Schema.Org Measurement Proposal

Version: 1.1
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Summary

In order to support scenarios involving describing sports statistics, we need the ability to describe measurements that happen over time (e.g. a baseball player's batting average over the course of a season) and assign those measurements to athletes and organizations. Our current schema.org vocabulary is not sufficient to cover these needs but models, somewhat inconsistently, various aspects of it. This proposal aims to clean up this existing vocabulary and introduce new terminology to meet the needs of describing sports statistics while also considering more broad use cases in order to not prevent their support in the future.

Terminology

For the purposes of this document, the following terminology and descriptions will be used.

Measurement (verb) is a form of Observation (verb), where the result of the Observation (verb) is the assignment of a Quantity to a Thing (the subject being observed). The term Measurement may refer to act of measuring (its verb form) or the result of that act (its noun form).

A Quantity is the combination of a Number and a Unit, where the Unit may be a Ratio of two similar Units.

- 6 miles is a quantity where '6' is the Number and 'miles' is the Unit
- 1 hour is a Quantity where '1' is the Number and 'hour' is the Unit
- 6 miles per hour is a Quantity where 'miles per hour' is the Unit, in the form of a Ratio, composed of the Unit 'miles' and 'hour' respectively.

Tieing this terminology back to an example of describing sports statistics, let's assume we want to describe the fact that "John hit 10 home runs over the course of the world series."

John - is the subject of the measurement
world series - is the duration over which the measurement took place

10 home runs - is the quantity that was measured
10 - is the number in that quantity
home runs - is the Unit in that quantity

Existing Ontology

class: Intangible
- subClass: StructuredValue
  - comment: Structured values are strings—for example, addresses—that have certain constraints on their structure.
  - subClass: QuantitativeValue
    - comment: A point value or interval for product characteristics and other purposes.
    - property: value
    - property: unitCode
    - property: maxValue
    - property: minValue
    - property: valueReference

- subClass: Quantity
  - comment: Quantities such as distance, time, mass, weight, etc. Particular instances of say Mass are entities like '3 Kg' or '4 milligrams'.
  - subClass: Distance
    - comment: Properties that take Distances as values are of the form '<Number> <Length unit of measure>'. E.g., '7 ft'
  - subClass: Duration
    - comment: Quantity: Duration (use ISO 8601 duration format).
  - subClass: Energy
    - comment: Properties that take Energy as values are of the form '<Number> <Energy unit of measure>'
  - subClass: Mass
    - comment: Properties that take Mass as values are of the form '<Number> <Mass unit of measure>'. E.g., '7 kg'

Proposal

We will introduce a new class (Measurement) to capture the intangible concept of a quantity associated with a Thing based on an act of measurement or observation.

Measurement is introduced as a new sub class of **Intangible**

```
rdfs:Class http://schema.org/Measurement
      rdfs:comment An assignment of a quantity to a Thing based on a
      measurement or observation.
```

```
      rdfs:subClassOf http://schema.org/Intangible
```

quantityType is introduced as a new property within the domain of **Measurement**

```
rdf:Property http://schema.org/quantityType
      rdfs:comment The type of quantity being measured (e.g.
      'height', 'speed', 'weight'), ideally expressed using a URL
      reference to schema.org or other standard quantity type (e.g.
      "http://schema.org/Distance" or
      "http://en.wikipedia.org/wiki/Metre").
      schema:domainIncludes http://schema.org/Measurement
      schema:rangeIncludes http://schema.org/Text
      schema:rangeIncludes http://schema.org/Quantity
      schema:rangeIncludes http://schema.org/Url
```

quantityValue is introduced as a new property within the domain of **Measurement**

```
rdf:Property http://schema.org/quantityValue
      rdfs:comment The resulting quantity value associated with a
      completed measurement (e.g. '7 inches', '60 mph', '100 kg')
      schema:domainIncludes http://schema.org/Measurement
      schema:rangeIncludes http://schema.org/QuantitativeValue
```

quantityUnit is introduced as a new property within the domain of **QuantitativeValue**

```
rdf:Property http://schema.org/quantityUnit
      rdfs:comment The unit of measurement associated with a quantity
      (e.g. 'inch', 'grams', 'hits'), ideally expressed using a URL
      reference to a standard unit (e.g.
      "http://en.wikipedia.org/wiki/Metre"). May be used in
      conjunction with a unitCode.
      schema:domainIncludes http://schema.org/QuantitativeValue
      schema:rangeIncludes http://schema.org/Text
      schema:rangeIncludes http://schema.org/Url
```

