Abstract

OWL 2 extends the W3C OWL Web Ontology Language with a small but useful set of features that have been requested by users, for which effective reasoning algorithms are now available, and that OWL tool developers are willing to support. The new features include extra syntactic sugar, additional property and qualified cardinality constructors, extended datatype support, simple metamodeling, and extended annotations.

This document is intended to provide a quick reference to the OWL 2 language, similar to what was provided in the Language Synopsis section of the OWL Web Ontology Language Overview. Inspiration for this effort includes work by the ebiquity Research Group at the University of Maryland Baltimore County (UMBC).
on earlier versions of a Reference Card for the Semantic Web. A draft printable version is available [1], but it is obsolete with respect to the current wiki version.

Status of this Document

May Be Superseded

This section describes the status of this document at the time of its publication. Other documents may supersede this document. A list of current W3C publications and the latest revision of this technical report can be found in the W3C technical reports index at http://www.w3.org/TR/.

Set of Documents

This document is being published as one of a set of 11 documents:

1. Structural Specification and Functional-Style Syntax
2. Direct Semantics
3. RDF-Based Semantics
4. Conformance and Test Cases
5. Mapping to RDF Graphs
6. XML Serialization
7. Profiles
8. Quick Reference Guide (this document)
9. New Features and Rationale
10. Manchester Syntax
11. rdf:text: A Datatype for Internationalized Text

First Public Working Draft

This document is intended to provide a quick reference to the OWL 2 language, similar to what was provided in the Language Synopsis section of the OWL Web Ontology Language Overview. It complements the OWL 2 Primer, an updated version of which will be published in due course. Inspiration for this effort includes work by the ebiquity Research Group at the University of Maryland Baltimore County (UMBC) on earlier versions of a Reference Card for the Semantic Web.

The intended final status of this document has not yet been determined; since it may become a Recommendation, it should be considered a Recommendation-Track document for now.

Please Comment By 2009-01-23

The OWL Working Group seeks public feedback on this First Public Working Draft. Please send your comments to public-owl-comments@w3.org (public archive). If
possible, please offer specific changes to the text that would address your concern. You may also wish to check the Wiki Version of this document for internal-review comments and changes being drafted which may address your concerns.

No Endorsement

Publication as a Working Draft does not imply endorsement by the W3C Membership. This is a draft document and may be updated, replaced or obsoleted by other documents at any time. It is inappropriate to cite this document as other than work in progress.

Patents

This document was produced by a group operating under the 5 February 2004 W3C Patent Policy. W3C maintains a public list of any patent disclosures made in connection with the deliverables of the group; that page also includes instructions for disclosing a patent. An individual who has actual knowledge of a patent which the individual believes contains Essential Claim(s) must disclose the information in accordance with section 6 of the W3C Patent Policy.

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• 1 OWL/OWL 2 Vocabulary
• 2 Built-in Datatypes and Facets
  ◦ 2.1 Built-in Datatypes
  ◦ 2.2 Facets
• 3 Name Spaces

Editor’s Note: To do list:
• Create inline hyperlinks to Syntax
• Create hyperlinks to Direct Semantics and RDF-Based Semantics once the anchors in those documents are ready
• Complete inline hyperlinks to Primer when the missing ones are ready
• Create inline hyperlinks to New Features and Rationale
• Make a new 2-page print version.
• Design a similar guide for profiles with 1 page print version.
# 1 OWL/OWL 2 Vocabulary

Shaded constructs are only available in OWL 2.

### OWL Classes

<table>
<thead>
<tr>
<th>all OWL individuals</th>
<th>owl:Thing</th>
</tr>
</thead>
<tbody>
<tr>
<td>empty class</td>
<td>owl:Nothing</td>
</tr>
</tbody>
</table>

### Connectives and Enumeration

<table>
<thead>
<tr>
<th>intersection</th>
<th>intersectionOf($C_1 \ldots C_n$)</th>
<th>x owl:intersectionOf [ $C_1 \ldots C_n$ ]</th>
<th>$C_j$ an OWL class</th>
</tr>
</thead>
<tbody>
<tr>
<td>union</td>
<td>unionOf($C_1 \ldots C_n$)</td>
<td>x owl:unionOf [ $C_1 \ldots C_n$ ]</td>
<td>$C_j$ an OWL class</td>
</tr>
<tr>
<td>complement</td>
<td>complementOf($C$)</td>
<td>x owl:complementOf $C$</td>
<td>$C$ an OWL class</td>
</tr>
<tr>
<td>enumeration</td>
<td>oneOf($i_1 \ldots i_n$)</td>
<td>x owl:oneOf [ $i_1 \ldots i_n$ ]</td>
<td>$i_j$ an OWL individual</td>
</tr>
</tbody>
</table>

### Restrictions Using Object Properties

`owl:Restriction`

Every `owl:Restriction` is an `owl:Class`.

