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

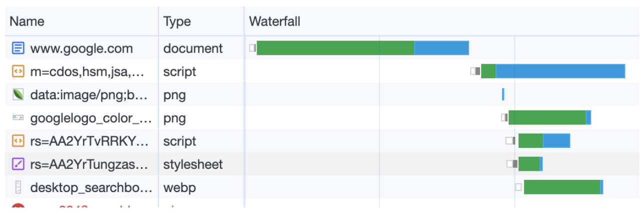
Thesis M.Sc.

IDP

# Modeling Web Page Performance Improvements via Loading Graphs and Testbed Simulations

## Motivation

We want to investigate whether we can improve real-world web page loading times by switching the API object serializer from JSON to CBOR [1]. However, which method allows us to find this out? This thesis shall investigate a novel approach to model and simulate this improvement. On one side, we can crawl popular websites and measure the loading times. This creates a lot of data that we have to simplify, e.g., by creating an acyclic loading graph like [2]. On the other hand, we can use performance measurements in our testbed to measure improvements using different technologies. However, this improvement might be irrelevant in the total time a web page loads. To get a real-world perspective, we can combine our model of the loading time and our performance measurements to estimate the overall improvement.



| Name | Type | Waterfall |
|---|---|---|
| www.google.com | document | |
| m=cdos,hsm,jsa,… | script | |
| data:image/png;b… | png | |
| googlelogo_color_… | png | |
| rs=AA2YrTvRRKY… | script | |
| rs=AA2YrTungzas… | stylesheet | |
| desktop_searchbo… | webp | |

## Your Task

- You develop a specialized crawler (e.g., based on Selenium or Puppeteer [3, 4]), that loads a web page and generates a loading graph similar to [2]
- The crawler should store any JSON responses together with the loading time metrics
- With this data, you model the network behavior of the JSON requests (also considering cached and uncached responses)
- On our testbed, you use the crawled JSON responses and the observed bandwidth to simulate the request using both JSON and CBOR.
- Now, the simulated performance can be applied to the loading graph to estimate how long the page would have loaded using the different technology

## Requirements

Good understanding how data is transferred on the Internet, knowledge of the Linux network stack, Bash, Javascript

## Contact

Markus Sosnowski sosnowski@net.in.tum.de
Florian Wiedner wiedner@net.in.tum.de

## References

[1] https://cbor.io/
[2] https://github.com/cyrus-and/chrome-page-graph
[3] https://www.selenium.dev/
[4] https://github.com/puppeteer/puppeteer