QuantitativeValue description changed to “The combination of a number and unit of measurement that expresses magnitude or multitude, usually resulting from an act of measurement.”
value description changed to "The numerical component of a quantitative value. For example, given a quantitative value of ‘6 kilograms’, ‘6’ is the considered the numerical ‘value’ and ‘kilograms’ is considered the unit of measurements.

unitCode description changed to "The UN/CEFACT Common Code (3 characters) for a unit of measurement."
Measurement is added to the domain of **about**
Measurement is added to the domain of **startDate**
startDate description changed to "The start date and time of the event, role, measurement or item (in ISO 8601 date format).
Measurement is added to the domain of **endDate**
endDate description changed to "The end date and time of the event, role, measurement or item (in ISO 8601 date format).
duringEvent is introduced as a new property with a domain of **Measurement** **

```
rdf:Property http://schema.org/duringEvent
      rdfs:comment Defines a duration associated with something in
      the form of an event rather than simply a start and end date.
      schema:domainIncludes http://schema.org/Measurement
      schema:rangeIncludes http://schema.org/Event
```

New Ontology

class: Intangible
- subClass: Measurement
  - property: quantityType
  - property: quantityValue
  - properyt: about
  - property: startDate
  - property: endDate
  - property: duringEvent
- subClass: StructuredValue
  - subClass: QuantitativeValue
    - property: value
    - property: quantityUnit
    - property: unitCode
    - property: maxValue
    - property: minValue
    - property: valueReference

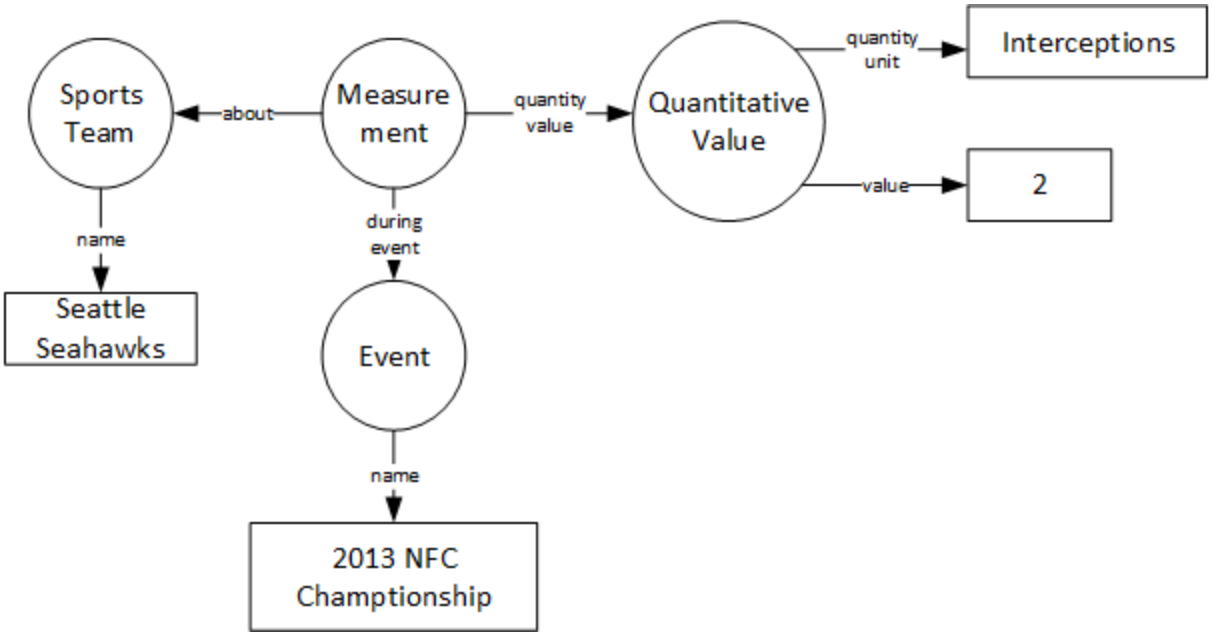
*** We should strongly consider adding this property to 'Role' and other classes where someone may want to express a duration in the form of a well-known event.*

