Capitrain« Cheops » – a service mesh to geo-distributed resources

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Tuteur	Geo Johns Antony, Adrien Lebre
Project	Cheops The complete project revolves around the issue of on managing resources in a geo-distributed infrastructure in Cloud and Edge scenario, an issue addressed by STACK research team of IMT Atlantique. The said project will be on implementing a certain module to manage relationships between resources in a geo-distributed scenario. This work will be oraganised around the following tasks : — Detect the kind of relationship occurring between geo-distributed resources. — Develop a module to analyse if user CRUD operations on a resource with dependencies can be satisfied.
Site Web	https://gitlab.inria.fr/discovery/cheops
Intitulé	

Domain
- — Software Build and Integration
- — Cloud Computing - Edge Computing
- — Research

Required Skills
- — Basic knowledge about CRUD requests and API's
- — Programming skills in Go lang.
- — The communication will be in English

Skills to acquire
- — Expertise in software development and managing geo-distributed resources.
- — Basic knowledge in Kubernetes framework
- — Contributing to an « open source »project

Context
Cloud to Edge paradigm is growing rapidly. Even though many tools have been proposed to manage resources they lack a generic solution. Our envisioned framework consist of :
- — Autonomous instances : local-first for robustness.
- — Collaboration (on demand/if needed) : leverage available resources.
- — Generic : the approach should work with multiple applications.
- — No touching the code : no extra efforts (intrusive) to existing code.

This non-invasive approach is made possible by (i) a DSL [1] that extends the application API and allows DevOps to program where/how the execution of each request should be executed, (ii) and its runtime, Cheops[2], a service that interprets and orchestrates each request in order to satisfy the geo-distribution parameters, allowing collaborations in a transparent manner for the underlying application.

Problem : Managing resources in a generic manner and solving dependencies which arises
As part of generic approach to geo-distribute resources. A Resource relationship model was introduced. In a micro-service scenario resources might be dependent to one another. These dependencies may be required at certain periods of time. Some need to be alive throughout the lifespan of the resources. Based on these initial observation, we proposed a theoretical relationship model by which it is possible to identify and maintain the dependency properties between resources. The goal of this project is to implement this theoretical model into Cheops.

Objective
Development of the relationship model to identify various relationships of resources and creating a dependency tree to address this model when a CRUD operation is performed. The development effort will take place in two stages

- Development of a micro-service in go lang to create the module.
- Integrate and test the module with a Kubernetes framework.

Deliverable

- A working module for the relationship module.
- A working prototype of the Dependency tree.
- A report in the form of slides associated with a demonstration of prototypes.

Project methodology
This project will be carried out using an agile method with regular meetings and informal reports It should also be noted that the codes produced must be available on a branch of the cheops gitlab repository (or any other git repository) under a free license (GNU GPL, Creative Commons for example)

Références

[1] Ronan-Alexandre Cherrueau, Marie Delavergne, and Adrien Lebre. Geo-Distribute Cloud Applications at the Edge. In *EURO-PAR 2021 - 27th International European Conference on Parallel and Distributed Computing*, pages 1–14, Lisbon, Portugal, August 2021.

[2] Marie Delavergne and Lebre Adrien Antony Geo Johns. Cheops, a service to blow away cloud applications to the edge. Research report, Inria Rennes, September 2022.