

Load Testing and Performance Evaluation of the Theia Online IDE

Bachelor Thesis Presentation

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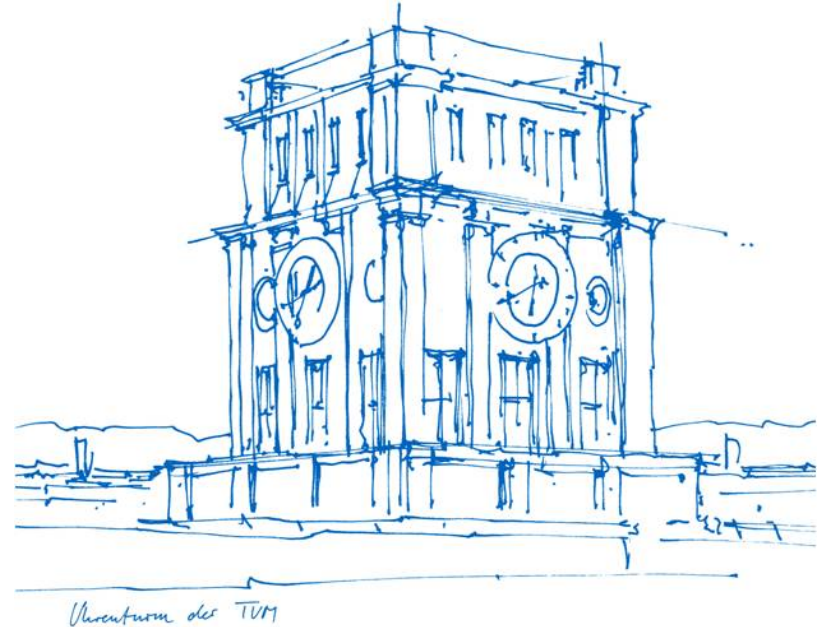
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Technische Universität München

TUM School of Computation, Information and Technology

Applied Education Technologies

Garching, 23. October 2025



Outline

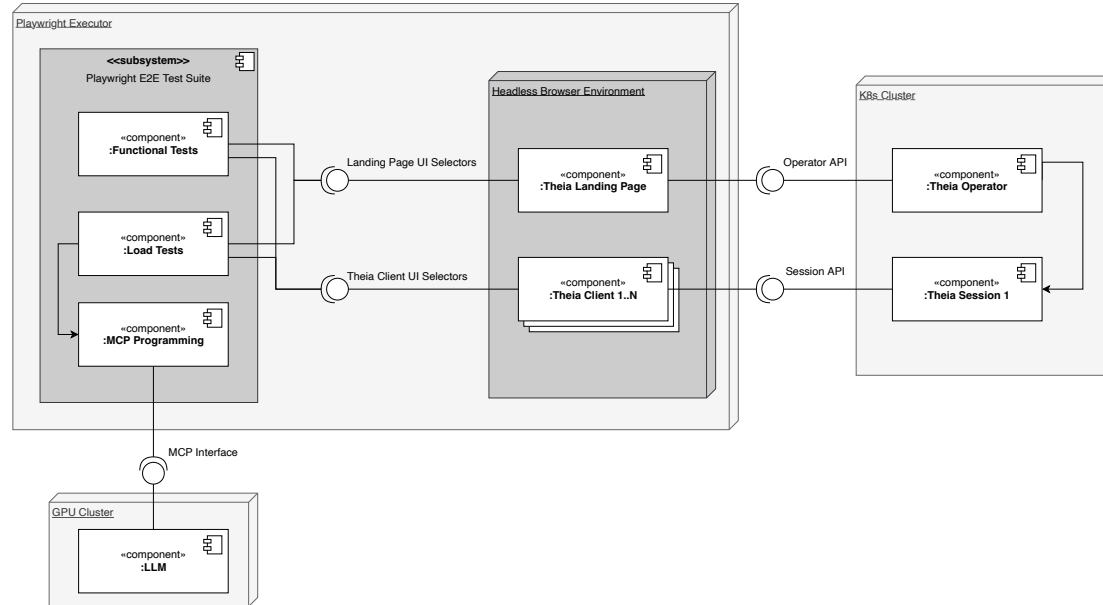
1. Introduction
2. Problem and Motivation
3. Objectives
4. Functionality Tests
5. Load Testing
6. Evaluation
7. MCP Testing / Demo
8. Status
9. Questions

