



# OWL 2 Web Ontology Language Quick Reference Guide

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A [color-coded version of this document showing changes made since the previous version](#) is also available.

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## Abstract

The OWL 2 Web Ontology Language, informally OWL 2, is an ontology language for the Semantic Web with formally defined meaning. OWL 2 ontologies provide classes, properties, individuals, and data values and are stored as Semantic Web documents. OWL 2 ontologies can be used along with information written in RDF, and OWL 2 ontologies themselves are primarily exchanged as RDF documents. The OWL 2 [Document Overview](#) describes the overall state of OWL 2, and should be read before other OWL 2 documents.

This document provides a non-normative quick reference guide to the OWL 2 language. It also provides links to other documents, including the [OWL 2 Primer](#) for language introduction and examples, the [OWL 2 Structural Specification and Functional Syntax](#)

document for more details of the functional syntax, and the [OWL 2 New Features and Rationale](#) document for new feature descriptions.

## 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### May Be Superseded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/>.*

### Summary of Changes

There have been no [substantive](#) changes since the [previous version](#). For details on the minor changes see the [change log](#) and [color-coded diff](#).

### W3C Members Please Review By 5 September 2012

The W3C Director seeks review and feedback from W3C Advisory Committee representatives, via their [review form](#) by 5 September 2012. This will allow the Director to assess consensus and determine whether to issue this document as a W3C Edited Recommendation.

Others are encouraged by the [OWL Working Group](#) to continue to send reports of implementation experience, and other feedback, to [public-owl-comments@w3.org](mailto:public-owl-comments@w3.org) ([public archive](#)). Reports of any success or difficulty with the [test cases](#) are encouraged. Open discussion among developers is welcome at [public-owl-dev@w3.org](mailto:public-owl-dev@w3.org) ([public archive](#)).

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## Table of Contents

- [1 Names, Prefixes, and Notation](#)
- [2 OWL 2 constructs and axioms](#)

- [2.1 Class Expressions](#)
- [2.2 Properties](#)
- [2.3 Individuals & Literals](#)
- [2.4 Data Ranges](#)
- [2.5 Axioms](#)
- [2.6 Declarations](#)
- [2.7 Annotations](#)
- [2.8 Ontologies](#)
- [3 Built-in Datatypes and Facets](#)
  - [3.1 Built-in Datatypes](#)
  - [3.2 Facets](#)
- [4 Appendix](#)
  - [4.1 New Features in OWL 2](#)
  - [4.2 Additional Vocabulary in OWL 2 RDF Syntax](#)
- [5 Appendix: Change Log \(Informative\)](#)
  - [5.1 Changes Since Recommendation](#)
  - [5.2 Changes Since Proposed Recommendation](#)
  - [5.3 Changes Since Candidate Recommendation](#)
- [6 Acknowledgments](#)

## 1 Names, Prefixes, and Notation

Names in OWL 2 are IRIs, often written in a shorthand prefix:localname, where prefix: is a [prefix name](#) that expands to an IRI, and localname is the remainder of the name. The [standard prefix names](#) in OWL 2 are:

Prefix Name	Expansion
rdf:	<a href="http://www.w3.org/1999/02/22-rdf-syntax-ns#">http://www.w3.org/1999/02/22-rdf-syntax-ns#</a>
rdfs:	<a href="http://www.w3.org/2000/01/rdf-schema#">http://www.w3.org/2000/01/rdf-schema#</a>
owl:	<a href="http://www.w3.org/2002/07/owl#">http://www.w3.org/2002/07/owl#</a>
xsd:	<a href="http://www.w3.org/2001/XMLSchema#">http://www.w3.org/2001/XMLSchema#</a>

We use notation conventions in the following tables\*:

Letters	Meaning	Letters	Meaning	Letters	Meaning	Letters	Meaning
C	class expression	CN	class name	D	data range	DN	datatype name
P	object property expression	PN	object property name	R	data property	A	annotation property
a	individual	aN	individual name	_:a	anonymous individual (a <a href="#">blank node label</a> )	v	literal
n	non-negative integer**	f	facet	ON	ontology name	U	IRI
s	IRI or anonymous individual	t	IRI, anonymous individual, or literal	p	prefix name	_:x	blank node
(a <sub>1</sub> ... a <sub>n</sub> )	<a href="#">RDF list</a>						

\* All of the above can have subscripts. \*\* as a shorthand for "n"^^xsd:nonNegativeInteger

## 2 OWL 2 constructs and axioms

For an OWL 2 DL ontology, there are some [global restrictions](#) on axioms.

