

This report documents the experiment conducted during the module SCAD. The experiments observe the effects of complex function calls.

Cloud Function Behaviour
SCAD P01

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1. Introduction

The task of lab 1 is to write simple cloud functions and measure their runtime. The functions include complexity of a few seconds and some actual processing as described in the following chapters. Finally, the functions will be tested by being invoked with sample data through the web interface.

2. Experiment Setup

Team Clueless uses the Google Cloud Platform as the function cloud provider and solved the exploration functions in Python 3.8 as the programming language. The memory is allocated to be 256 MB of RAM and the triggers are set to HTTP. The region is set to Europe-west6 and the timeout is set to 60 s. For each of the experiment the same setup is used with exception of experiment E2 for which we allocated 1GB.

3. Procedure

We wrote a test tool which invokes every function a 100 times and measures their response times. As requested by the lab we chose four of the experiments to work with. As some of the experiments complement each other, we decided to combine them into one.

The functions cover the following tasks:

- E0: Hello World function called 100 times: It's response times will be used as the baseline for the comparisons.
- E2: configured memory allocation: Our function uses 1 GB in memory allocation. And uses the same program as used in E0.
- E4: library size - inclusion of a large library: We included the Python library Numpy and calculated a small matrix multiplication.
- E7: external network calls - e.g., to parse website: To test this, we dynamically download a ZHAW website on every function call. The downloaded page contains a list of all the individual degree programs currently available. After the download we used the optional library beautifulsoup to filter the listed programs out and return the full list to the caller.
- E8: processor affinity - check /proc/cpuinfo: We read out the CPU information and received following data: Processor : 0, vendor_id : GenuineIntel, cpu family : 6, model : 85, model name : unknown, stepping : unknown, cpu MHz : 2692.868, fpu : yes etc.

4. Results and Findings

Google Cloud has the following prices for every 100 ms used.

Speicher	CPU ¹	Preis/100 ms (Preisstufe 1)
128 MB	200 MHz	0,000000231 \$
256 MB	400 MHz	0,000000463 \$
512 MB	800 MHz	0,000000925 \$
1.024 MB	1,4 GHz	0,000001650 \$

Figure 1 - Google Cloud Prices, Source: Google Cloud Platform

Summing up the cost of a hundred calls for each function we conclude that the costs do not even round up to one cent.

Task	Costs for 100 calls
E0	0.00005093 \$
E2	0.00020625 \$
E4:	0.000057875 \$
E7	0.000400495 \$
E8	0.000064357 \$

Table 1 - Costs per 100 Calls

Resource limits of Google Cloud are listed below.

Quota	Description	Limit	Can be increased	Scope
Number of functions	The total number of functions that can be deployed per region	1,000	No	per region
Max deployment size	The maximum size of a single function deployment	100MB (compressed) for sources. 500MB (uncompressed) for sources plus modules.	No	per function
Max uncompressed HTTP request size	Data sent to HTTP Functions in an HTTP request	10MB	No	per invocation
Max uncompressed HTTP response size	Data sent from HTTP functions in an HTTP response	10MB	No	per invocation
Max event size for background functions	Data sent in events to background functions	10MB	No	per event
Max function memory	Amount of memory each function instance can use	8192MiB	No	per function

Figure 2 - Google Cloud Resource Limits, Source: Google Cloud Platform

The next table contains the execution duration of each cloud function in milliseconds.

Experiment	Min	Max	Median	Mean
E0	46.050048	163.34976	54.659968	63.21079296
E2	47.480064	1127.10016	55.030144	65.78650624
E4	46.490112	1265.469952	53.629952	80.41670144
E7	608.499968	2187.800064	738.76992	813.5969894
E8	48.550144	1224.190208	54.774912	93.9677952