Introduction

Motivation and Problem

Objectives

Top Level Design



Functionality Tests

Functionality Tests



Playwright

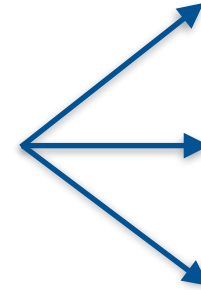


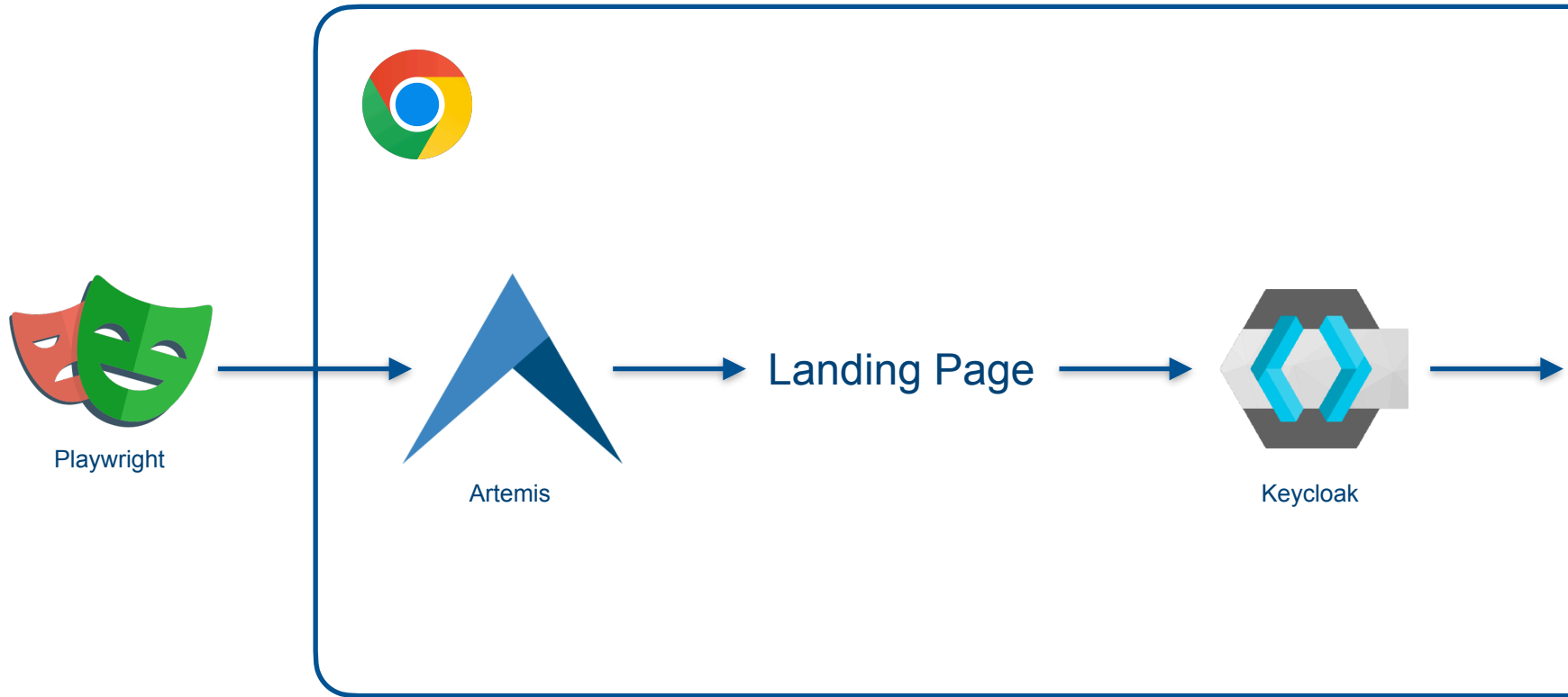
Test Suite

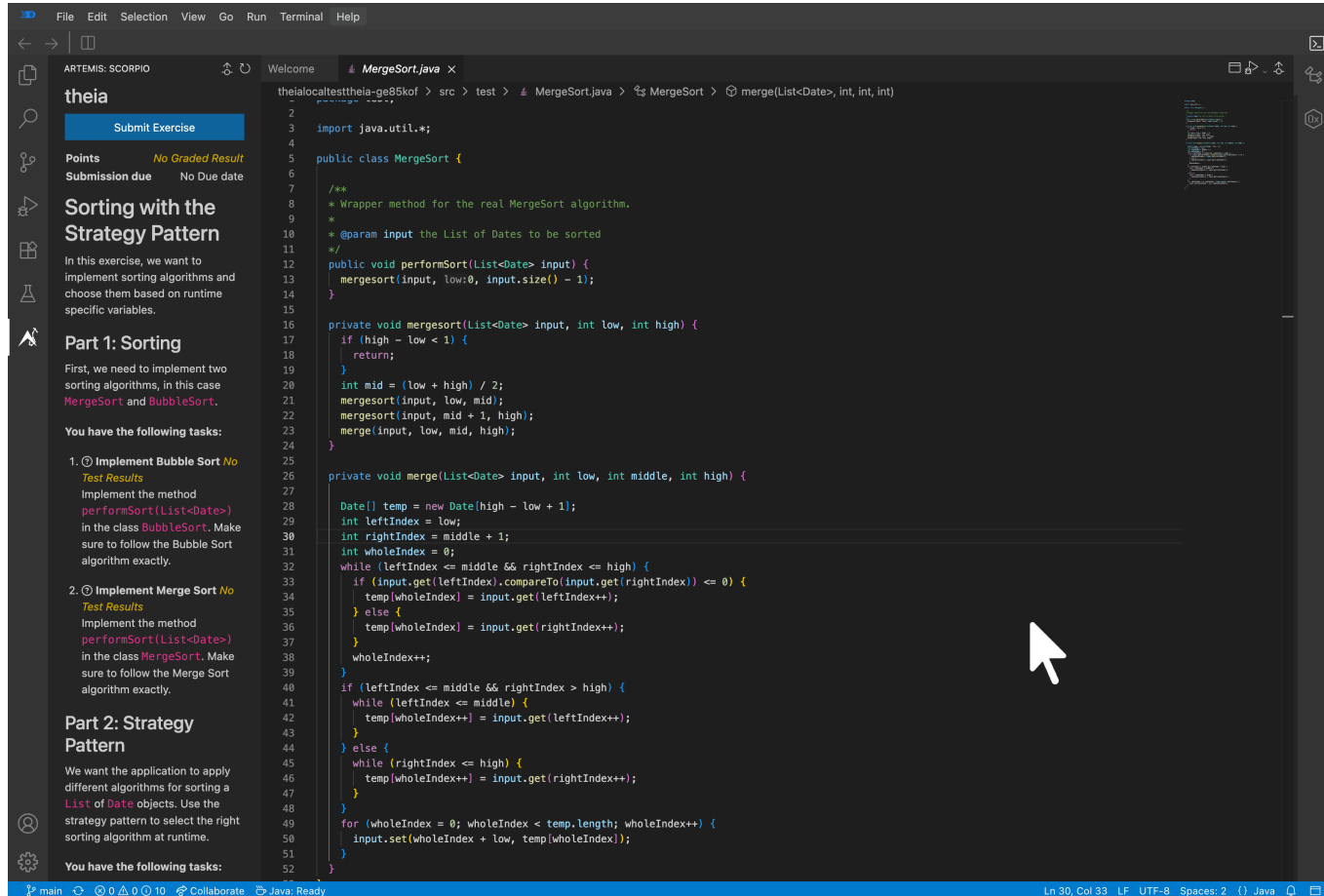
Websockets



Playwright







File Edit Selection View Go Run Terminal Help

theia

Submit Exercise

Points **No Graded Result**
Submission due No Due date

Sorting with the Strategy Pattern

In this exercise, we want to implement sorting algorithms and choose them based on runtime specific variables.

Part 1: Sorting

First, we need to implement two sorting algorithms, in this case **MergeSort** and **BubbleSort**.

You have the following tasks:

1. **Implement Bubble Sort** **No Test Results**
Implement the method `performSort(List<Date>)` in the class **BubbleSort**. Make sure to follow the Bubble Sort algorithm exactly.
2. **Implement Merge Sort** **No Test Results**
Implement the method `performSort(List<Date>)` in the class **MergeSort**. Make sure to follow the Merge Sort algorithm exactly.