In the following tables the first column provides links to the [Primer](#) (if applicable), the second column provides links to the [Functional Syntax](#), and the third column gives RDF triples in the [Turtle syntax](#).

### 2.1 Class Expressions

#### Predefined and Named Classes

Language Feature	Functional Syntax	RDF Syntax
named class	CN	CN
universal class	<a href="#">owl:Thing</a>	owl:Thing
empty class	<a href="#">owl:Nothing</a>	owl:Nothing

#### Boolean Connectives and Enumeration of Individuals

Language Feature	Functional Syntax	RDF Syntax
<a href="#">intersection</a>	<a href="#">ObjectIntersectionOf</a> (C <sub>1</sub> ... C <sub>n</sub> )	_:x rdf:type owl:Class. _:x owl:intersectionOf ( C <sub>1</sub> ... C <sub>n</sub> ).
<a href="#">union</a>	<a href="#">ObjectUnionOf</a> (C <sub>1</sub> ... C <sub>n</sub> )	_:x rdf:type owl:Class. _:x owl:unionOf ( C <sub>1</sub> ... C <sub>n</sub> ).
<a href="#">complement</a>	<a href="#">ObjectComplementOf</a> (C)	_:x rdf:type owl:Class. _:x owl:complementOf C.
<a href="#">enumeration</a>	<a href="#">ObjectOneOf</a> (a <sub>1</sub> ... a <sub>n</sub> )	_:x rdf:type owl:Class. _:x owl:oneOf ( a <sub>1</sub> ... a <sub>n</sub> ).

#### Object Property Restrictions

Language Feature	Functional Syntax	RDF Syntax
<a href="#">universal</a>	<a href="#">ObjectAllValuesFrom</a> (P C)	_:x rdf:type owl:Restriction. _:x owl:onProperty P. _:x owl:allValuesFrom C
<a href="#">existential</a>	<a href="#">ObjectSomeValuesFrom</a> (P C)	_:x rdf:type owl:Restriction. _:x owl:onProperty P. _:x owl:someValuesFrom C
<a href="#">individual value</a>	<a href="#">ObjectHasValue</a> (P a)	_:x rdf:type owl:Restriction. _:x owl:onProperty P. _:x owl:hasValue a.
<a href="#">local reflexivity</a>	<a href="#">ObjectHasSelf</a> (P)	_:x rdf:type owl:Restriction. _:x owl:onProperty P. _:x owl:hasSelf "true"^^xsd:boolean.
<a href="#">exact cardinality</a>	<a href="#">ObjectExactCardinality</a> (n P)	_:x rdf:type owl:Restriction. _:x owl:onProperty P. _:x owl:cardinality n.
<a href="#">qualified exact cardinality</a>	<a href="#">ObjectExactCardinality</a> (n P C)	_:x rdf:type owl:Restriction. _:x owl:onProperty P. _:x owl:qualifiedCardinality n. _:x owl:onClass C.

maximum cardinality	<a href="#">ObjectMaxCardinality</a> (n P)	_:x rdf:type owl:Restriction. _:x owl:onProperty P. _:x owl:maxCardinality n.
<a href="#">qualified maximum cardinality</a>	<a href="#">ObjectMaxCardinality</a> (n P C)	_:x rdf:type owl:Restriction. _:x owl:onProperty P. _:x owl:maxQualifiedCardinality n. _:x owl:onClass C.
minimum cardinality	<a href="#">ObjectMinCardinality</a> (n P)	_:x rdf:type owl:Restriction. _:x owl:onProperty P. _:x owl:minCardinality n.
<a href="#">qualified minimum cardinality</a>	<a href="#">ObjectMinCardinality</a> (n P C)	_:x rdf:type owl:Restriction. _:x owl:onProperty P. _:x owl:minQualifiedCardinality n. _:x owl:onClass C.