Examples

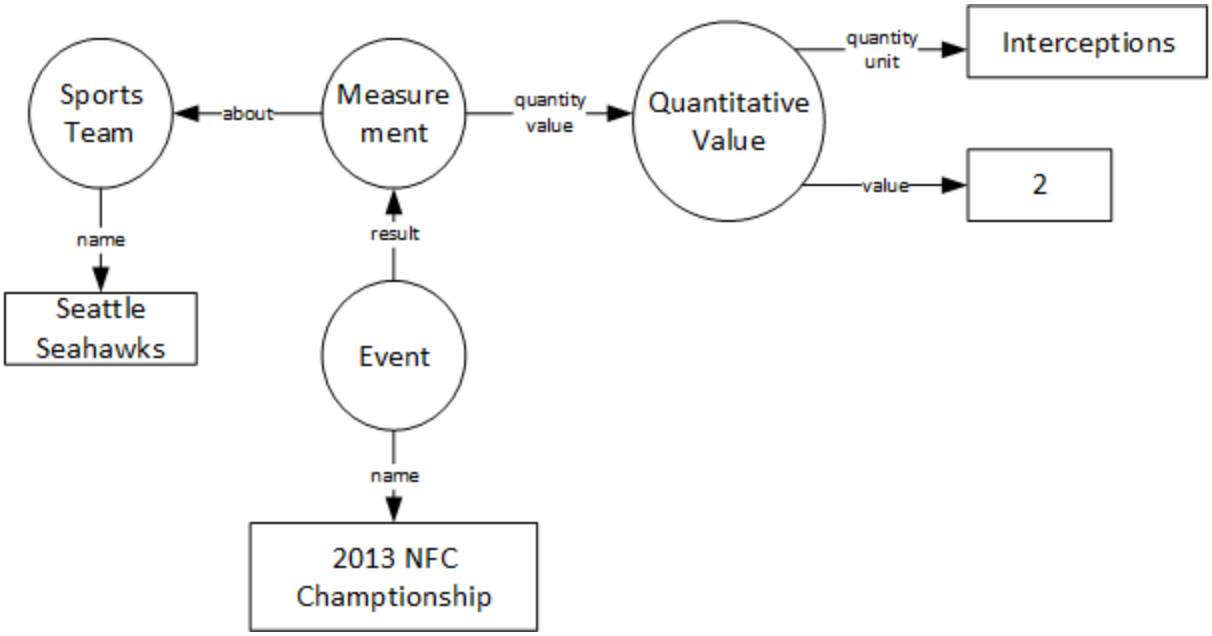
Example 1: Interception statistics for the Seattle Seahawks American Football Team during the 2013 NFC Championship event.

```
{
  "@context": "http://schema.org",
  "@type": "SportsTeam",
  "name": "Seattle Seahawks",
  "@reverse": {
    "about": {
      "@type": "Measurement",
      "quantityValue": {
        "@type": "QuantitativeValue",
        "quantityUnit": "http://en.wikipedia.org/wiki/Interception",
        "value": "2"
      },
      "duringEvent": {
        "@type": "SportsEvent",
        "name": "2013 NFC Championship"
      }
    }
  }
}

// same as above, but within the context of the measurement instance
{
  "@context": "http://schema.org",
  "@type": "Measurement",
  "about": {
    "@type": "SportsTeam",
    "name": "Seattle Seahawks"
  },
  "quantityValue": {
    "@type": "QuantitativeValue",
    "quantityUnit": "http://en.wikipedia.org/wiki/Interception",
    "value": "2"
  },
  "duringEvent": {
    "@type": "SportsEvent",
    "name": "2013 NFC Championship"
  }
```

```
}

// both of these examples could be represented by the following graph
```




```
// same as above two example, but within the context of the event

{
  "@context": "http://schema.org",
  "@type": "SportsEvent",
  "name": "2013 NFC Championship",
  "result": {
    "@type": "Measurement",
    "about": {
      "@type": "SportsTeam",
      "name": "Seattle Seahawks"
    },
    "quantityValue": {
      "@type": "QuantitativeValue",
      "quantityUnit": "http://en.wikipedia.org/wiki/Interception",
      "value": "2"
    }
  }
}

// the graph for this third variation would be slightly different
```