Part 2: Strategy Pattern

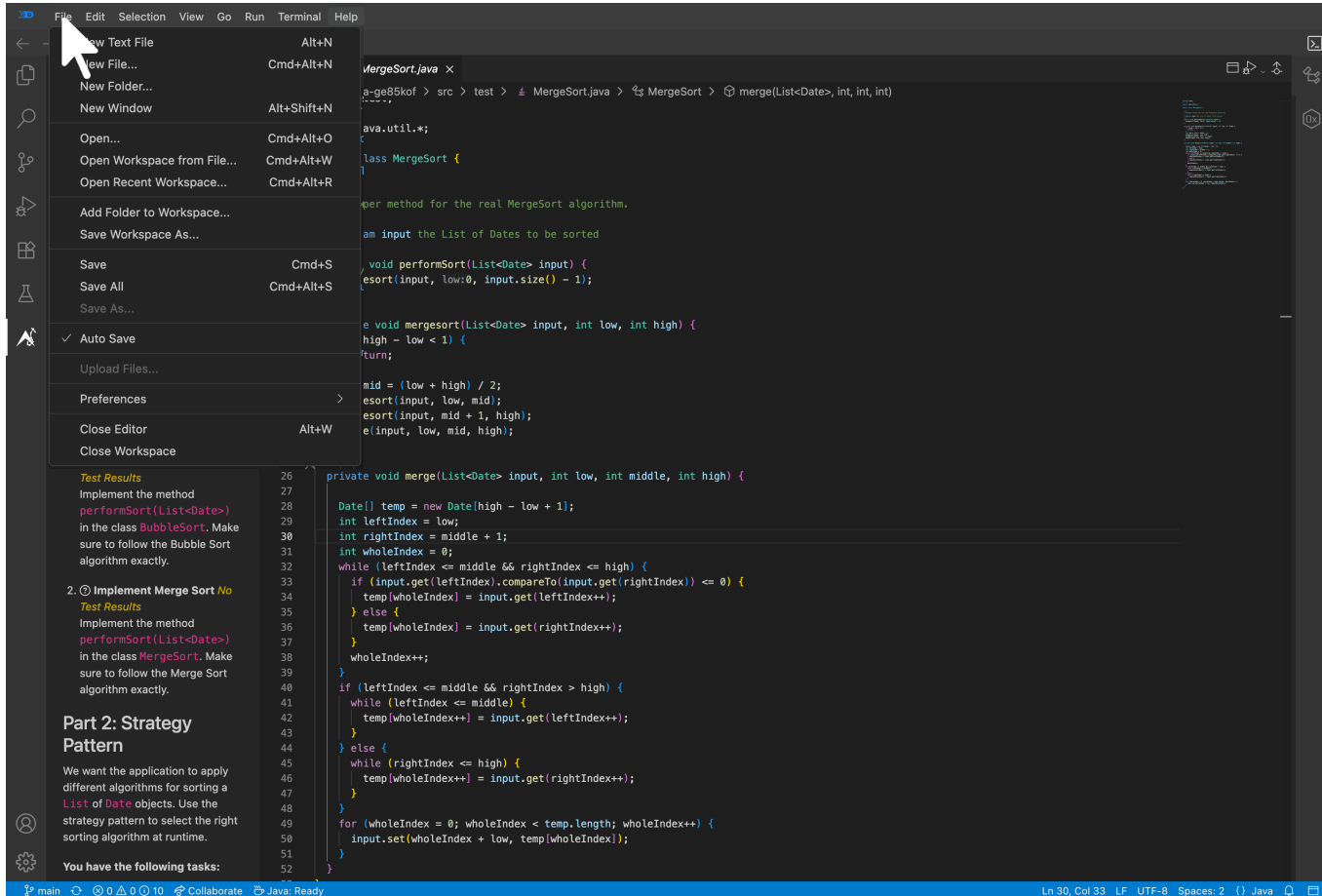
We want the application to apply different algorithms for sorting a **List of Date** objects. Use the strategy pattern to select the right sorting algorithm at runtime.

You have the following tasks:

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```



The screenshot shows an IDE with a Java project. The main editor displays the `MergeSort.java` file, which implements the Merge Sort algorithm. The code includes a `performSort` method and a `merge` method. The sidebar on the left contains instructions for implementing the Merge Sort algorithm.

File Menu:

- New Text File (ALT+N)
- New File... (CMD+ALT+N)
- New Folder...
- New Window (ALT+SHIFT+N)
- Open... (CMD+ALT+O)
- Open Workspace from File... (CMD+ALT+W)
- Open Recent Workspace... (CMD+ALT+R)
- Add Folder to Workspace...
- Save Workspace As...
- Save (CMD+S)
- Save All (CMD+ALT+S)
- Save As...
- ✓ Auto Save
- Upload Files...
- Preferences
- Close Editor (ALT+W)
- Close Workspace

Test Results:

Implement the method `performSort(List<Date>)` in the class `BubbleSort`. Make sure to follow the Bubble Sort algorithm exactly.

2. Implement Merge Sort

Test Results

Implement the method `performSort(List<Date>)` in the class `MergeSort`. Make sure to follow the Merge Sort algorithm exactly.

Part 2: Strategy Pattern

We want the application to apply different algorithms for sorting a `List of Date` objects. Use the strategy pattern to select the right sorting algorithm at runtime.

You have the following tasks:

```

26 private void merge(List<Date> input, int low, int middle, int high) {
27
28     Date[] temp = new Date[high - low + 1];
29     int leftIndex = low;
30     int rightIndex = middle + 1;
31     int wholeIndex = 0;
32     while (leftIndex <= middle && rightIndex <= high) {
33         if (input.get(leftIndex).compareTo(input.get(rightIndex)) <= 0) {
34             temp[wholeIndex] = input.get(leftIndex++);
35         } else {
36             temp[wholeIndex] = input.get(rightIndex++);
37         }
38         wholeIndex++;
39     }
40     if (leftIndex <= middle && rightIndex > high) {
41         while (leftIndex <= middle) {
42             temp[wholeIndex++] = input.get(leftIndex++);
43         }
44     } else {
45         while (rightIndex <= high) {
46             temp[wholeIndex++] = input.get(rightIndex++);
47         }
48     }
49     for (wholeIndex = 0; wholeIndex < temp.length; wholeIndex++) {
50         input.set(wholeIndex + low, temp[wholeIndex]);
51     }
52 }

```

Ln 30, Col 33 LF UTF-8 Spaces: 2 {} Java

The screenshot shows an IDE with a file menu open on the left. The menu items are:

