

LEO Trek

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Anwender_innen-DOKUMENTATION and Entwickler_innen-DOKUMENTATION

Who are we? LEO Trek is a research and development project conducted at the Distributed Systems Group (DSG) at TU Wien. The project team is composed by Asst. Prof. Nastic, Cynthia Marcelino, and Thomas Pusztai. The goal is to provide open, reusable building blocks for computing across the Edge–Cloud–Space 3D continuum.

What is it? LEO Trek is an open-source toolkit for orchestrating, simulating, and optimizing serverless and AI workflows in the Edge–Cloud–Space 3D Continuum. It consists of several modular software components, including:

- **Stardust:** a scalable simulator for the 3D Continuum. Github: <https://github.com/polaris-slo-cloud/stardust-go/>
- **HyperDrive:** an SLO-aware serverless scheduler for the 3D Continuum. Github: <https://github.com/polaris-slo-cloud/hyper-drive/>
- **ChunkFunc:** a workflow resource optimizer that accounts for input size and cost–performance trade-offs. Github: <https://github.com/polaris-slo-cloud/chunk-func/>
- **FedCCL:** a Federated Learning Framework. Github: <https://github.com/polaris-slo-cloud/fedccl/>
- **Databelt:** a state management framework for serverless workflows in the 3D Continuum. Github: <https://github.com/polaris-slo-cloud/databelt/>
- **Gaia:** a serverless runtime for automated CPU/GPU selection for serverless AI. Github: <https://github.com/polaris-slo-cloud/gaia/>

Each module is self-sufficient, containing its own documentation. They can be used independently and combined as needed.

Who is it for and how does it help? LEO Trek is designed for researchers, platform engineers, and third-party developers working on distributed, serverless, and edge systems. It explains the system architecture, core components, and extension points, enabling reuse, evaluation, and further development of the open-source codebase.

How does it work? LEO Trek is composed of a set of modular components that enable simulation, scheduling, optimization, state management, and hardware acceleration in the 3D Continuum. The components can be used independently or combined, allowing both users to run simulations and evaluations and developers to extend or integrate the system. Each component is provided as a self-contained open-source repository that includes all information required to build, configure, use, and further develop the software.