<table>
<thead>
<tr>
<th>universal</th>
<th>AllValuesFrom($P C$)</th>
<th>x rdf:type owl:Restriction. x owl:onProperty $P$. x owl:allValuesFrom $C$</th>
<th>$P$ an object property. $C$ an OWL class</th>
</tr>
</thead>
<tbody>
<tr>
<td>existential</td>
<td>SomeValuesFrom($P C$)</td>
<td>x rdf:type owl:Restriction. x owl:onProperty $P$. x owl:someValuesFrom $C$</td>
<td>$P$ an object property. $C$ an OWL class</td>
</tr>
<tr>
<td>individual value</td>
<td>HasValue($P i$)</td>
<td>x rdf:type owl:Restriction. x owl:onProperty $P$. x owl:hasValue $i$.</td>
<td>$P$ an object property. $i$ an individual</td>
</tr>
<tr>
<td>self</td>
<td>ExistsSelf($P$)</td>
<td>x rdf:type owl:SelfRestriction. x owl:onProperty $P$.</td>
<td>$P$ an object property</td>
</tr>
</tbody>
</table>

### Cardinality Restrictions

| exact cardinality | ExactCardinality($n P$)                  | x rdf:type owl:Restriction. x owl:onProperty $P$. x owl:cardinality $n$.  | $P$ an object property. $n$ a nonNegativeInteger |
| maximum cardinality | MaxCardinality($n P$)                  | x rdf:type owl:Restriction. x owl:onProperty $P$. x owl:maxCardinality $n$. | $P$ an object property. $n$ a nonNegativeInteger |
### Qualified Cardinality Restrictions

<table>
<thead>
<tr>
<th>Cardinality</th>
<th>Description</th>
<th>RDF Expression</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Minimum</strong></td>
<td><strong>Cardinality</strong></td>
<td>( x \text{ rdf:type } \text{owl:Restriction}. )( x \text{ owl:onProperty } P. )( x \text{ owl:minCardinality } n. ) P an object property. n a nonNegativeInteger</td>
</tr>
<tr>
<td><strong>Exact</strong></td>
<td><strong>Cardinality</strong></td>
<td>( x \text{ rdf:type } \text{owl:Restriction}. )( x \text{ owl:onProperty } P. )( x \text{ owl:qualifiedCardinality } n. )( x \text{ owl:onClass } C. ) P an object property. n a nonNegativeInteger; C an OWL class</td>
</tr>
<tr>
<td><strong>Maximum</strong></td>
<td><strong>Cardinality</strong></td>
<td>( x \text{ rdf:type } \text{owl:Restriction}. )( x \text{ owl:minQualifiedCardinality } n. )( x \text{ owl:onClass } C. ) P an object property. n a nonNegativeInteger; C an OWL class</td>
</tr>
</tbody>
</table>

### Restrictions Using Data Properties

Every owl:Restriction is an owl:Class.