- New Text File (ALT+N)
- New File... (Cmd+ALT+N)
- New Folder...
- New Window (ALT+SHIFT+N)
- Open... (Cmd+ALT+O)
- Open Workspace from File... (Cmd+ALT+W)
- Open Recent Workspace... (Cmd+ALT+R)
- Add Folder to Workspace...
- Save Workspace As...
- Save (Cmd+S)
- Save All (Cmd+ALT+S)
- Save As...
- ✓ Auto Save
- Upload Files...
- Preferences
- Close Editor (ALT+W)
- Close Workspace

The main editor shows the following Java code for MergeSort:

```

MergeSort.java
a-ge85kof > src > test > MergeSort.java > MergeSort > merge(List<Date>, int, int)
...
ava.util.*;
class MergeSort {
    // per method for the real MergeSort algorithm.
    // an input the List of Dates to be sorted
    void performSort(List<Date> input) {
        esort(input, low:0, input.size() - 1);
    }
    void mergesort(List<Date> input, int low, int high) {
        high - low < 1) {
            'turn;
        }
        mid = (low + high) / 2;
        esort(input, low, mid);
        esort(input, mid + 1, high);
        e(input, low, mid, high);
    }
    private void merge(List<Date> input, int low, int middle, int high) {
        while (leftIndex <= middle && rightIndex <= high) {
            if (input.get(leftIndex).compareTo(input.get(rightIndex)) <= 0) {
                temp[wholeIndex] = input.get(leftIndex++);
            } else {
                temp[wholeIndex] = input.get(rightIndex++);
            }
            wholeIndex++;
        }
        if (leftIndex <= middle && rightIndex > high) {
            while (leftIndex <= middle) {
                temp[wholeIndex++] = input.get(leftIndex++);
            }
        } else {
            while (rightIndex <= high) {
                temp[wholeIndex++] = input.get(rightIndex++);
            }
        }
        for (wholeIndex = 0; wholeIndex < temp.length; wholeIndex++) {
            input.set(wholeIndex + low, temp[wholeIndex]);
        }
    }
}

```

The bottom panel shows the 'Test Results' tab with the following text:

Test Results
Implement the method
performSort(List<Date> input)
in the class MergeSort. Make
sure to follow the Merge Sort
algorithm exactly.

2. Implement Merge Sort No
Test Results
Implement the method
performSort(List<Date> input)
in the class MergeSort. Make
sure to follow the Merge Sort
algorithm exactly.

Part 2: Strategy
Pattern

We want the application to apply
different algorithms for sorting a
List of Date objects. Use the
strategy pattern to select the right
sorting algorithm at runtime.

You have the following tasks:

expect(page.locator(".menu-widget")).toBeVisible()

Functionality in Test



Editor



Search



Terminal



VCS

Load Testing

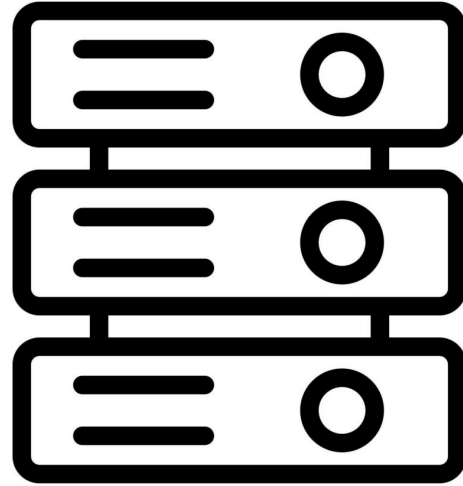
Load Testing

Load Testing

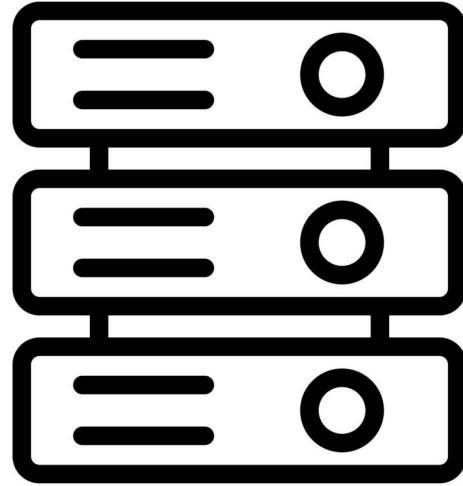




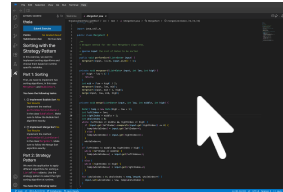
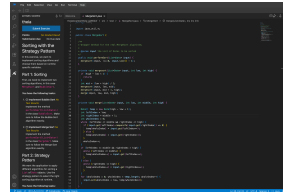
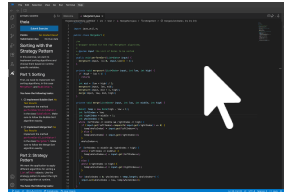
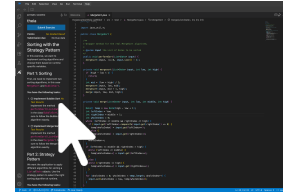
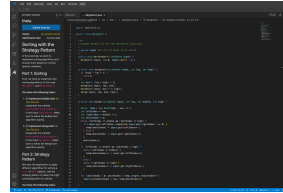
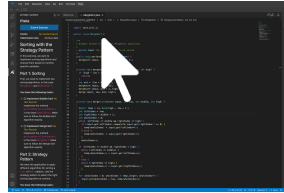
N - Instances



Prewarming (Preview...)

