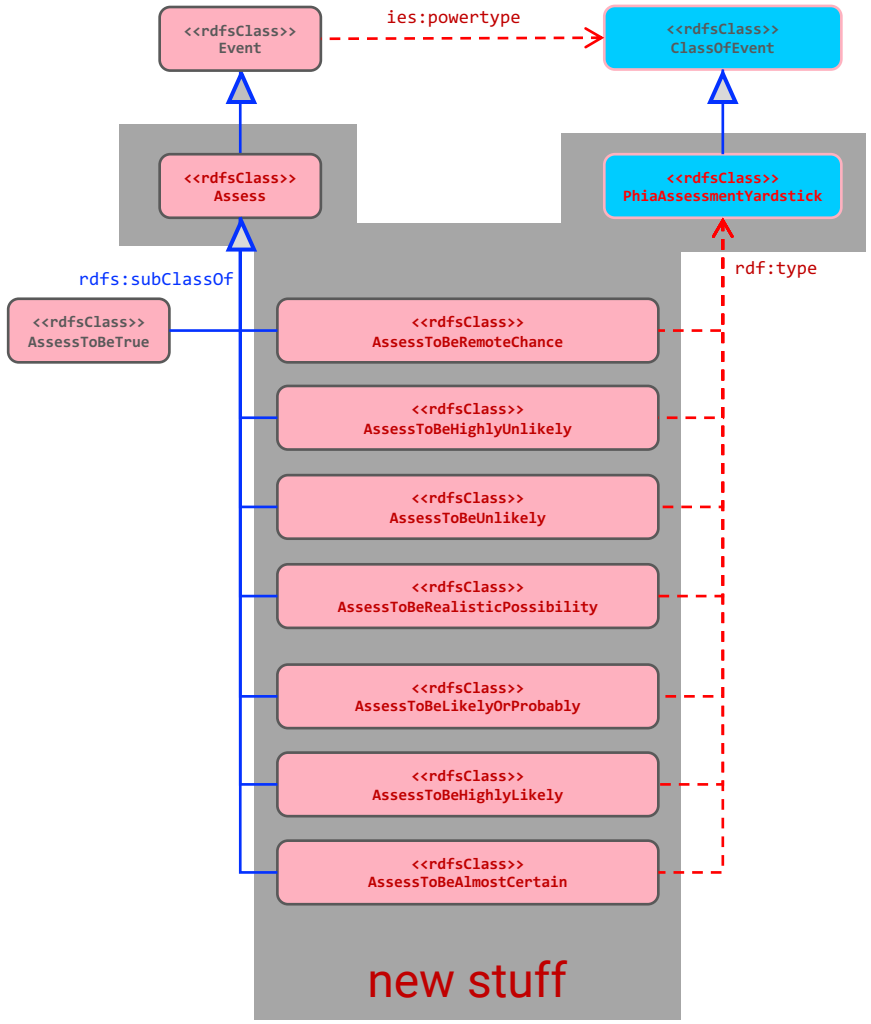




RDF Schema for “Approaching” Use-Case Extensions

```
@prefix                 ies:            <http://ies.data.gov.uk/ontology/ies4#> .
@prefix                 rdf:            <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix                 rdfs:           <http://www.w3.org/2000/01/rdf-schema#> .

ies:Approach            rdf:type        rdfs:Class .
ies:Approach            rdfs:subClassOf ies:Event .
ies:Approached          rdf:type        rdfs:Class .
ies:Approached          rdfs:subClassOf ies:EventParticipant .
ies:Approacher          rdf:type        rdfs:Class .
ies:Approacher          rdfs:subClassOf ies:EventParticipant .
ies:ActiveApproacher    rdf:type        rdfs:Class .
ies:ActiveApproacher    rdfs:subClassOf ies:Approacher .
ies:ActiveApproacher    rdfs:subClassOf ies:ActiveEventParticipant .
```

Proposed IES Modifications for Assessments



PHIA Probability Yardstick

Probability range	Judgement terms	Fraction range
≤ ≈5%	Remote chance	≤ ≈ 1/20
≈10% - ≈20%	Highly unlikely	≈1/10 - ≈1/5
≈25% - ≈35%	Unlikely	≈1/4 - ≈1/3
≈40% - <50%	Realistic possibility	≈4/10 - <1/2
≈55% - ≈75%	Likely or Probably	≈4/7 - ≈3/4
≈80% - ≈90%	Highly likely	≈4/5 - ≈9/10
≥ ≈95%	Almost certain	≥ ≈19/20
= approximately equal to	≥ is greater than or equal to	≤ is less than or

See: https://www.app.college.police.uk/app-content/intelligence-management/analysis/delivering-effective-analysis/

RDF Schema for Assessment Extensions

```
@prefix                                ies:                  <http://ies.data.gov.uk/ontology/ies4#> .
@prefix                                rdf:                  <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix                                rdfs:                 <http://www.w3.org/2000/01/rdf-schema#> .

ies:Assess                             rdf:type              rdfs:Class .
ies:Assess                             rdfs:subClassOf       ies:Event .
ies:AssessToBeTrue                     rdfs:subClassOf       ies:Assess .
ies:PhiaAssessmentYardstick            rdf:type              rdfs:Class .
ies:PhiaAssessmentYardstick            rdfs:subClassOf       ies:ClassOfEventEvent .
ies:AssessToBeRemoteChance             rdf:type              rdfs:Class .
ies:AssessToBeRemoteChance             rdf:type              ies:PhiaAssessmentYardstick .
ies:AssessToBeRemoteChance             rdfs:subClassOf       ies:Assess .
ies:AssessToBeHighlyUnlikely           rdf:type              rdfs:Class .
ies:AssessToBeHighlyUnlikely           rdf:type              ies:PhiaAssessmentYardstick .
ies:AssessToBeHighlyUnlikely           rdfs:subClassOf       ies:Assess .
ies:AssessToBeUnlikely                 rdf:type              rdfs:Class .
ies:AssessToBeUnlikely                 rdf:type              ies:PhiaAssessmentYardstick .
ies:AssessToBeUnlikely                 rdfs:subClassOf       ies:Assess .
ies:AssessToBeRealisticPossibility     rdf:type              rdfs:Class .
ies:AssessToBeRealisticPossibility     rdf:type              ies:PhiaAssessmentYardstick .
ies:AssessToBeRealisticPossibility     rdfs:subClassOf       ies:Assess .
ies:AssessToBeLikelyOrProbably         rdf:type              rdfs:Class .
ies:AssessToBeLikelyOrProbably         rdf:type              ies:PhiaAssessmentYardstick .
ies:AssessToBeLikelyOrProbably         rdfs:subClassOf       ies:Assess .
ies:AssessToBeHighlyLikely             rdf:type              rdfs:Class .
ies:AssessToBeHighlyLikely             rdf:type              ies:PhiaAssessmentYardstick .
ies:AssessToBeHighlyLikely             rdfs:subClassOf       ies:Assess .
ies:AssessToBeAlmostCertain            rdf:type              rdfs:Class .
ies:AssessToBeAlmostCertain            rdf:type              ies:PhiaAssessmentYardstick .
ies:AssessToBeAlmostCertain            rdfs:subClassOf       ies:Assess .
```

This triple also needs to be removed from IES Schema:

```
ies:AssessToBeTrue                     rdfs:subClassOf       ies:Event .
```

(Note: this is not a breaking change, as the class itself has not been removed)
(Note: the `rdf:type rdfs:Class` triples aren't strictly needed given that `ies:ClassOfEvent` is a subclass of `rdfs:Class`, but not all ontology editors are smart enough to spot this.