### Data Property Restrictions

Language Feature	Functional Syntax	RDF Syntax
universal	<a href="#">DataAllValuesFrom</a> (R D)	_:x rdf:type owl:Restriction. _:x owl:onProperty R. _:x owl:allValuesFrom D.
existential	<a href="#">DataSomeValuesFrom</a> (R D)	_:x rdf:type owl:Restriction. _:x owl:onProperty R. _:x owl:someValuesFrom D.
literal value	<a href="#">DataHasValue</a> (R v)	_:x rdf:type owl:Restriction. _:x owl:onProperty R. _:x owl:hasValue v.
exact cardinality	<a href="#">DataExactCardinality</a> (n R)	_:x rdf:type owl:Restriction. _:x owl:onProperty R. _:x owl:cardinality n.
qualified exact cardinality	<a href="#">DataExactCardinality</a> (n R D)	_:x rdf:type owl:Restriction. _:x owl:onProperty R. _:x owl:qualifiedCardinality n. _:x owl:onDataRange D.
maximum cardinality	<a href="#">DataMaxCardinality</a> (n R)	_:x rdf:type owl:Restriction. _:x owl:onProperty R. _:x owl:maxCardinality n.
qualified maximum cardinality	<a href="#">DataMaxCardinality</a> (n R D)	_:x rdf:type owl:Restriction. _:x owl:onProperty R. _:x owl:maxQualifiedCardinality n. _:x owl:onDataRange D.
minimum cardinality	<a href="#">DataMinCardinality</a> (n R)	_:x rdf:type owl:Restriction. _:x owl:onProperty R. _:x owl:minCardinality n.
qualified minimum cardinality	<a href="#">DataMinCardinality</a> (n R D)	_:x rdf:type owl:Restriction. _:x owl:onProperty R. _:x owl:minQualifiedCardinality n. _:x owl:onDataRange D.

### Restrictions Using n-ary Data Range

In the following table 'D<sup>n</sup>' is an n-ary data range.

Language Feature	Functional Syntax	RDF Syntax
n-ary universal	<a href="#">DataAllValuesFrom</a> (R <sub>1</sub> ... R <sub>n</sub> D <sup>n</sup> )	_:x rdf:type owl:Restriction. _:x owl:onProperties ( R <sub>1</sub> ... R <sub>n</sub> ). _:x owl:allValuesFrom D <sup>n</sup> .

n-ary existential	<a href="#">DataSomeValuesFrom</a> ( $R_1 \dots R_n D^n$ )	$\_x$ rdf:type owl:Restriction. $\_x$ owl:onProperties ( $R_1 \dots R_n$ ). $\_x$ owl:someValuesFrom $D^n$ .
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## 2.2 Properties

### Object Property Expressions

Language Feature	Functional Syntax	RDF Syntax
<a href="#">named object property</a>	<a href="#">PN</a>	PN
<a href="#">universal object property</a>	<a href="#">owl:topObjectProperty</a>	owl:topObjectProperty
<a href="#">empty object property</a>	<a href="#">owl:bottomObjectProperty</a>	owl:bottomObjectProperty
<a href="#">inverse property</a>	<a href="#">ObjectInverseOf</a> (PN)	$\_x$ owl:inverseOf PN

### Data Property Expressions

Language Feature	Functional Syntax	RDF Syntax
<a href="#">named data property</a>	<a href="#">R</a>	R
<a href="#">universal data property</a>	<a href="#">owl:topDataProperty</a>	owl:topDataProperty
<a href="#">empty data property</a>	<a href="#">owl:bottomDataProperty</a>	owl:bottomDataProperty

## 2.3 Individuals & Literals

Language Feature	Functional Syntax	RDF Syntax
<a href="#">named individual</a>	<a href="#">aN</a>	aN
anonymous individual	$\_a$	$\_a$
<a href="#">literal</a> (datatype value)	<a href="#">"abc"^^DN</a>	"abc"^^DN