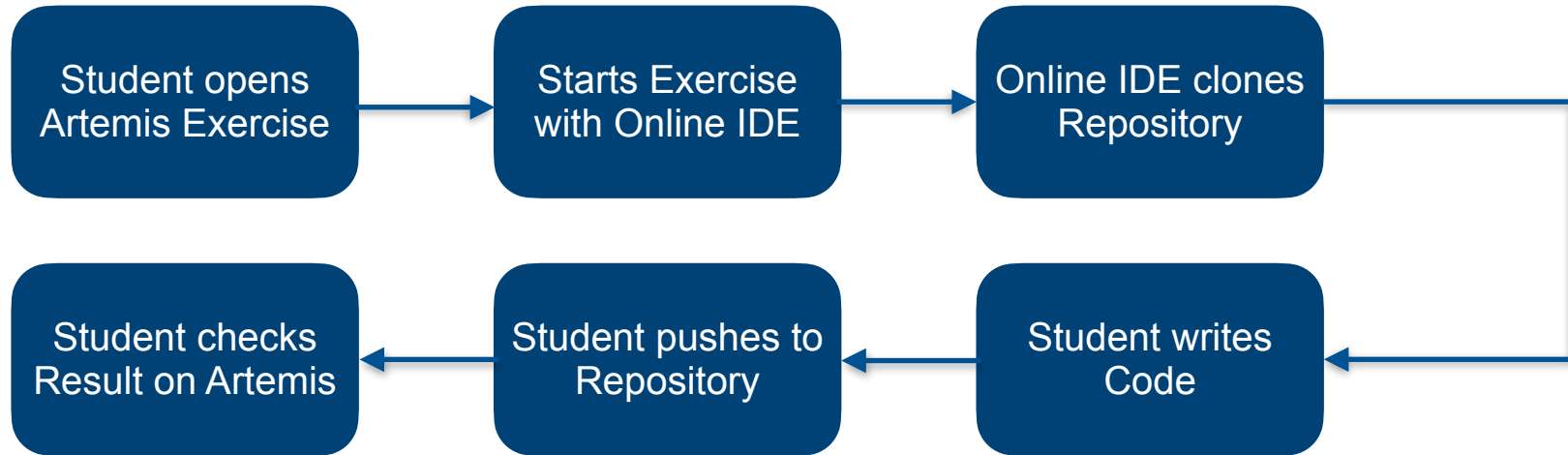


Prewarming (Preview...)

