Chair of Network Architectures and Services
School of Computation, Information, and Technology
Technical University of Munich

TUM

Thesis M.Sc.

Finding Ideal Web Caching Strategies based on Preemptive Caching and a Graph-based REST API Model

Motivation

APIs are the driving force behind the digital economy—powering everything from web applications and IoT devices to next-generation AI agents. The demand for fast, efficient, and sustainable data communication is growing exponentially, and innovative solutions are needed.

We are working on a startup project to build the first AI-driven web proxy for semantic API optimization. Leveraging cutting-edge research and state-of-the-art AI technologies, we offer a unique opportunity to actively shape a transformative solution.

API
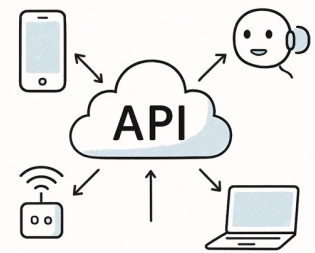
Shaping the Future
of API Communication

Your Task

- Thorough related work analysis (papers, tools, approaches)
- Extend a graph-based REST API Model modeling dependencies between API endpoints. Use public models like [2] to validate applicability to complex real-world APIs.
- Develop a Next.js frontend to show a graphical representation of the model and allow editing it.
- Derive a caching strategy (simple TTL-based, Invalidation-based) from the model and implement it using CDN edge functions (e.g., via [1]). Similar to [3].
- Preemptivly cache responses to analyze cache-hit metrics for different strategies
- Show and evaluate cache statistics per strategy to find the ideal strategy

Requirements

- Experience in full-stack development (react, Typescript), web caching, REST API design
- Motivation :)

References

[1] https://www.fastly.com/documentation/guides/concepts/edge-state/cache/
[2] https://openapisearch.com/
[3] https://blog.cloudflare.com/speeding-up-apis-ricochet-for-api-gateway

Contact

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