

Exploring the design space of back-end services: Or how to lose your mental sanity with C

Eduardo Rodriguez Fernandez

Chair for Data Processing, Technical University of Munich

eduardo.rodriguez@tum.de

Abstract—Most of the popular modern web-development frameworks, like Node.js, Flask or the standard library of Go, handle the creation and management of a running back-end service, in a mostly abstracted high-level way that does not allow a developer much freedom of modification of the inherent system architecture of the server. Such an inflexible and abstracted, often plug-and-play, server implementation helps to facilitate web development by concealing the system-level design choices from the end user. The problem of blindly relying in a web framework without understanding its internal architecture is that it might not be the most suitable choice for a particular web application, which then ends up having unnecessarily bloated and difficult to maintain dependency-prone services. The aim of this paper is to explore the design space of a dependency-free, cloud-deployable back-end service purely written in C, through a literature review and an actual software implementation. In order to weigh the advantages and challenges, in terms of both performance and software development ease, of a highly abstracted back-end framework and a self-made low-level service.

Index Terms—back-end services, concurrency, C, databases, software architecture, systems programming, software engineering, design principles

I. INTRODUCTION

Describe that a chat app is being used as an example implementation. Argue why the architectural design of the chat app is more IO-bound than CPU-bound [1] and therefore works best with a traditional pre-emptive scheduler.

“If you have a program that is focused on IO-Bound work, then context switches are going to be an advantage. Once a Thread moves into a Waiting state, another Thread in a Runnable state is there to take its place. This allows the core to always be doing work. This is one of the most important aspects of scheduling. Don't allow a core to go idle if there is work (Threads in a Runnable state) to be done.

If your program is focused on CPU-Bound work, then context switches are going to be a performance nightmare. Since the Thread always has work to do, the context switch is stopping that work from progressing. This situation is in stark contrast with what happens with an IO-Bound workload”[1] (correct this since it is actually from part 1)

II. STATE OF THE ART

Describe how the systems architecture of other popular web frameworks is, for instance Go and its goroutines.

Describe the concurrency model of Golang, and its goroutines. Explicitly mentioning that most developers have no knowledge or even control, over how this is done [2]. Make

clear that since we are developing the chat app in C, it makes sense to compare it with Go, since Go is C for the 21st Century/ it was developed by the Bell Labs architects of C (maybe find a good reference from the Go philosophy statement from its creators that talks about this). And Go also being a concurrency-first language with a very simple syntax for handling concurrency.

If, another main discussion in the methodology would be the async own database implementation, it would be interesting to talk about locks in any db system, and use the data book as a major reference.

Might as well read and describe how nginx works ?????

III. CONCLUSION

REFERENCES

- [1] W. Kennedy, “Scheduling in Go,” <https://www.ardanlabs.com/blog/2018/08/scheduling-in-go-part2.html>, August 2018.
- [2] K. Cox-Buday, *Concurrency in Go*. Sebastopol, California: O’Reilly, August 2017.
- [3] M. Kerrisk, *The Linux Programming Interface*. San Francisco: No Starch Press, 2010.
- [4] M. Kleppmann, *Designing Data-Intensive Applications*. Sebastopol, California: O’Reilly, March 2017.
- [5] R. C. Seacord, *Effective C: an introduction to professional C programming*. San Francisco: No Starch Press, 2020.