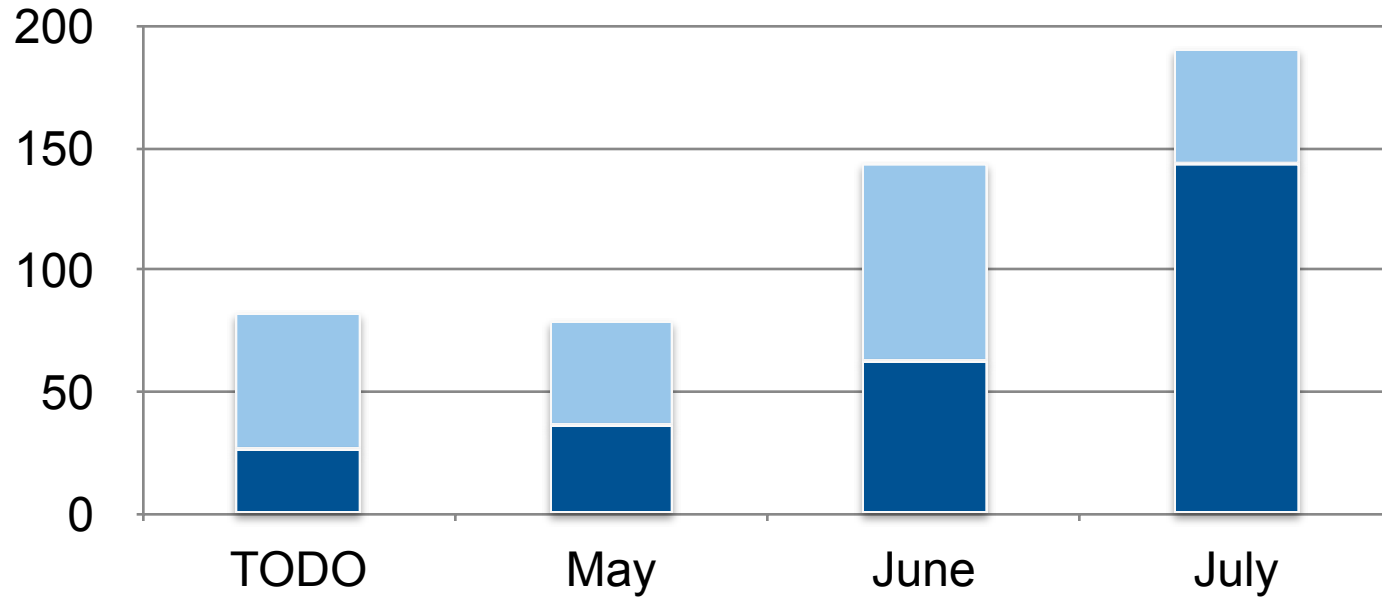


N - Instances

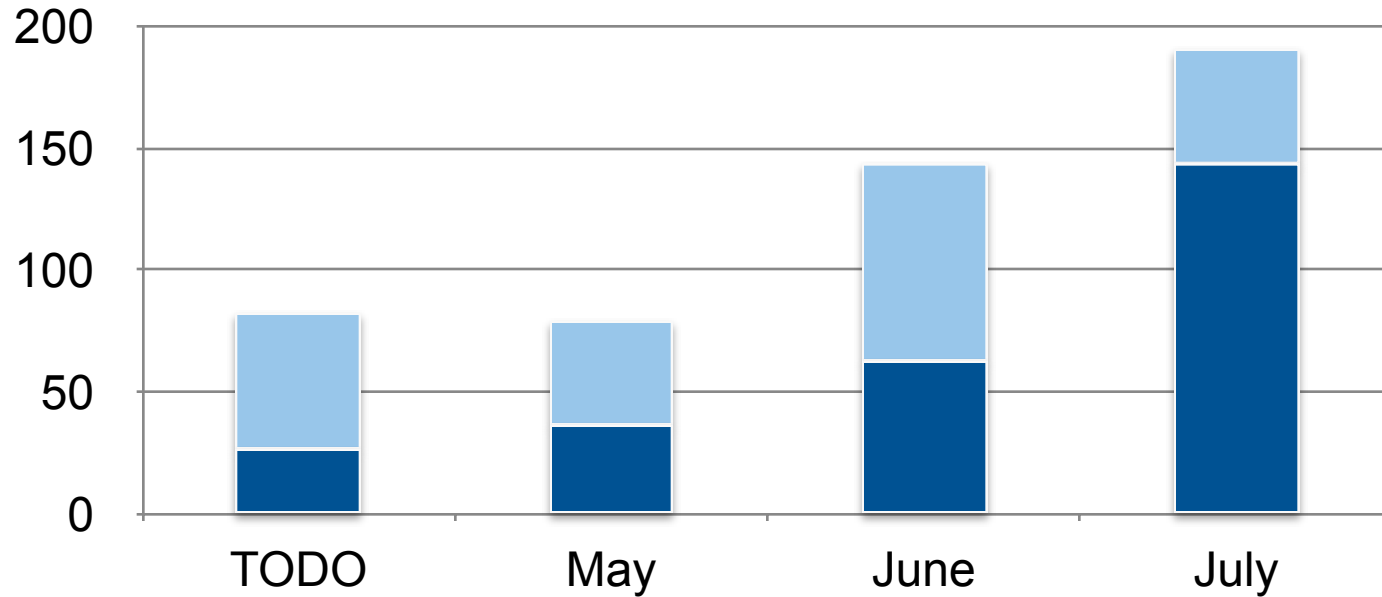
Example Workflow



Evaluation



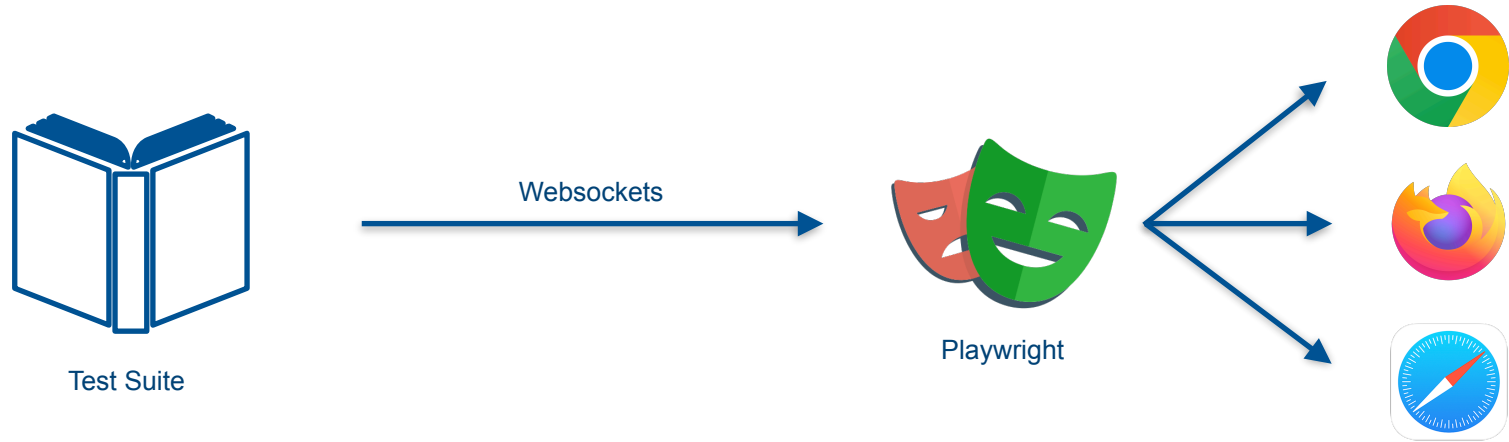
Evaluation



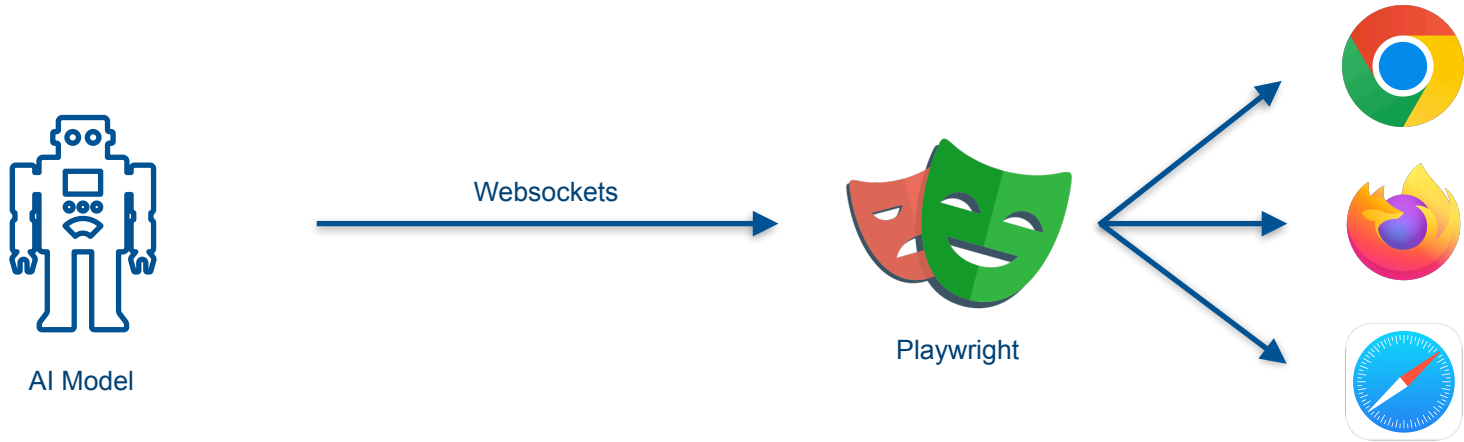
What is MCP

Model Context Protocol

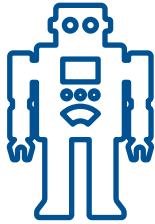
How can we utilize MCP for testing



How can we utilize MCP for testing