<table>
<thead>
<tr>
<th>Cardinality</th>
<th>Description</th>
<th>RDF Expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>universal</td>
<td><strong>AllValuesFrom</strong></td>
<td>( x \text{ rdf:type } \text{owl:Restriction}. )( x \text{ owl:onProperty } P. )( x \text{ owl:allValuesFrom } D. ) P a data property. D a datatype</td>
</tr>
<tr>
<td>existential</td>
<td><strong>SomeValuesFrom</strong></td>
<td>( x \text{ rdf:type } \text{owl:Restriction}. )( x \text{ owl:onProperty } P. )( x \text{ owl:someValuesFrom } D. ) P a data property. D a datatype</td>
</tr>
<tr>
<td>n-ary</td>
<td><strong>AllValuesFrom</strong></td>
<td>( x \text{ rdf:type } \text{owl:Restriction}. )( x \text{ owl:onProperties } [P_1 \ldots P_n]. )( x \text{ owl:allValuesFrom } D. ) P_i a data property. D an n-ary datatype</td>
</tr>
<tr>
<td>n-ary</td>
<td><strong>SomeValuesFrom</strong></td>
<td>( x \text{ rdf:type } \text{owl:Restriction}. )( x \text{ owl:onProperties } [P_1 \ldots P_n]. )( x \text{ owl:someValuesFrom } D. ) P_i a data property. D an n-ary datatype</td>
</tr>
<tr>
<td>individual</td>
<td><strong>HasValue</strong></td>
<td>( x \text{ rdf:type } \text{owl:Restriction}. )( x \text{ owl:onProperty } P. )( x \text{ owl:hasValue } v. ) P an object property. v a literal</td>
</tr>
</tbody>
</table>

### Cardinality Restrictions

<table>
<thead>
<tr>
<th>Cardinality</th>
<th>Description</th>
<th>RDF Expression</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Exact</strong></td>
<td><strong>Cardinality</strong></td>
<td>( x \text{ rdf:type } \text{owl:Restriction}. )( x \text{ owl:onProperty } P. )( x \text{ owl:cardinality } n. ) P a data property. n a nonNegativeInteger</td>
</tr>
</tbody>
</table>
### Qualified Cardinality Restrictions

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>RDF</th>
</tr>
</thead>
</table>
| **maximum cardinality** | $\text{MaxCardinality}(n \ P)$ | $x \ \text{rdf:type owl:Restriction.}  \
 x \ \text{owl:onProperty} \ P.  \
 x \ \text{owl:maxCardinality} \ n.  \
 P \ \text{a data property.}  \
 n \ \text{a nonNegativeInteger}$ |
| **minimum cardinality** | $\text{MinCardinality}(n \ P)$ | $x \ \text{rdf:type owl:Restriction.}  \
 x \ \text{owl:onProperty} \ P.  \
 x \ \text{owl:minCardinality} \ n.  \
 P \ \text{a data property.}  \
 n \ \text{a nonNegativeInteger}$ |

### Class Axioms

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>RDF</th>
</tr>
</thead>
<tbody>
<tr>
<td>subclasses</td>
<td>$\text{SubClassOf}(C_1 \ C_2)$</td>
<td>$C_1 \ \text{rdfs:subClassOf} \ C_2. \ \text{C_1 an OWL class}$</td>
</tr>
<tr>
<td>equivalent classes</td>
<td>$\text{EquivalentClasses}(C_1 \ C_2)$</td>
<td>$C_1 \ \text{owl:equivalentClass} \ C_2. \ \text{C_1 an OWL class}$</td>
</tr>
<tr>
<td>disjoint classes</td>
<td>$\text{DisjointClasses}(C_1 \ C_2)$</td>
<td>$C_1 \ \text{owl:disjointWith} \ C_2. \ \text{C_1 an OWL class}$</td>
</tr>
</tbody>
</table>
| pairwise disjoint classes | $\text{DisjointClasses}(C_1 \ldots \ C_n)$ | $x \ \text{rdf:type} \ \text{owl:AllDisjointClasses.}  \
 x \ \text{owl:members} \ [ \ C_1 \ldots \ C_n \ ].  \
 C_i \ \text{an OWL class}$ |
| disjoint union        | $\text{DisjointUnionOf}(C_1 \ldots \ C_n)$ | $C \ \text{owl:disjointUnionOf} \ [ \ C_1 \ldots \ C_n \ ].  \
 C \ \text{an OWL class.}  \
 C_i \ \text{an OWL class}$ |

### Data Types rdfs:Datatype

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>RDF</th>
</tr>
</thead>
<tbody>
<tr>
<td>datatype complement</td>
<td>$\text{ComplementOf}(D)$</td>
<td>$x \ \text{owl:datatypeComplementOf} \ D. \ \text{D a datatype}$</td>
</tr>
</tbody>
</table>
### Enumeration

<table>
<thead>
<tr>
<th>Enumeration</th>
<th>Datatype Restriction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>OneOf(v1 … vn)</code></td>
<td><code>DatatypeRestriction(D f1 v1 … fn vn)</code></td>
<td>x owl:oneOf [ v1 … vn ]. f1 a constraining facet, vj a restriction value</td>
</tr>
<tr>
<td>vj a literal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Object Properties

