Evaluation of performance and productivity metrics of potential programming languages in the HPC environment

— Bachelor Thesis —

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Abstract

The world of high-performance computing is evolving rapidly and programming languages used in this environment are held up to a very high standard. It comes as no surprise that runtime performance is the top priority in language selection when an hour of computation costs thousands of dollars. The focus on raw power led to C and Fortran having an almost monopolistic position in the industry, because their execution speed is nearly unmatched.

This thesis aims to analyze new programming languages in the context of HPC. To compare not only speed but also development productivity and general inner metrics, a basic traffic simulation is implemented in C, Mozilla's Rust and Google's Go. These two languages were chosen on their basic promise of performance as well as memory-safety in the case of Rust or easy multhithreaded execution (Go). The implementations are limited to shared-memory parallelism to achieve a fair comparison since the library support for inter-process communication is rather limited at the moment.
Nonetheless the comparison should allow a decent rating of the viability of these two languages in high-performance computing.

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1. Introduction

In diesem Kapitel ...

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Referenzbeispiel: Für mehr Informationen, siehe Kapitel **??**.

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2. Design

In diesem Kapitel ...

3. Implementation

In diesem Kapitel ...

4. Evaluation

In diesem Kapitel ...

5. Conclusion

In diesem Kapitel ...

   - Only evaluated shared memory -> Multi process implementations -> C: MPI, Rust: MPI via C FFI opaque pointer, Go: MPI via wrapper? (less idiomatic code)

Bibliography

Nachname, Vorname (2012). "Titel des Artikels". In: *Testjournal* 2, pp. 1–42.

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Appendices

A. Appendix

- System configuration -> clang/gcc version -> rustc and cargo version (including commit hash!) -> go version

Erklärung

Ich versichere, dass ich die Arbeit selbstständig verfasst und keine anderen, als die angegebenen Hilfsmittel – insbesondere keine im Quellenverzeichnis nicht benannten Internetquellen – benutzt habe, die Arbeit vorher nicht in einem anderen Prüfungsverfahren eingereicht habe und die eingereichte schriftliche Fassung der auf dem elektronischen Speichermedium entspricht.

Optional: Ich bin mit der Einstellung der Bachelor-Arbeit in den Bestand der Bibliothek des Fachbereichs Informatik einverstanden.

Hamburg, den 26.11.2014   . . . .