OCEL 2.0: Enabling Object-Centric Process Mining

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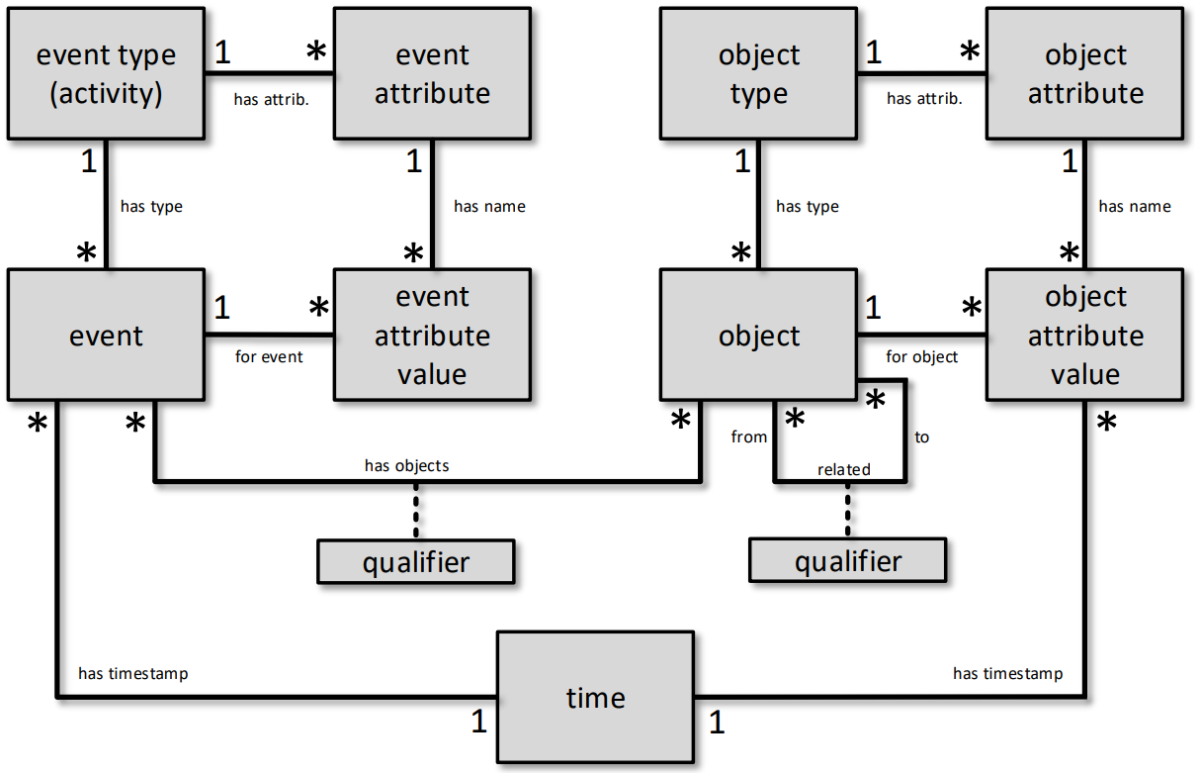
Exciting news for those interested in #ProcessMining! We have released **OCEL 2.0**. Explore it now at https://www.ocel-standard.org.

OCEL, which stands for **Object-Centric Event Log**, serves as the exchange format for **Object-Centric Event Data** (#OCED) and serves as the foundation for **Object-Centric Process Mining** (#OCPM) [1]. This latest standard, OCEL 2.0, introduces a comprehensive specification, including metamodel and formalization, along with three exchange formats (SQLite, XML, and JSON). It also offers numerous example datasets, libraries, and software tools.

