

| | DL | OWL (Manchester syntax) | Semantics |
|-------------------------|---------------|--------------------------|---|
| Top | \top | <code>owl:Thing</code> | $\Delta^{\mathcal{I}}$ |
| Conjunction | $C \sqcap D$ | <code>C and D</code> | $C^{\mathcal{I}} \cap D^{\mathcal{I}}$ |
| Disjunction | $C \sqcup D$ | <code>C or D</code> | $C^{\mathcal{I}} \cup D^{\mathcal{I}}$ |
| Negation | $\neg C$ | <code>not C</code> | $\Delta^{\mathcal{I}} \setminus C^{\mathcal{I}}$ |
| Existential restriction | $\exists r.C$ | <code>r some C</code> | $\{u \mid \text{exists } v \text{ such that } (u, v) \in r^{\mathcal{I}} \text{ and } v \in C^{\mathcal{I}}\}$ |
| Universal restriction | $\forall r.C$ | <code>r only C</code> | $\{u \mid \text{for every } v \text{ such that } (u, v) \in r^{\mathcal{I}} \text{ we have } v \in C^{\mathcal{I}}\}$ |
| Number restrictions | $\geq k r.C$ | <code>r min k C</code> | $\{u \mid \text{at least } k v \text{ such that } (u, v) \in r^{\mathcal{I}} \text{ and } v \in C^{\mathcal{I}}\}$ |
| | $\leq k r.C$ | <code>r max k C</code> | $\{u \mid \text{at most } k v \text{ such that } (u, v) \in r^{\mathcal{I}} \text{ and } v \in C^{\mathcal{I}}\}$ |
| Nominal | $\{a\}$ | <code>{a} {a,b,c}</code> | $\{a^{\mathcal{I}}\} \quad \{a^{\mathcal{I}}, b^{\mathcal{I}}, c^{\mathcal{I}}\}$ |
| Inverse role | r^{-} | <code>inverse r</code> | $\{(u, v) \mid (v, u) \in r^{\mathcal{I}}\}$ |

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|---------------------|-------------------|---------------------------|--|
| Concept inclusion | $C \sqsubseteq D$ | C SubClassOf: D | $C^{\mathcal{I}} \subseteq D^{\mathcal{I}}$ |
| Concept equivalence | $C \equiv D$ | C EquivalentTo: D | $C^{\mathcal{I}} = D^{\mathcal{I}}$ |
| Role inclusion | $r \sqsubseteq s$ | r SubPropertyOf: s | $r^{\mathcal{I}} \subseteq s^{\mathcal{I}}$ |
| Concept assertion | $C(a)$ | a Type C | $a^{\mathcal{I}} \in C^{\mathcal{I}}$ |
| Role assertion | $r(a, b)$ | a r b | $(a^{\mathcal{I}}, b^{\mathcal{I}}) \in r^{\mathcal{I}}$ |

Interpretation $\mathcal{I} = (\Delta^{\mathcal{I}}, \cdot^{\mathcal{I}})$

- $\Delta^{\mathcal{I}}$ is non-empty set (domain/universe)
- $\cdot^{\mathcal{I}}$ is a function that maps
 - each individual name a to $a^{\mathcal{I}} \in \Delta^{\mathcal{I}}$
 - each concept name A to $A^{\mathcal{I}} \subseteq \Delta^{\mathcal{I}}$
 - each role name r to $r^{\mathcal{I}} \subseteq \Delta^{\mathcal{I}} \times \Delta^{\mathcal{I}}$

Knowledge base (KB) = TBox (ontology) + ABox (data)

- TBox \mathcal{T} : finite set of axioms
- ABox \mathcal{A} : finite set of concept and role assertions

Model of KB: interpretation satisfying all axioms, assertions

Satisfiable KB: has at least one model

Entailed from KB: holds in all models of the KB $\mathcal{K} \models \alpha$