## 2.4 Data Ranges

### Data Range Expressions

Language Feature	Functional Syntax	RDF Syntax
<a href="#">named datatype</a>	<a href="#">DN</a>	DN
<a href="#">data range complement</a>	<a href="#">DataComplementOf</a> (D)	$\_x$ rdf:type rdfs:Datatype. $\_x$ owl:datatypeComplementOf D.
<a href="#">data range intersection</a>	<a href="#">DataIntersectionOf</a> ( $D_1 \dots D_n$ )	$\_x$ rdf:type rdfs:Datatype. $\_x$ owl:intersectionOf ( $D_1 \dots D_n$ ).
<a href="#">data range union</a>	<a href="#">DataUnionOf</a> ( $D_1 \dots D_n$ )	$\_x$ rdf:type rdfs:Datatype. $\_x$ owl:unionOf ( $D_1 \dots D_n$ ).
<a href="#">literal enumeration</a>	<a href="#">DataOneOf</a> ( $v_1 \dots v_n$ )	$\_x$ rdf:type rdfs:Datatype. $\_x$ owl:oneOf ( $v_1 \dots v_n$ ).
<a href="#">datatype restriction</a>	<a href="#">DatatypeRestriction</a> (DN $f_1 v_1 \dots f_n v_n$ )	$\_x$ rdf:type rdfs:Datatype. $\_x$ owl:onDatatype DN. $\_x$ owl:withRestrictions ( $\_x_1 \dots \_x_n$ ). $\_x_j f_j v_j. \quad j=1 \dots n$

## 2.5 Axioms

### Class Expression Axioms

Language Feature	Functional Syntax	RDF Syntax
<a href="#">subclass</a>	<a href="#">SubClassOf</a> ( $C_1 C_2$ )	$C_1$ rdfs:subClassOf $C_2$ .

<a href="#">equivalent classes</a>	<a href="#">EquivalentClasses</a> ( $C_1 \dots C_n$ )	$C_j$ owl:equivalentClass $C_{j+1}$ . $j=1\dots n-1$
<a href="#">disjoint classes</a>	<a href="#">DisjointClasses</a> ( $C_1 C_2$ )	$C_1$ owl:disjointWith $C_2$ .
pairwise disjoint classes	<a href="#">DisjointClasses</a> ( $C_1 \dots C_n$ )	$\_ :x$ rdf:type owl:AllDisjointClasses. $\_ :x$ owl:members ( $C_1 \dots C_n$ ).
disjoint union	<a href="#">DisjointUnionOf</a> ( $CN C_1 \dots C_n$ )	$CN$ owl:disjointUnionOf ( $C_1 \dots C_n$ ).

## Object Property Axioms

Language Feature	Functional Syntax	RDF Syntax
<a href="#">subproperty</a>	<a href="#">SubObjectPropertyOf</a> ( $P_1 P_2$ )	$P_1$ rdfs:subPropertyOf $P_2$ .
<a href="#">property chain inclusion</a>	<a href="#">SubObjectPropertyOf</a> (ObjectPropertyChain( $P_1 \dots P_n$ ) $P$ )	$P$ owl:propertyChainAxiom ( $P_1 \dots P_n$ ).
<a href="#">property domain</a>	<a href="#">ObjectPropertyDomain</a> ( $P C$ )	$P$ rdfs:domain $C$ .
<a href="#">property range</a>	<a href="#">ObjectPropertyRange</a> ( $P C$ )	$P$ rdfs:range $C$ .
<a href="#">equivalent properties</a>	<a href="#">EquivalentObjectProperties</a> ( $P_1 \dots P_n$ )	$P_j$ owl:equivalentProperty $P_{j+1}$ . $j=1\dots n-1$
<a href="#">disjoint properties</a>	<a href="#">DisjointObjectProperties</a> ( $P_1 P_2$ )	$P_1$ owl:propertyDisjointWith $P_2$ .
<a href="#">pairwise disjoint properties</a>	<a href="#">DisjointObjectProperties</a> ( $P_1 \dots P_n$ )	$\_ :x$ rdf:type owl:AllDisjointProperties. $\_ :x$ owl:members ( $P_1 \dots P_n$ ).
<a href="#">inverse properties</a>	<a href="#">InverseObjectProperties</a> ( $P_1 P_2$ )	$P_1$ owl:inverseOf $P_2$ .
<a href="#">functional property</a>	<a href="#">FunctionalObjectProperty</a> ( $P$ )	$P$ rdf:type owl:FunctionalProperty.
<a href="#">inverse functional property</a>	<a href="#">InverseFunctionalObjectProperty</a> ( $P$ )	$P$ rdf:type owl:InverseFunctionalProperty.
<a href="#">reflexive property</a>	<a href="#">ReflexiveObjectProperty</a> ( $P$ )	$P$ rdf:type owl:ReflexiveProperty.
<a href="#">irreflexive property</a>	<a href="#">IrreflexiveObjectProperty</a> ( $P$ )	$P$ rdf:type owl:IrreflexiveProperty.
<a href="#">symmetric property</a>	<a href="#">SymmetricObjectProperty</a> ( $P$ )	$P$ rdf:type owl:SymmetricProperty.
<a href="#">asymmetric property</a>	<a href="#">AsymmetricObjectProperty</a> ( $P$ )	$P$ rdf:type owl:AsymmetricProperty.
<a href="#">transitive property</a>	<a href="#">TransitiveObjectProperty</a> ( $P$ )	$P$ rdf:type owl:TransitiveProperty.

