COLLABORATIVE DISCUSSION 2:

(PEER RESPONSES)

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1 Response from Peers

1.1 Response from Rodrigo Pereira Cruz

My peer's entry manages to not only provide a clear and comprehensive overview of ontology languages, but also successfully lends credence to his perspective on why OWL 2 is the superior option when compared to its peers to build feature-rich ontologies, outlining this language's strengths and advantages over competitors such as Knowledge Interchange Format (KIF), Resource Description Framework (RDF), and even OWL Lite.

OWL 2 is a knowledge representation language, designed to formulate, exchange and reason with knowledge about a domain of interest (W3C, 2012). It was designed, since its inception, to address several shortcomings of the original OWL, itself already a prominent ontology language, many of which are centred around its lack of expressiveness (Grau et al., 2008; W3C, 2012). As evidenced by Murphy's entry, OWL 2 known for its various strengths, such as standardised semantics and datatype and annotation properties (Bilenchi et al., 2025), all of which make it a premier choice for knowledge representation.

Overall, by combining features not easily found in other languages, and directly addressing known issues in the original OWL, OWL 2 has successfully cemented itself as a very strong candidate, as outlined by my peer, for the best currently available ontology language and has become a keystone player in the world of knowledge representation.

References

- W3C. (2012) OWL 2 Web Ontology Language Primer (Second Edition). Available at: https://www.w3.org/TR/owl2-primer/ (Accessed: 29 March 2025).
- Grau, B.C., Horrocks, I., Motik, B., Parsia, B. Patel-Schneider, P. and Sattler, U. (2008) 'OWL 2: The next step for OWL', *Journal of Web Semantics* 6(4), pp. 309-322. Available at: https://doi.org/10.1016/j.websem.2008.05.001.
- W3C. (2012) OWL 2 Web Ontology Language Document Overview (Second Edition). Available at: https://www.w3.org/TR/owl2-overview/ (Accessed: 29 March 2025).
- Bilenchi, I., Gramegna, F., Loseto, G., Ieva, S., Scioscia, F. and Ruta, M. (2025) 'Cowl: Pushing OWL 2 over the Edge', *Internet of Things* 29(1), 101439. Available at: https://doi.org/10.1016/j.iot.2024.101439.

2 My Response to Peers

2.1 Response to Mohamed Khaled Eissa Almail Alzaabi

In this post, Mohamed provides a sound and coherent argument for OWL2 being the most suitable ontology language for software agents on the World Wide Web. I appreciate how he connects his points back to Kalibatiene and Vasilecas's (2011) definition and highlights the role of formalism and common conceptualisation as prerequisites to ontology engineering.

The advanced constructs found in OWL2 (like disjoint classes, class equivalence, and complex hierarchies) show its potency in representing rich semantic relationships and enabling automated reasoning. This becomes critical when agents need to make intelligent decisions based on complex, interrelated data.

Additionally, OWL2 is supported by many of the best reasoning engines (e.g., Pellet, HermiT, and FaCT++), enhancing its worth even more. Such engines enable systems to draw new conclusions from the information in such ontologies, allowing more advanced capabilities, such as consistency checking and semantic inference (Hitzler et al., 2009).

I also appreciated the comparison with other languages. KIF's logical strengths are clear, but, as he noted, it lacks native support for web technologies (Ginsberg, 1991). RDF's simplicity is valuable but limited in expressiveness, and OWL-lite, while lightweight, does not offer the advanced semantics that OWL2 enables.

Another feature worth mentioning is that OWL2 has defined specific profiles, like EL, QL and RL, which are optimised for performance in specific application contexts. Having profiles for large or complex data sets allows the developer some flexibility without compromising reasoning (W3C, 2012).

Finally, Mohamed's emphasis on interoperability with W3C standards like RDF and SPARQL is crucial. According to Allemang and Hendler (2011), this aspect of seamless integration is necessary for semantic web systems in real life. All in all, the post was coherent, reasonable, and instructional. That helped solidify OWL2 as the premier language for semantic interoperability and intelligent web-based applications.

