

Oracle and Oracle Labs

Oracle, a global provider of enterprise cloud computing, is empowering businesses of all sizes on their journey of digital transformation. Oracle Cloud provides leading-edge capabilities in software as a service, platform as a service, infrastructure as a service, and data as a service.

Oracle's application suites, platforms, and infrastructure leverage both the latest technologies and emerging ones – including artificial intelligence, machine learning, blockchain, and Internet of Things – in ways that create business differentiation and advantage for customers. Continued technological advances are always on the horizon.

Oracle invests heavily in research and development: US\$6.2 billion in FY 2017. Oracle Labs is the advanced research and development arm of Oracle. We focus on the development of technologies that keep Oracle at the forefront of the computer industry. Oracle Labs is the only organization at Oracle that is devoted exclusively to research.

Oracle Labs researchers look for novel approaches and methodologies, often taking on projects with high risk or uncertainty, or that are difficult to tackle within a product-development organization. Oracle Labs research is focused on real-world outcomes: our researchers aim to develop technologies that will someday play a significant role in the evolution of technology and society. For example, chip multithreading and the Java programming language grew out of work done in Oracle Labs.

Walnut Project

Programming languages used to develop application logic are being pushed down the software stack as data processing logic is becoming increasingly sophisticated and specialized. Achieving a high-performance implementation of a new programming language is a daunting engineering-intensive task. Integrating that implementation safely and securely into data processing engines adds further complexity and challenges. Arguably, repeating this for every new popular language is not sustainable. The complexity can be dramatically reduced if these programming languages are all implemented on a common foundation.

Oracle Labs' Graal project is providing such a foundation, in the form of an ecosystem for developing inter-operable high-performance programming language implementations. The common foundation consists of a state-of-the-art feedback-driven speculative runtime compiler (Graal), a framework for developing self-modifying interpreters that exploit these ability for speculative optimization (Truffle), and an embeddable runtime to execute languages implemented with that common foundation (Substrate VM).

The Walnut project aims at extending this common foundation to improve data processing along several dimensions:

1. define a framework for rapidly and efficiently integrating new programming languages (e.g. JavaScript, Python or R) into existing data processing engines;
2. apply the speculative runtime compilation strategies that modern programming languages, such as Java and JavaScript, have enjoyed for over two decades to data processing engines, and query execution in particular;
3. use runtime compilation technologies to rapidly develop new extensions to data processing engines and to enable efficient interoperability between engines specific to different data models (e.g., graph and relational).

The Walnut project has various openings for internship on the themes described above.

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