**owl:ObjectProperty**

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universal</td>
<td>owl:topObjectProperty = owl:Thing × owl:Thing</td>
</tr>
<tr>
<td>Bottom</td>
<td>owl:bottomObjectProperty = empty binary relation</td>
</tr>
<tr>
<td>Property Chain</td>
<td><code>PropertyChain(P1 … Pn)</code> x owl:propertyChain [P1 … Pn]. P1 an object property</td>
</tr>
</tbody>
</table>

### Object Property Axioms

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subproperty</td>
<td><code>SubPropertyOf(P Q)</code> P rdfs:subPropertyOf Q. P,Q object properties</td>
</tr>
<tr>
<td>Complex Subproperty</td>
<td><code>SubPropertyOf(PropertyChain(P1 … Pn) Q)</code> x rdfs:subPropertyOf Q. x owl:propertyChain [P1 … Pn]. P1 and Q object properties</td>
</tr>
<tr>
<td>Property Domain</td>
<td><code>PropertyDomain(P C)</code> P rdfs:domain C. P an object property, C an OWL class</td>
</tr>
<tr>
<td>Property Range</td>
<td><code>PropertyRange(P C)</code> P rdfs:range C. P an object property, C an OWL class</td>
</tr>
<tr>
<td>Equivalent Properties</td>
<td>EquivalentProperties(P Q) P owl:equivalentProperty Q. P,Q object properties</td>
</tr>
<tr>
<td>Disjoint Properties</td>
<td>DisjointProperties(P Q) P owl:propertyDisjointWith Q. P,Q object properties</td>
</tr>
<tr>
<td>Property Type</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Pairwise Disjoint Properties</td>
<td>DisjointProperties(P₁ … Pₙ)</td>
</tr>
<tr>
<td>Inverse Properties</td>
<td>InverseProperties(P Q)</td>
</tr>
<tr>
<td>Functional Property</td>
<td>FunctionalProperty(P)</td>
</tr>
<tr>
<td>Inverse Functional Property</td>
<td>InverseFunctionalProperty(P)</td>
</tr>
<tr>
<td>Reflexive Property</td>
<td>ReflexiveProperty(P)</td>
</tr>
<tr>
<td>Irreflexive Property</td>
<td>IrreflexiveProperty(P)</td>
</tr>
<tr>
<td>Symmetric Property</td>
<td>SymmetricProperty(P)</td>
</tr>
<tr>
<td>Asymmetric Property</td>
<td>AsymmetricProperty(P)</td>
</tr>
</tbody>
</table>
### Datatype Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>universal datatype property</strong></td>
<td>$\text{owl:topDataProperty} = \text{owl:Thing} \times \text{rdfs:Literal}$</td>
</tr>
<tr>
<td><strong>bottom datatype property</strong></td>
<td>$\text{owl:bottomDataProperty}$</td>
</tr>
</tbody>
</table>

### Datatype Property Axioms

<table>
<thead>
<tr>
<th>Axiom</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>subproperty</strong></td>
<td>$\text{SubPropertyOf}(P, Q)$</td>
</tr>
<tr>
<td><strong>property domain</strong></td>
<td>$\text{PropertyDomain}(P, C)$</td>
</tr>
<tr>
<td><strong>property range</strong></td>
<td>$\text{PropertyRange}(P, C)$</td>
</tr>
<tr>
<td><strong>equivalent properties</strong></td>
<td>$\text{EquivalentProperties}(P, Q)$</td>
</tr>
<tr>
<td><strong>disjoint properties</strong></td>
<td>$\text{DisjointProperties}(P, Q)$</td>
</tr>
<tr>
<td><strong>pairwise disjoint properties</strong></td>
<td>$\text{DisjointProperties}(P_1, \ldots, P_n)$</td>
</tr>
<tr>
<td><strong>functional property</strong></td>
<td>$\text{FunctionalProperty}(P)$</td>
</tr>
</tbody>
</table>

### Keys

<table>
<thead>
<tr>
<th>Axiom</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HasKey</strong></td>
<td>$\text{HasKey}(C, P_1, \ldots, P_n)$</td>
</tr>
</tbody>
</table>