## Data Property Axioms

Language Feature	Functional Syntax	RDF Syntax
<a href="#">subproperty</a>	<a href="#">SubDataPropertyOf</a> ( $R_1 R_2$ )	$R_1$ rdfs:subPropertyOf $R_2$ .
<a href="#">property domain</a>	<a href="#">DataPropertyDomain</a> ( $R C$ )	$R$ rdfs:domain $C$ .
<a href="#">property range</a>	<a href="#">DataPropertyRange</a> ( $R D$ )	$R$ rdfs:range $D$ .
<a href="#">equivalent properties</a>	<a href="#">EquivalentDataProperties</a> ( $R_1 \dots R_n$ )	$R_j$ owl:equivalentProperty $R_{j+1}$ . $j=1\dots n-1$
disjoint properties	<a href="#">DisjointDataProperties</a> ( $R_1 R_2$ )	$R_1$ owl:propertyDisjointWith $R_2$ .
pairwise disjoint properties	<a href="#">DisjointDataProperties</a> ( $R_1 \dots R_n$ )	$\_ :x$ rdf:type owl:AllDisjointProperties. $\_ :x$ owl:members ( $R_1 \dots R_n$ ).
<a href="#">functional property</a>	<a href="#">FunctionalDataProperty</a> ( $R$ )	$R$ rdf:type owl:FunctionalProperty.

## Datatype Definitions



Language Feature	Functional Syntax	RDF Syntax
<a href="#">datatype definition</a>	<a href="#">DatatypeDefinition</a> (DN D)	DN owl:equivalentClass D.

## Assertions

Language Feature	Functional Syntax	RDF Syntax
<a href="#">individual equality</a>	<a href="#">SameIndividual</a> ( $a_1 \dots a_n$ )	$a_j$ owl:sameAs $a_{j+1}$ . $j=1\dots n-1$
<a href="#">individual inequality</a>	<a href="#">DifferentIndividuals</a> ( $a_1 a_2$ )	$a_1$ owl:differentFrom $a_2$ .
pairwise individual inequality	<a href="#">DifferentIndividuals</a> ( $a_1 \dots a_n$ )	$_:x$ rdf:type owl:AllDifferent. $_:x$ owl:members ( $a_1 \dots a_n$ ).
<a href="#">class assertion</a>	<a href="#">ClassAssertion</a> (C a)	a rdf:type C.
<a href="#">positive object property assertion</a>	<a href="#">ObjectPropertyAssertion</a> (PN $a_1 a_2$ )	$a_1$ PN $a_2$ .
<a href="#">positive data property assertion</a>	<a href="#">DataPropertyAssertion</a> (R a v)	a R v.
<a href="#">negative object property assertion</a>	<a href="#">NegativeObjectPropertyAssertion</a> (P $a_1 a_2$ )	$_:x$ rdf:type owl:NegativePropertyAssertion. $_:x$ owl:sourceIndividual $a_1$ . $_:x$ owl:assertionProperty P. $_:x$ owl:targetIndividual $a_2$ .
<a href="#">negative data property assertion</a>	<a href="#">NegativeDataPropertyAssertion</a> (R a v)	$_:x$ rdf:type owl:NegativePropertyAssertion. $_:x$ owl:sourceIndividual a. $_:x$ owl:assertionProperty R. $_:x$ owl:targetValue v.