References

- Allemang, D. and Hendler, J., 2011. *Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL*. 2nd ed. Amsterdam: Morgan Kaufmann.
- Ginsberg, A., 1991. *Knowledge Interchange Format (KIF) Definition*. [online] Available at: http://logic.stanford.edu/kif/dpans.html [Accessed 1 Apr. 2025].
- Hitzler, P., Krötzsch, M. and Rudolph, S., 2009. *Foundations of Semantic Web Technologies*. Boca Raton: Chapman and Hall/CRC.

- Kalibatiene, D. and Vasilecas, O., 2011. Ontology-Based Enterprise Modelling: A Requirements Engineering Approach. *Electronics and Electrical Engineering*, 4(110), pp.101–106.
- W3C, 2012. *OWL 2 Web Ontology Language Document Overview (Second Edition)*. [online] Available at: https://www.w3.org/TR/owl2-overview/ [Accessed 1 Apr. 2025].
- Janowicz, K., Van Harmelen, F., Hendler, J., & Hitzler, P. (2015). Why the Data Train Needs Semantic Rails. AI Magazine, 36(1), 5-14.

2.2 Response to Rodrigo Pereira Cruz

I liked Rodrigo's post on ontology languages. It is an excellent argument for OWL2, and I support his point of view, particularly concerning OWL2 flexibility and repressibility when modelling representative ontology-based scenarios.

He pointed out the qualified cardinality restrictions and rich property characteristics of OWL2, which are among the distinctive features that bring its expressive power to a new level and can genuinely benefit software agents required to function in a dynamic and diverse web space (W3C, 2012).

His comparison with the other languages was also spot-on. The lack of standardisation in KIF (Ginsberg, 1991) and the limited expressiveness in OWL-lite (W3C, 2004) make them less practical for real-world applications where ontologies need to support advanced reasoning. I also liked that Rodrigo acknowledged RDF's foundational role - often underestimated, but as he mentioned, it lacks the semantic depth that OWL2 provides (Reynolds et al., 2005).

OWL2 is helpful to the end-users because it is compatible with other W3C standards. This integration with RDF and SPARQL makes it easier for Semantic Web applications. A key machine-readable aspect of data that is often crucial in the context of linked data systems is related to the concept of interoperability. This is supported by Allemang and Hendler (2011), who emphasise the practical strengths of OWL in enabling intelligent, scalable web applications.

Overall, it was a great post—clear, concise, and informative. Rodrigo did a fabulous job showing how OWL2 provides breadth in terms of expressiveness and interoperability and how it remains the gold standard for Semantic Web development. I also enjoyed how he walked the line between technical detail and aptitude, making the topic accessible to those new to ontology languages.

References

- Allemang, D. and Hendler, J., 2011. *Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL*. 2nd ed. Amsterdam: Morgan Kaufmann.
- Ginsberg, A., 1991. *Knowledge Interchange Format (KIF) Definition*. [online] Available at: http://logic.stanford.edu/kif/dpans.html [Accessed 1 Apr. 2025].
- Reynolds, D., Seaborne, A., Manola, F. and Hayes, P., 2005. *Resource Description Framework (RDF): Concepts and Abstract Syntax*. [online] W3C

Recommendation. Available at: https://www.w3.org/TR/rdf-concepts/ [Accessed 1 Apr. 2025].

- W3C, 2004. *OWL Web Ontology Language Overview*. [online] World Wide Web Consortium. Available at: https://www.w3.org/TR/owl-features/ [Accessed 1 Apr. 2025].
- W3C, 2012. *OWL 2 Web Ontology Language Document Overview (Second Edition)*. [online] Available at: https://www.w3.org/TR/owl2-overview/ [Accessed 1 Apr. 2025].