---

owl:TransitiveProperty

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\text{TransitiveProperty}(P)$</td>
<td>$P \ \text{rdf:type} \ \text{owl:TransitiveProperty}$.</td>
</tr>
</tbody>
</table>

$\text{P} \ \text{i} \Rightarrow \text{P} \ \text{i} \Rightarrow \text{P} \ \text{i}$
• Assertions

<table>
<thead>
<tr>
<th>Individual equality</th>
<th>SameIndividual(a₁,a₂)</th>
<th>a₁ owl:sameAs a₂.</th>
<th>a₁,a₂ individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual equality</td>
<td>SameIndividual(a₁ … aₙ)</td>
<td>aᵢ owl:sameAs aᵢ₊₁.</td>
<td>a₁ an individual</td>
</tr>
<tr>
<td>Individual inequality</td>
<td>DifferentIndividuals(a₁ a₂)</td>
<td>a₁ owl:differentFrom a₂.</td>
<td>a₁,a₂ individuals</td>
</tr>
<tr>
<td>Pairwise individual inequality</td>
<td>DifferentIndividuals(a₁ … aₙ)</td>
<td>x rdf:owl:AllDifferent.</td>
<td>a₁ an individual</td>
</tr>
<tr>
<td>Class assertion</td>
<td>ClassAssertion(C a)</td>
<td>a rdf:type C.</td>
<td>a an individual, C an OWL class</td>
</tr>
<tr>
<td>Positive object property assertion</td>
<td>PropertyAssertion( P a₁ a₂ )</td>
<td>a₁ P a₂.</td>
<td>P an object property, a₁ an individual</td>
</tr>
<tr>
<td>Negative object property assertion</td>
<td>NegativePropertyAssertion(P a₁ a₂ )</td>
<td>x rdf:type owl:NegativePropertyAssertion.</td>
<td>P an object property, a₁ an individual</td>
</tr>
<tr>
<td>Negative datatype property assertion</td>
<td>NegativePropertyAssertion(P a₁ a₂ )</td>
<td>x rdf:type owl:NegativePropertyAssertion.</td>
<td>P a datatype property, a₁ an individual, a₂ a literal</td>
</tr>
</tbody>
</table>

• Lists rdf:List (an RDF feature)

Note: in everywhere else of the document, we use only the concise N3 syntax.

<table>
<thead>
<tr>
<th>concise N3 syntax</th>
<th>[a₁ … aₙ]</th>
</tr>
</thead>
<tbody>
<tr>
<td>triple-based N3 syntax</td>
<td>x₁ rdf:type rdf:List.</td>
</tr>
<tr>
<td></td>
<td>x₁ rdf:first a₁.</td>
</tr>
<tr>
<td></td>
<td>x₁ rdf:rest x₂.</td>
</tr>
<tr>
<td></td>
<td>…</td>
</tr>
<tr>
<td></td>
<td>xₙ rdf:type rdf:List.</td>
</tr>
</tbody>
</table>
• **Declarations**

<table>
<thead>
<tr>
<th>Role</th>
<th>Declaration Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>class</td>
<td>Declaration( Class( x ) )</td>
<td>x rdf:type owl:Class.</td>
</tr>
<tr>
<td>datatype</td>
<td>Declaration( Datatype( x ) )</td>
<td>x rdf:type rdfs:Datatype.</td>
</tr>
<tr>
<td>object property</td>
<td>Declaration( ObjectProperty( x ) )</td>
<td>x rdf:type owl:ObjectProperty.</td>
</tr>
<tr>
<td>datatype property</td>
<td>Declaration( DataProperty( x ) )</td>
<td>x rdf:type owl:DatatypeProperty.</td>
</tr>
<tr>
<td>annotation property</td>
<td>Declaration( AnnotationProperty( x ) )</td>
<td>x rdf:type owl:AnnotationProperty.</td>
</tr>
<tr>
<td>named individual</td>
<td>Declaration( NamedIndividual( x ) )</td>
<td>x rdf:type owl:NamedIndividual.</td>
</tr>
</tbody>
</table>

• **Reification**

If an axiom, when removed of all annotations, can be translated in a single RDF triple s p o, it can also be mapped to the following reificated form:

<table>
<thead>
<tr>
<th>Axioms</th>
<th>Subject</th>
<th>Predicate</th>
<th>Object</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>x rdf:type owl:Axiom.</td>
<td>x owl:subject s.</td>
<td>x owl:object o.</td>
</tr>
</tbody>
</table>

s the subject, p the predicate, o the object of the triple.