## Keys

Language Feature	Functional Syntax	RDF Syntax
<a href="#">Key</a>	<a href="#">HasKey</a> (C ( $P_1 \dots P_m$ ) ( $R_1 \dots R_n$ ))	C owl:hasKey ( $P_1 \dots P_m R_1 \dots R_n$ ). $m+n>0$

## 2.6 Declarations

Language Feature	Functional Syntax	RDF Syntax
<a href="#">class</a>	<a href="#">Declaration</a> (Class( $CN$ ))	$CN$ rdf:type owl:Class.
<a href="#">datatype</a>	<a href="#">Declaration</a> (Datatype( $DN$ ))	$DN$ rdf:type rdfs:Datatype.
<a href="#">object property</a>	<a href="#">Declaration</a> (ObjectProperty( $PN$ ))	$PN$ rdf:type owl:ObjectProperty.
<a href="#">data property</a>	<a href="#">Declaration</a> (DataProperty( $R$ ))	$R$ rdf:type owl:DatatypeProperty.
<a href="#">annotation property</a>	<a href="#">Declaration</a> (AnnotationProperty( $A$ ))	$A$ rdf:type owl:AnnotationProperty.
<a href="#">named individual</a>	<a href="#">Declaration</a> (NamedIndividual( $aN$ ))	$aN$ rdf:type owl:NamedIndividual.

## 2.7 Annotations

### Annotations

Language Feature	Functional Syntax	RDF Syntax
<a href="#">annotation assertion</a>	<a href="#">AnnotationAssertion</a> (A s t)	s A t.
<a href="#">annotation of an axiom</a> where the axiom in RDF is one or more triples of the form $s_i U t_i$ , i.e., with the same predicate U.	AXIOM( <a href="#">Annotation</a> (A t) ...)	$_:x_i$ A t. $s_i U t_i$ . ... $_:x_i$ rdf:type



		<pre>owl:Axiom. _:xi owl:annotatedSource Si. _:xi owl:annotatedProperty U. _:xi owl:annotatedTarget ti.</pre>
<a href="#">annotation of an axiom</a> where the axiom in RDF is <code>_:x U t1</code>	<pre>AXIOM(Annotation(A t) ... )</pre>	<pre>_:x A t. _:x U t1. ...</pre>
<a href="#">annotation of another annotation</a> (the other annotation in RDF starts with <code>s1</code> )	<pre>Annotation(Annotation(A t) ... A1 t1)</pre>	<pre>_:x A t. s1 A1 t1. ... _:x rdf:type owl:Annotation. _:x owl:annotatedSource s1. _:x owl:annotatedProperty A1. _:x owl:annotatedTarget t1.</pre>

### Annotation Properties

Language Feature	Functional Syntax	RDF Syntax
named annotation property	<a href="#">A</a>	A
human-readable name	<a href="#">rdfs:label</a>	<a href="#">rdfs:label</a>
human-readable comment	<a href="#">rdfs:comment</a>	<a href="#">rdfs:comment</a>
additional information	<a href="#">rdfs:seeAlso</a>	<a href="#">rdfs:seeAlso</a>
defining agent	<a href="#">rdfs:isDefinedBy</a>	<a href="#">rdfs:isDefinedBy</a>
version information	<a href="#">owl:versionInfo</a>	owl:versionInfo
deprecation	<a href="#">owl:deprecated</a>	owl:deprecated
backwards compatibility	<a href="#">owl:backwardCompatibleWith</a>	owl:backwardCompatibleWith
incompatibility	<a href="#">owl:incompatibleWith</a>	owl:incompatibleWith
prior version	<a href="#">owl:priorVersion</a>	owl:priorVersion

### Annotation Axioms

Language Feature	Functional Syntax	RDF Syntax
<a href="#">annotation subproperties</a>	<a href="#">SubAnnotationPropertyOf(A1 A2)</a>	A1 rdfs:subPropertyOf A2.
annotation property domain	<a href="#">AnnotationPropertyDomain(A U)</a>	A rdfs:domain U.
annotation property range	<a href="#">AnnotationPropertyRange(A U)</a>	A rdfs:range U.