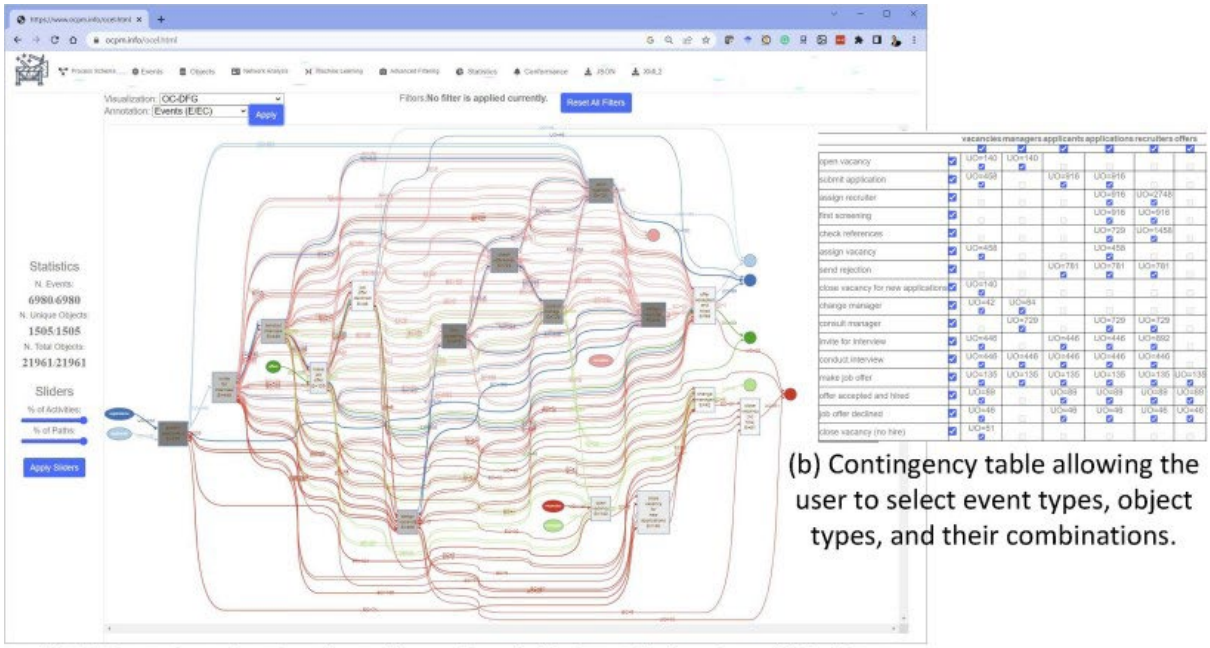
The inaugural release, OCEL 1.0, made its debut in 2020 and sparked the development of various OCPM techniques. With OCEL 2.0, we have added **Object-to-Object (O2O)** relations next to **Event-to-Object (E20)** relations, and the ability to modify object attributes and qualify O2O and E2O relationships. Similar to OCEL 1.0, an event can reference multiple objects of different types, freeing it from the constraints of a single-case concept. Explore these new possibilities today!



The metamodel of OCEL 2.0. The data can be stored and exchanged in various formats (relation, XML, JSON, etc.), but the core concepts are universal.

Conventional approaches to process modeling and analysis typically center around a single type of object, often referred to as cases or instances, with each event exclusively linked to one such object. This limited perspective can distort our understanding of reality, giving rise to the well-known convergence and divergence issues [1,2]. Moreover, data extraction is frequently labor-intensive and must be repeated when new questions arise.

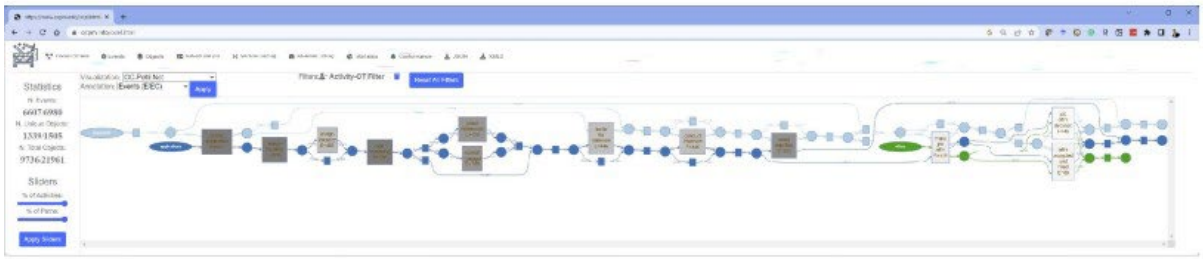
Object-Centric Process Mining (OCPM) adopts a more holistic and inclusive approach to process enhancement. It considers multiple types of objects and events involving varying numbers of objects. Leveraging the OCEL 2.0 standard and associated OCPM tools, one can effortlessly examine operational activities from various angles using a single, unchanging data source. This eliminates the need for data extraction when shifting perspectives, providing an unparalleled degree of flexibility through on-demand process mining views.



