DL SYMBOLS

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Table 1: List of DL Symbols

Name	**DL**	**Manchester**	**Semantics**
domain of interpretation	$\triangle^{\mathcal{I}}$		The maximal set of all the things this ontology deals with
Thing(OWL) or top(DL)	$\top$	`owl:Thing`	Equivalent to the domain of interpretation
Nothing(OWL) or bottom(DL)	$\bot$	`owl:Nothing`	Equivalent to the empty set
Top object property	U	`owl:topObjectProperty`	Maximal set of pairs for the domain of interpretation: $\triangle^{\mathcal{I}} \times \triangle^{\mathcal{I}}$
Bottom object property	B	`owl:bottomObjectProperty`	Maximal set of pairs for the domain of interpretation: $\triangle^{\mathcal{I}} \times \triangle^{\mathcal{I}}$
instance or individual	c	`Individual: c`	$c \in \triangle^{\mathcal{I}}$ which is read as: c is a member of the domain of interpretation
class(OWL) or concept(DL)	C	`Class: C`	$C \subseteq \triangle^{\mathcal{I}}$, which is read as: C is a set of individuals that is a subset of the domain of interpretation.
object property(OWL) or role(DL)	r	`ObjectProperty: r`	A set of ordered pairs of individuals
data property(OWL) or concrete role(DL)	t	`DataProperty: t`	A set of ordered pairs where the first component of each pair is an individual and the second component is a data value
concept subsumption axiom	$C \sqsubseteq D$	`Class C:` `SubClassOf: D`	The set of individuals represented by the concept C is a subset of the set of individuals represented by the concept D
concept equivalence axiom	$C \equiv D$	`Class C:` `EquivalentTo: D`	The set of individuals represented by the concept C is equivalent to the set of individuals represented by the concept D

role subsumption axiom	$r \sqsubseteq s$	`ObjectProperty r:`
		`SubPropertyOf: s` or if r and s are concrete roles/data properties:
		`DataProperty r:`
		`SubPropertyOf: s`
			The set of pairs of individuals represented by the role r is a subset of the set of pairs of individuals represented by the concept s

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role equivalence axiom	$r \equiv s$	`ObjectProperty r:` `EquivalentTo: s`	The set of pairs of individuals represented by the role r is equivalent to the set of pairs of individuals represented by the concept s

instance of (OWL) or concept assertion (DL)	$C(x)$	`Class: C`
		`Individual: x`
		`Type: C`
			The individual x is an instance of the concept C,

property assertion (OWL) or role assertion (DL)	$r(x, y)$	`ObjectProperty: r`
		`Individual: y`
		`Individual: x`
		`Facts: r y`
			Individual x is related to individual y via the property r.

individuals are the same	$x \approx y$	`Individual: x`
		`Individual: y`
		`SameAs: x`	

individuals are different	$x \not\approx y$	`Individual: x`
		`Individual: y`
		`DifferentFrom: x`	

concept negation	$\neg C$	`not C`	Everything in the domain of interpretation that is not in C
intersection of concepts	$C \sqcap D$	`C and D`	The intersection of the sets represented by the concepts C and D. Read as: the conjunction of C and D.
disjunction of concepts	$C \sqcup D$	`C or D`	The union of the sets represented by the concepts C and D. Read as: the disjunction of C and D.
qualified existential restriction	$\exists r.C$	`r some C`	This represents the set of individuals such that for each individual d there is at least 1 element e that is linked to an individual d of type C via the role r. Read as: The set of individuals with an r-filler that is of type C.
unqualified existential restriction	$\exists r$ or $\exists r.\top$	`r some owl:Thing`	This represents the set of individuals such that for each individual d there is at least 1 element e that is linked to an individual d via the role r. Read as: The set of individuals with an r-filler.
value restriction	$\exists r.\{x\}$	`r hasValue x`	This a more specialized form of the existential restriction. This represents the set of individuals such that for each individual d belonging to the set, it is linked to the individual x (respectively value x when r is a data property or concrete role). Read as: The set of individuals with the individual x (respectively, the value x) as r-filler.
qualified universal restriction	$\forall r.C$	`r only C`	This is the set of individuals where for each individual d of the set, it holds that whenever d is linked to an individual e via r, then e is of type C. Read as: the set of individuals where all r-fillers are of type C.

unqualified universal restriction	$\forall r$ or $\forall r.\top$	`r only owl:Thing`	This is the set of individuals where for each individual d of the set, it holds that whenever d is linked to an individual e via r, then e is of type C.
qualified minimum cardinality restriction	$\geq nr.C$	`r min n C`	This represents the set of individuals such that each individual d is linked to at least n individuals of type C via the role r. Read as: The set of individuals with at least n r-fillers that are of type C.
unqualified minimum cardinality restriction	$\geq nr.\top$ or $\geq nr$	`r min n owl:Thing`	This represents the set of individuals such that each individual d is linked to at least n individuals via the role r. Read as: The set of individuals with at least n r-fillers.
qualified maximum cardinality restriction	$\leq nr.C$	`r max n C`	This represents the set of individuals such that each individual d is linked to at most n individuals of type C via the role r. Read as: The set of individuals with at most n r-fillers of type C.
unqualified maximum cardinality restriction	$\leq nr.\top$ or $\leq nr$	`r max n owl:Thing`	This represents the set of individuals such that each individual d is linked to at most n individuals via the role r. Read as: The set of individuals with at most n r-fillers.

inverse property(OWL) or inverse role(DL)	r^{-}	`ObjectProperty: r`
		`ObjectProperty: s`
		`InverseOf: r`
			The set that is the inverse of r consists of the pairs (x,y) of r that are swapped around to (y,x).

property chain(OWL) or role chain(DL)	$p1 \circ p2 \sqsubseteq p$	`ObjectProperty: p1`
		`ObjectProperty: p2`
		`ObjectProperty: p`
		`SubPropertyChain: p1 o p2`
			If we have $p1(x, y)$ and $p2(y, z)$, then it follows that $p(x, z)$. An example is `ObjectProperty: grandParentOf SubPropertyChain: parentOf o parentOf`.

TBox	$\mathcal{T}$	NA	The set of all concept axioms.
RBox	$\mathcal{R}$	NA	The set of all role axioms .
ABox	$\mathcal{A}$	NA	The set of all assertions regarding individuals.
Ontology	$\mathcal{O}$	NA	Consists of the union of the TBox, RBox and ABox where any of these could be potentially be empty.
entailment	$\models$	NA	States that an axiom or assertion follows from a TBox, RBox, ABox or ontology. I.e., $\mathcal{T} \models C \sqsubseteq D$ states that C is subsumed by D follows from the TBox $\mathcal{T}$. Typically used wrt reasoning in description logics.

References