• **Annotations**

<table>
<thead>
<tr>
<th>Annotations</th>
<th>Annotation Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>annotations</td>
<td>Annotation( P v)</td>
<td>x rdf:type owl:Annotation. y the annotated resource P annotation property v a resource.</td>
</tr>
<tr>
<td>annotations</td>
<td>Annotation( P v)</td>
<td>y P v. y the annotated resource P annotation property v a resource.</td>
</tr>
</tbody>
</table>

Note: an annotated resource can be an ontology, an ontology entity, an axiom, an anonymous individual, or even another annotation.

**Annotation Properties**

<table>
<thead>
<tr>
<th>Human-readable Name</th>
<th>Label</th>
<th>rdfs:label</th>
</tr>
</thead>
</table>
### Annotation Property Axioms

<table>
<thead>
<tr>
<th>annotation subproperties</th>
<th>P rdfs:subPropertyOf Q.</th>
<th>P,Q annotation properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>annotation property domain</td>
<td>P rdfs:domain U.</td>
<td>P an annotation property, U a URI</td>
</tr>
<tr>
<td>annotation property range</td>
<td>P rdfs:range U.</td>
<td>P an annotation property, U a URI</td>
</tr>
</tbody>
</table>

### Deprecation

| deprecated class | C rdf:type owl:DeprecatedClass. | C an OWL class or a datatype |
| deprecated property | P rdf:type owl:DeprecatedProperty. | P an object property, datatype property or annotation property. |

Note: "Deprecated" is the short for owl:deprecated "true"^^xsd:boolean

---

- **OWL Ontologies** owl:Ontology

| OWL ontology | Ontology (O V) | O rdf:type owl:Ontology. O owl:versionInfo V. | O a URI; V a URI (optional) |

<table>
<thead>
<tr>
<th>Ontology Properties</th>
<th>owl:OntologyProperty</th>
</tr>
</thead>
<tbody>
<tr>
<td>importing</td>
<td>O owl:imports U.</td>
</tr>
<tr>
<td>backwards compatibility</td>
<td>O owl:backwardCompatibleWith U.</td>
</tr>
<tr>
<td>incompatibility</td>
<td>O owl:incompatibleWith U.</td>
</tr>
<tr>
<td>prior version</td>
<td>O owl:priorVersion U.</td>
</tr>
</tbody>
</table>

---

- **Deprecated Vocabulary in OWL 2**
2 Built-in Datatypes and Facets

2.1 Built-in Datatypes

The value space is a set determining the set of values of the datatype. A literal value "abc" of the datatype DT can be given in the form "abc"^^DT.

- Numeric DataTypes
  owl:realPlus and owl:real: (base datatype for other numeric datatypes, should not be directly instantiated)

<table>
<thead>
<tr>
<th>owl:realPlus</th>
<th>the set of all real numbers plus +INF (positive infinity), -INF (negative infinity), 0 (negative zero), NaN (not-a-number)</th>
</tr>
</thead>
<tbody>
<tr>
<td>owl:real</td>
<td>the set of all real numbers</td>
</tr>
</tbody>
</table>

Other numeric Datatypes

<table>
<thead>
<tr>
<th>xsd:double</th>
<th>xsd:nonNegativeInteger</th>
<th>xsd:long</th>
<th>xsd:unsignedLong</th>
</tr>
</thead>
<tbody>
<tr>
<td>xsd:float</td>
<td>xsd:nonPositiveInteger</td>
<td>xsd:int</td>
<td>xsd:unsignedInt</td>
</tr>
<tr>
<td>xsd:decimal</td>
<td>xsd:positiveInteger</td>
<td>xsd:short</td>
<td>xsd:unsignedShort</td>
</tr>
<tr>
<td>xsd:integer</td>
<td>xsd:negativeInteger</td>
<td>xsd:byte</td>
<td>xsd:unsignedByte</td>
</tr>
</tbody>
</table>