(b) Contingency table allowing the user to select event types, object types, and their combinations.

(a) Object-Centric Directly-Follows Graph (OC-DFG) showing all 6 object types and all 16 activities

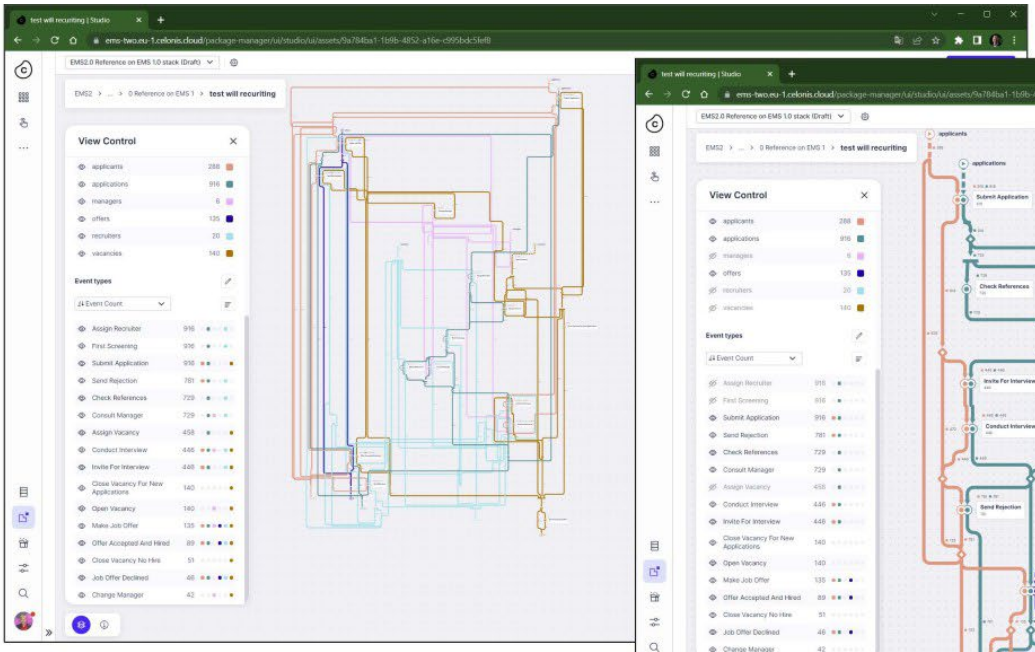
(c) Object-Centric Petri Net (OC-PN) showing three object types (applicants, applications, and offers) and all related activities



(c) Object-Centric Petri Net (OC-PN) showing the same three object types (applicants, applications, and offers), but a subset of 12 activities.