## 2.8 Ontologies

### Ontologies

Language Feature	Functional Syntax	RDF Syntax
<a href="#">OWL ontology</a> ( <a href="#">importing</a> ) <sup>1 2</sup>	<pre>Ontology([ON [U]] Import(ON1)...</pre>	<pre>ON rdf:type owl:Ontology. [ON owl:versionIRI U.] ON owl:imports ON1. ...</pre>

	Annotation(A t) ... )	ON A t. ...
prefix declaration <sup>3</sup>	<a href="#">Prefix</a> (p=U)	@prefix p U.

1. [ ] represents optional constructs
2. In the RDF syntax `_:x` is used in place of ON if there is no ontology name.
3. RDF syntax is in Turtle, other RDF serializations may vary.

### 3 Built-in Datatypes and Facets

#### 3.1 Built-in Datatypes

Universal Datatype	<a href="#">rdfs:Literal</a>
	<a href="#">owl:rational</a>   <a href="#">owl:real</a>
Numbers	<a href="#">xsd:double</a>   <a href="#">xsd:float</a>   <a href="#">xsd:decimal</a>   <a href="#">xsd:integer</a>
	<a href="#">xsd:long</a>   <a href="#">xsd:int</a>   <a href="#">xsd:short</a>   <a href="#">xsd:byte</a>
	<a href="#">xsd:nonNegativeInteger</a>   <a href="#">xsd:nonPositiveInteger</a>
	<a href="#">xsd:positiveInteger</a>   <a href="#">xsd:negativeInteger</a>
	<a href="#">xsd:unsignedLong</a>   <a href="#">xsd:unsignedInt</a>
	<a href="#">xsd:unsignedShort</a>   <a href="#">xsd:unsignedByte</a>
Strings	<a href="#">rdf:PlainLiteral</a> (RDF plain literals) <a href="#">xsd:string</a>   <a href="#">xsd:NCName</a>   <a href="#">xsd:Name</a>   <a href="#">xsd:NMTOKEN</a> <a href="#">xsd:token</a>   <a href="#">xsd:language</a>   <a href="#">xsd:normalizedString</a>
Boolean Values	<a href="#">xsd:boolean</a> (value space: <i>true</i> and <i>false</i> )
Binary Data	<a href="#">xsd:base64Binary</a>   <a href="#">xsd:hexBinary</a>
IRIs	<a href="#">xsd:anyURI</a>
Time Instants	<a href="#">xsd:dateTime</a> (optional time zone offset) <a href="#">xsd:dateTimeStamp</a> (required time zone offset)
XML Literals	<a href="#">rdf:XMLLiteral</a>

#### 3.2 Facets

Facet	Value	Applicable Datatypes	Explanation
<a href="#">xsd:minInclusive</a> <a href="#">xsd:maxInclusive</a> <a href="#">xsd:minExclusive</a> <a href="#">xsd:maxExclusive</a>	literal in the corresponding datatype	Numbers, Time Instants	Restricts the value-space to greater than (equal to) or lesser than (equal to) a value
<a href="#">xsd:minLength</a> <a href="#">xsd:maxLength</a> <a href="#">xsd:length</a>	Non-negative integer	Strings, Binary Data, IRIs	Restricts the value-space based on the lengths of the literals
<a href="#">xsd:pattern</a>	xsd:string literal as a regular expression	Strings, IRIs	Restricts the value space to literals that > match the regular expression
<a href="#">rdf:langRange</a>	xsd:string literal as a regular expression	rdf:PlainLiteral	Restricts the value space to literals with language tags that match the regular expression