Table 2 - Execution Duration

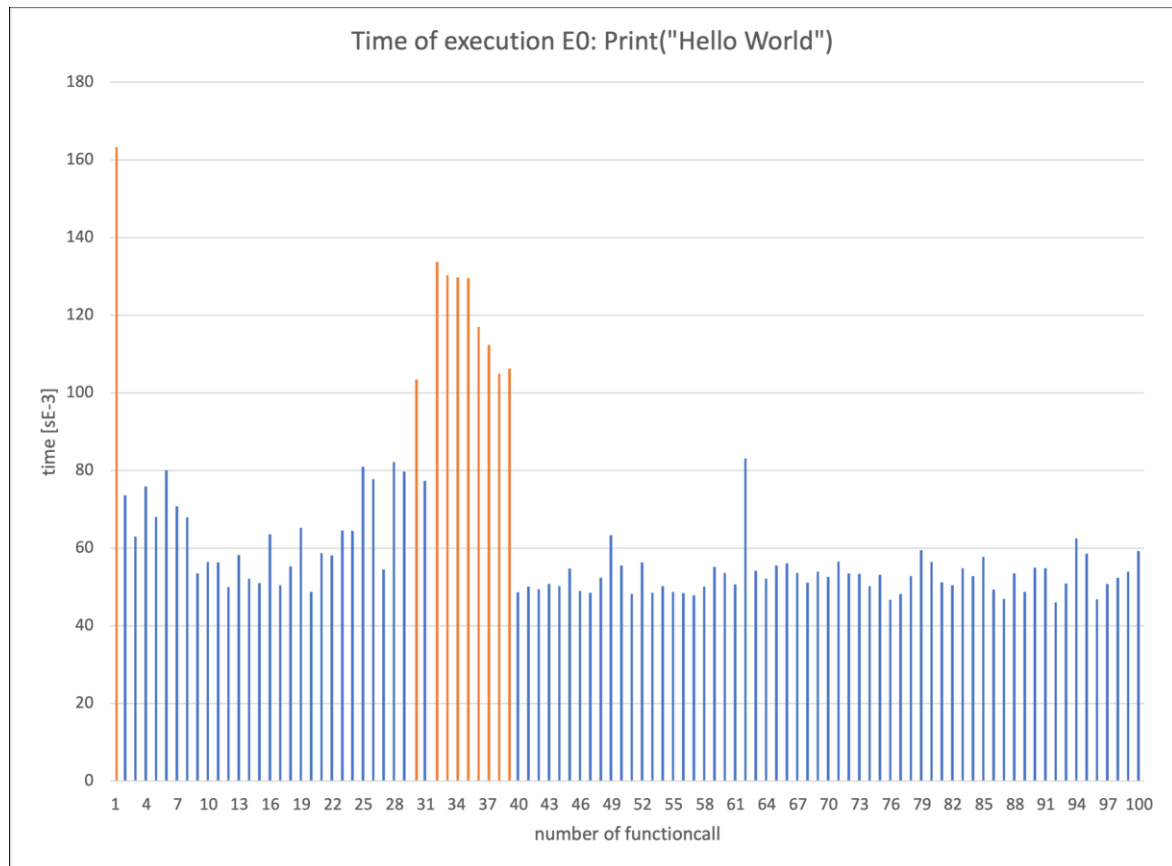