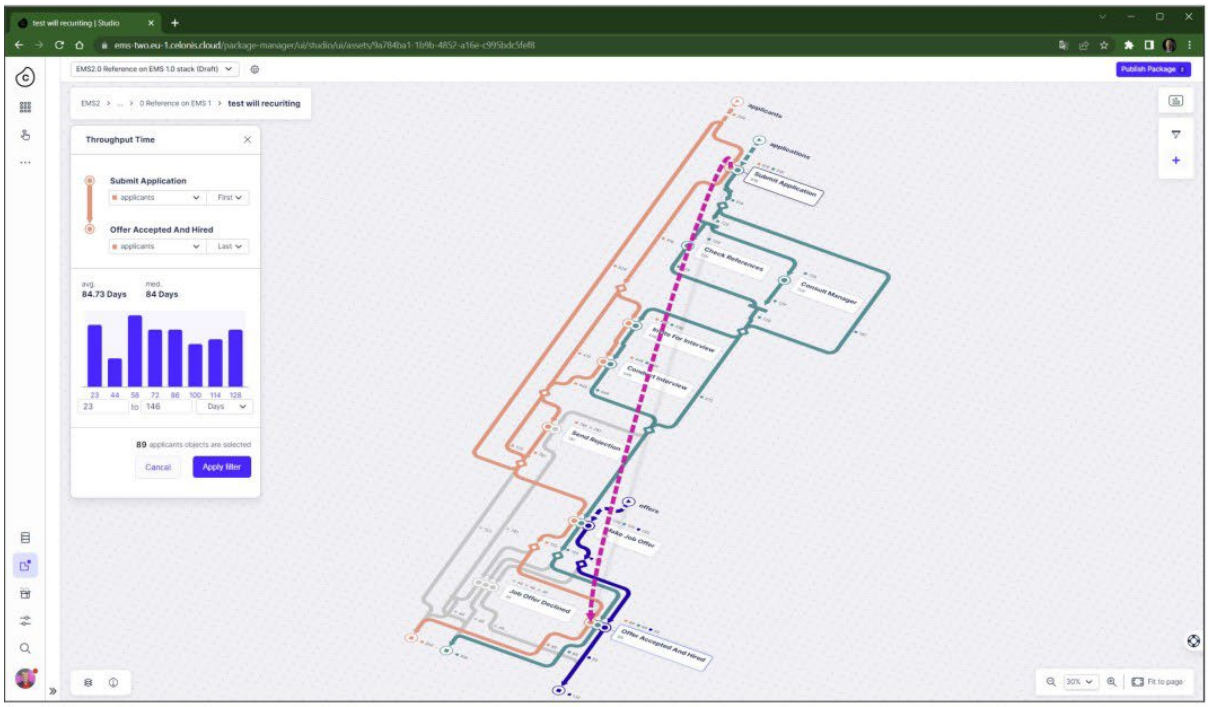
Some screenshots of the OCPM tool while analyzing a data set with six object types. The OCPM tool fully supports OCEL 2.0 [1].

Several tools are at your disposal for analyzing OCEL 2.0 event logs (e.g., OCPM and OCpi). We also provide libraries to support and facilitate easy integration. We expect these ideas coming from research to be adopted in industry. For example, Celonis has embraced OCED and OCPM, and through Process Sphere and the Celonis object-centric data model, users can benefit from this directly.



(a) Object-Centric BPMN model showing all 6 object types and all 16 activities and the interface to select subsets of objects types and activities (contingency table) on the left-hand side

(b) Object-Centric BPMN model after selecting three object types (applicants, applications, and offers)



(c) Analyzing the time between an applicant applying for a vacancy and actually being hired. In total 89 applicants were hired (of a total of 288 applicants applying 916 times). The average time between applying and accepting an offer was 84 days

Analysis of the same data sets using Celonis Process Sphere [1].

OCPM also uncovers fresh and valuable improvement prospects, particularly in areas where processes intersect with organizational units. This underscores the significance

of OCEL 2.0. To delve deeper into this groundbreaking standard, visit https://www.ocel-standard.org. We welcome your feedback! Let us know what you think via ocel@pads.rwth-aachen.de.

Thanks to all the PADS members who contributed to the new standard, especially Alessandro Berti, Istvan Koren, Jan Niklas Adams, Gyunam Park, Benedikt Knopp, Nina Graves, Majid Rafiei, Lukas Liß, Leah Tacke Genannt Unterberg, Yisong Zhang, Christopher Schwanen, and Marco Pegoraro. They have helped to create the relational database (SQLite), XML, and JSON formats, the open-access data sets, software libraries, and software tools that make it easy to start using the #OCED standard.

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References

[1] W.M.P van der Aalst. Object-Centric Process Mining: Unraveling the Fabric of Real Processes. *Mathematics*, 11(12):2691, 2023.

[2] W.M.P. van der Aalst and A. Berti. Discovering Object-Centric Petri Nets. *Fundamenta Informaticae*, 175(1-4):1–40, 2020.

[3] W.M.P. van der Aalst. *Process Mining: Data Science in Action*. Springer-Verlag, Berlin, 2016.

[4] W.M.P. van der Aalst and J. Carmona, editors. *Process Mining Handbook*, volume 448 of *Lecture Notes in Business Information Processing*. Springer-Verlag, Berlin, 2022.

Originally published as a LinkedIn Pulse https://www.linkedin.com/pulse/ocel-20-enabling-object-centric-process-mining-wil-van-der-aalst-yafie/ (20-10-2023)