## 4 Appendix

### 4.1 New Features in OWL 2

Class Expressions	<ul style="list-style-type: none"> <li>• <a href="#">local reflexivity</a> (self restriction)</li> <li>• <a href="#">object</a> and <a href="#">data</a> qualified exact/maximum/minimal cardinality restriction</li> <li>• <a href="#">universal</a> and <a href="#">existential</a> restriction on n-ary data range</li> </ul>
Class Axioms	<ul style="list-style-type: none"> <li>• <a href="#">pairwise disjoint classes</a></li> <li>• <a href="#">class disjoint union</a></li> </ul>
Property Expressions	<ul style="list-style-type: none"> <li>• <a href="#">universal</a> and <a href="#">empty</a> object property</li> <li>• <a href="#">universal</a> and <a href="#">empty</a> data property</li> <li>• <a href="#">inverse object property expression</a></li> </ul>
Property Axioms	<ul style="list-style-type: none"> <li>• <a href="#">property chain inclusion</a></li> <li>• <a href="#">disjoint object properties</a></li> <li>• <a href="#">disjoint data properties</a></li> <li>• <a href="#">reflexive</a>, <a href="#">irreflexive</a>, and <a href="#">asymmetric</a> object property.</li> </ul>
Data Ranges	<ul style="list-style-type: none"> <li>• <a href="#">datatype definition</a></li> <li>• <a href="#">data range complement</a>, <a href="#">intersection</a> and <a href="#">union</a></li> <li>• <a href="#">datatype restriction</a> and <a href="#">facets</a></li> <li>• <a href="#">hook for n-ary datatype</a></li> </ul>
Assertions	<ul style="list-style-type: none"> <li>• <a href="#">negative object property assertion</a></li> <li>• <a href="#">negative data property assertion</a></li> </ul>
Annotation	<ul style="list-style-type: none"> <li>• <a href="#">annotation assertion</a></li> <li>• <a href="#">annotation of an axiom or an annotation</a></li> <li>• <a href="#">annotation subproperties</a></li> <li>• annotation property <a href="#">domain</a> and <a href="#">range</a></li> <li>• owl:deprecated annotation property</li> </ul>
<a href="#">Extra Built-in Datatypes</a>	<ul style="list-style-type: none"> <li>• owl:rational, owl:real, xsd:dateTimeStamp, rdf:PlainLiteral</li> </ul>
Others	<ul style="list-style-type: none"> <li>• <a href="#">key</a></li> <li>• <a href="#">declaration</a></li> <li>• <a href="#">metamodeling capabilities</a> (Punning)</li> <li>• <a href="#">anonymous individual</a></li> </ul>

### 4.2 Additional Vocabulary in OWL 2 RDF Syntax

Feature	Vocabulary	Note
data range	owl:DataRange	deprecated in OWL 2, replaced by <a href="#">rdfs:Datatype</a>
membership of a set of pairwise different individuals	owl:distinctMembers	can alternatively use owl:members
ontology property	owl:OntologyProperty	
deprecation	owl:DeprecatedClass, owl:DeprecatedProperty	alternative RDF syntax: s rdf:type owl:DeprecatedClass . or s rdf:type owl:DeprecatedProperty . can be replaced by  s owl:deprecated "true"^^xsd:boolean .

## 5 Appendix: Change Log (Informative)

### 5.1 Changes Since Recommendation

This section summarizes the changes to this document since the [Recommendation of 27 October, 2009](#).

- Minor typographical errors were corrected as detailed on the [OWL 2 Errata](#) page.

### 5.2 Changes Since Proposed Recommendation

This section summarizes the changes to this document since the [Proposed Recommendation of 22 September, 2009](#).

- Minor editorial changes to "Annotations" table.
- Minor editorial change to the explanation of table headers and others.
- Link to a pdf version of the guide, i.e., the OWL 2 Reference Card.

### 5.3 Changes Since Candidate Recommendation

This section summarizes the changes to this document since the [Candidate Recommendation of 11 June, 2009](#).

- The "Features At Risk" note w.r.t. the owl:rational and rdf:XMLLiteral datatypes was removed: implementation support has been adequately demonstrated, and the features are no longer considered at risk (see [Resolution 5](#) and [Resolution 6](#), 05 August 2009).
- Some minor editorial changes were made.

## 6 Acknowledgments

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