Example 2: The artists with the most cumulative weeks at number one according to Billboard 200

```
{
  "@context": "http://schema.org",
  "@type": "ItemList",
  "@url": "http://en.wikipedia.org/wiki/Billboard_200",
  "name": "Top music artists",
  "itemListElement": [
    {
      "@type": "ListItem",
      "position": 1,
      "positionBasis": {
        "@type": "Measurement",
        "quantityValue": {
          "@type": "QuantitativeValue",
          "quantityUnit": "http://en.wikipedia.org/wiki/Week",
          "value": "132"
        }
      }
      "item": {
        "@type": "MusicGroup",
        "name": "Beatles"
      }
    },{
      "@type": "ListItem",
```

```
      "position": 2,
      "positionBasis": {
      "@type": "Measurement",
        "quantityValue": {
          "@type": "QuantitativeValue",
          "quantityUnit": "http://en.wikipedia.org/wiki/Week",
          "value": "67"
        }
      }
      "item": {
        "@type": "MusicGroup",
        "name": "Elvis Preseley"
      }
    }
  ]
}

// the ratio of HDP to carbon dioxide emissions for the country of
France in 2006
//
https://en.wikipedia.org/wiki/List_of_countries_by_ratio_of_GDP_to_ca
rbon_dioxide_emissions

{
  "@context": "http://schema.org",
  "@type": "Country",
  "name": "France",
  "@reverse": {
    "about": {
      "@type": "Measurement",
      "quantityValue": {
        "@type": "QuantitativeValue",
        "name" "Ratio of GDP to Carbon Dioxide Emissions"
        "quantityUnit": "International Dollars Per Ton",
        "value": "5153"
      },
      "startDate": "2006-01-01",
      "endDate": "2006-12-31"
      }
    }
  }
}
```

Background / Reference Material

Wikipedia.org Definitions

Measurement - the assignment of numbers to objects or events;
Quantity - a value that is numerical in nature; it expresses a magnitude or multitude.
Rate - a ratio of two measurements

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Observations and Measurements (O&M)
http://en.wikipedia.org/wiki/Observations_and_Measurements
http://schemas.opengis.net/om/2.0/observation.xsd

feature of interest - the subject of the observation (e.g. when measuring the speed of a cheetah, the cheetah is the feature of interest)
observed property - the type of property being observed (e.g. speed, length, etc.)
result - the value of the property observed (e.g. 50 miles / hour)
procedure – the instrument, algorithm or process used (which may be described using SensorML)
phenomenon time – the real-world time associated with the result (e.g. 3 homeruns in a baseball game, where the baseball game is the phenomenon time)
result time – the time when the result was generated
valid time – the period during which the result may be used

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VIM (http://www.bipm.org/en/publications/guides/vim.html)
International vocabulary of metrology - Basic and general concepts and associated terms (VIM)

quantity - property of a phenomenon, body, or substance, where the property has a magnitude that can be expressed as a number and a reference. the reference can be a measurement unit, measurement procedure, a reference material or a combination of those. 'miles per hour' is an examples of quantity. note that quantity expresses type whereas an instance of measured quantity is a quantity value. '6 miles per hour' is quantity value (an instance of the quantity 'miles per hour') where the number is '6' and the reference is 'miles per hour'.
kind - a means of classifying quantities. for example: *diameter*, *height*, and *width* are all the same kind of quantities; they all measure the quantity *length*; they are types / subclasses / kinds of *length*
measurement unit - real scalar quantity, defined and adopted by convention, with which any other quantity of the same kind can be compared to express the ratio of the two quantities as a number. Normally designated by conventionally assigned names and symbols.

quantity value - the value of a quantity; the number and reference expressing magnitude
numerical quantity value - the number in a quantity value (sans any reference).
derived quantity / **derived unit** - a quantity or measurement unit respectively, where the associated quantity value is derived from a relationship between different measurement units; e.g. miles per hour and density (mass by volume)
measurement - the process of experimentally obtaining one or more quantity values (instances) attributed to a quantity. the act of measurement implies comparison or counting of entities.

Change Log

1.0.0 - 2014/08/05

- First Draft

1.1.0 - 2014/09/03

- Added references to VIM and O&B standards
- Introduced a 'Terminology' section and moved respective info from Background to here
- Adjust terminology based on additional insight from VIM and O&B standards
- Overhauled proposal to match new view on terminology
- Added graph illustrations to sports examples
- Added GDP to CO2 emission example