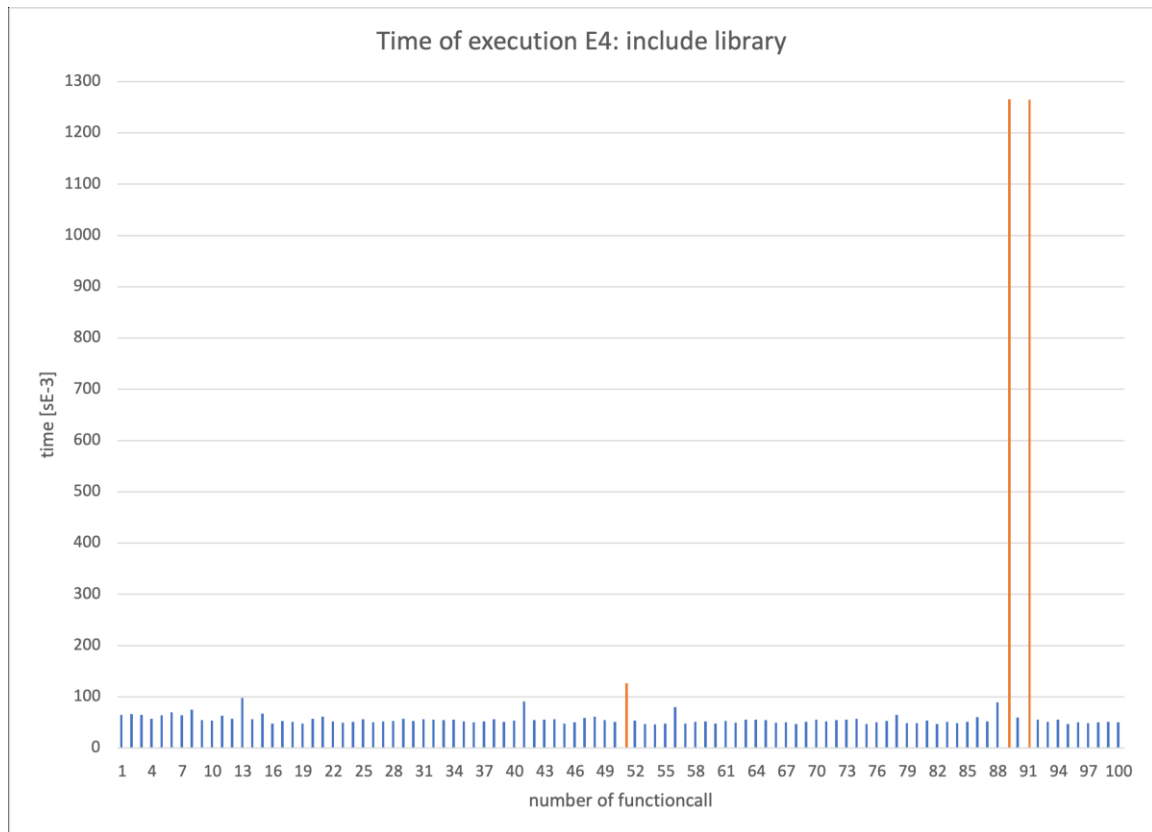
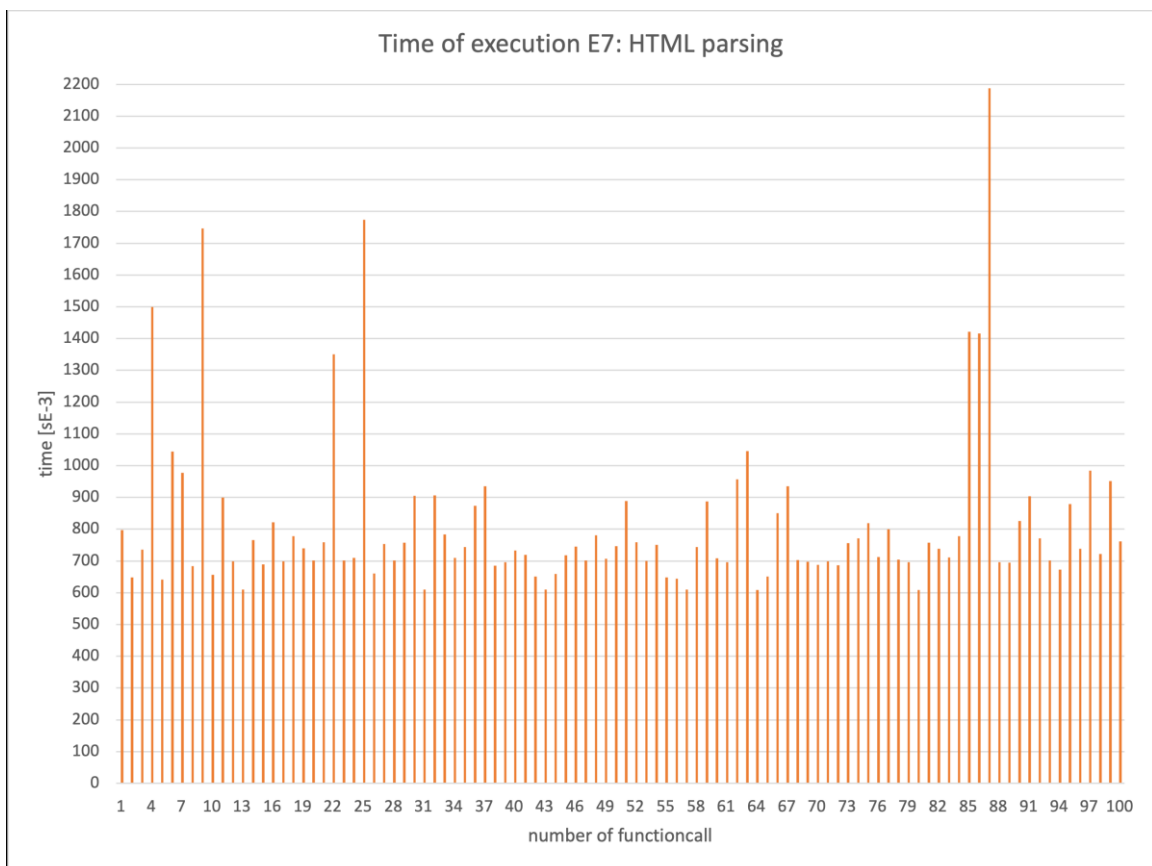