- Strings: value space is of the form <"abc", tag>

Strings with a Language Tag: tag is either an empty string or a lowercase language tag

| rdf:text     | internationalized strings |

Strings without a Language Tag: tag is an empty string

<table>
<thead>
<tr>
<th>xsd:string</th>
<th>xsd:NCName</th>
</tr>
</thead>
<tbody>
<tr>
<td>xsd:normalizedString</td>
<td>xsd:NMTOKEN</td>
</tr>
<tr>
<td>xsd:token</td>
<td>xsd:language</td>
</tr>
<tr>
<td>xsd:Name</td>
<td></td>
</tr>
</tbody>
</table>

- Boolean Values

| xsd:Boolean | value space has only two values: true and false |

- Binary Data

<table>
<thead>
<tr>
<th>xsd:base64Binary</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>xsd:hexBinary</td>
<td></td>
</tr>
</tbody>
</table>

- URLs

| xsd:anyURI |

- Time Instants

OWL 2 datatype

| owl:dateTime | value space is set of numbers that represent difference |

between the time instant and the first time instant of the 1st of January 1 AD in the proleptic Gregorian calendar, in seconds

XSD datatypes

<table>
<thead>
<tr>
<th>xsd:date</th>
<th>xsd:gDay</th>
<th>xsd:gYear</th>
</tr>
</thead>
<tbody>
<tr>
<td>xsd:dateTime</td>
<td>xsd:gMonth</td>
<td>xsd:gYearMonth</td>
</tr>
<tr>
<td>xsd:duration</td>
<td>xsd:gMonthDay</td>
<td>xsd:time</td>
</tr>
</tbody>
</table>

- **XML Fragment**

```xml
<rdf:XMLLiteral
```

### 2.2 Facets

The facet space is a set of pairs of the form \(< f v >\), where \(f\) is a URI called a constraining facet, and \(v\) is a value. Each such pair is mapped to a subset of the value space of the datatype.

**Notations:**

- Numeric Datatype, String Datatype and Binary datatype refer to a set of datatypes based on the classification done in the prior section.

<table>
<thead>
<tr>
<th>Facet (f)</th>
<th>Datatype</th>
<th>Value (v)</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>xsd:minInclusive, xsd:maxInclusive, xsd:minExclusive, xsd:maxExclusive</td>
<td>Numeric Datatype DT, owl:dateTime DT</td>
<td>Literal in DT</td>
<td>Restrictions the value-space to greater than (equal to) or lesser than (equal to) a value</td>
</tr>
<tr>
<td>xsd:minLength, xsd:maxLength, xsd:length</td>
<td>String Datatype, Binary Datatype, xsd:anyURI</td>
<td>Nonnegative integer</td>
<td>Restrictions the value-space based on the lengths of the literals</td>
</tr>
<tr>
<td>xsd:pattern</td>
<td>String Datatype, xsd:anyURI</td>
<td>xsd:string literal whose value is a regular expression</td>
<td>Restrictions the value space to literals that match the regular expression</td>
</tr>
<tr>
<td>rdf:langPattern</td>
<td>rdf:text</td>
<td>xsd:string literal whose value is a regular expression</td>
<td>Restrictions the value space to literals with language tags that match the regular expression</td>
</tr>
</tbody>
</table>
### 3 Name Spaces

Standard Namespaces and Prefixes used in OWL 2

<table>
<thead>
<tr>
<th>Prefix</th>
<th>URI</th>
</tr>
</thead>
<tbody>
<tr>
<td>rdf</td>
<td><a href="http://www.w3.org/1999/02/22-rdf-syntax-ns#">http://www.w3.org/1999/02/22-rdf-syntax-ns#</a></td>
</tr>
<tr>
<td>rdfs</td>
<td><a href="http://www.w3.org/2000/01/rdf-schema#">http://www.w3.org/2000/01/rdf-schema#</a></td>
</tr>
<tr>
<td>owl</td>
<td><a href="http://www.w3.org/2002/07/owl#">http://www.w3.org/2002/07/owl#</a></td>
</tr>
<tr>
<td>xsd</td>
<td><a href="http://www.w3.org/2001/XMLSchema#">http://www.w3.org/2001/XMLSchema#</a></td>
</tr>
<tr>
<td>ox</td>
<td><a href="http://www.w3.org/2006/12/owl2-xml#">http://www.w3.org/2006/12/owl2-xml#</a></td>
</tr>
</tbody>
</table>