Figure 3 - Time of Execution of E0



Figure 4 - Time of Execution of E2

*Figure 5 - Time od Execution of E4**Figure 6 - Time od Execution of E7*

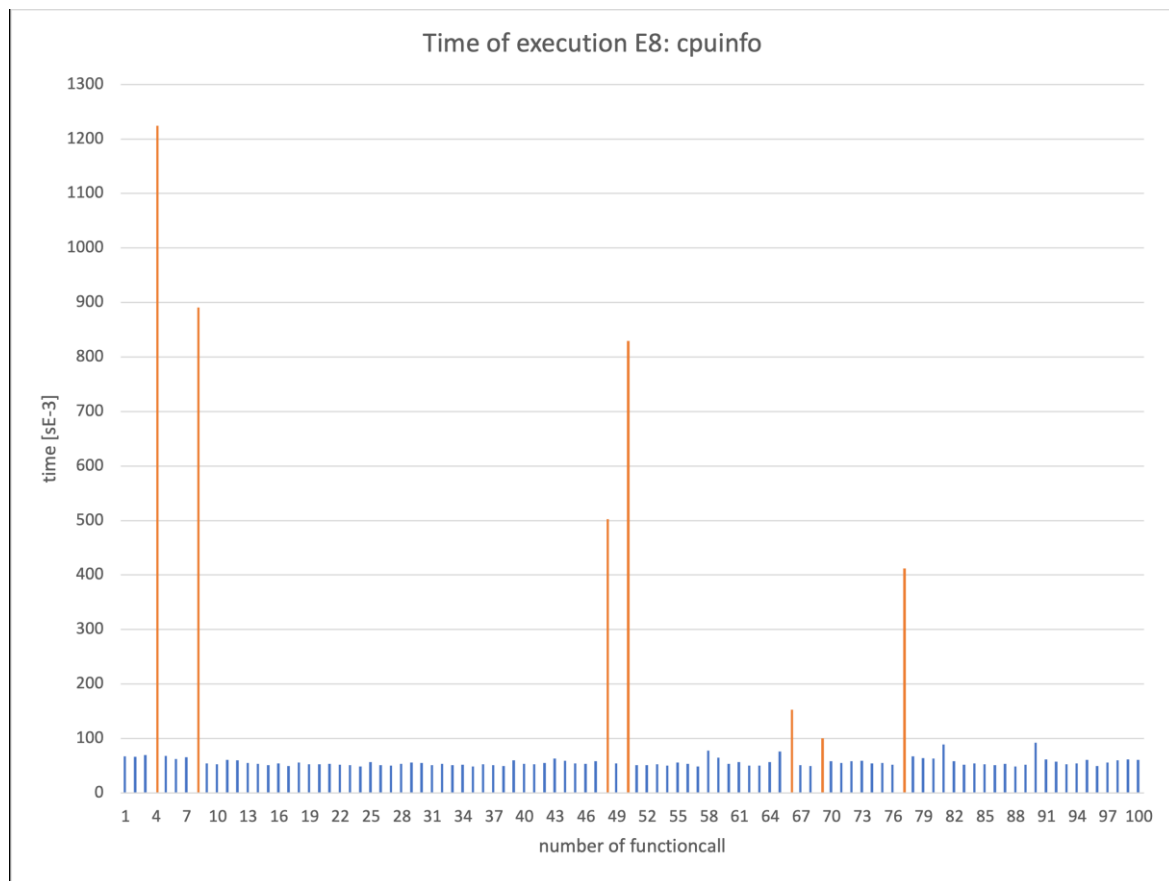


Figure 7 - Time od Execution of E8

5. Discussion

In experiment E2 the amount of memory allocation did not change the duration of the function call compared to E0. There was a spike at 1127 milliseconds, but the mean and median show little difference.

In experiment E4 and E7 there are a few more spikes but the median execution time is similar to the one in experiments E0 and E2.

In experiment E7 the external function call takes a lot more time, since the function needs to wait on the external service. The median duration of 738 milliseconds is about 14 times higher compared to E0.

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