How can we utilize MCP for testing

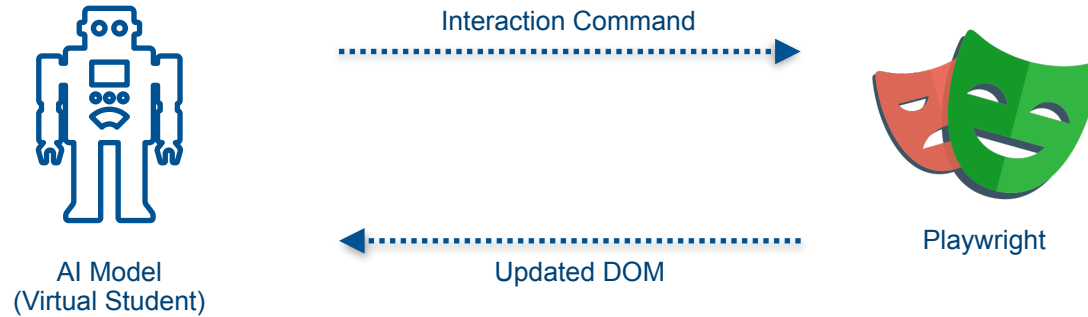


AI Model

Prompt:

Imagine you are a student with a programming exercise. You are given an Online IDE with all the known functionality. Interact with the Online IDE and behave like a student trying to solve the task.

How can we utilize MCP for testing



Status

- | | |
|--------------------------|---|
| ▸ Functionality Tests | ✓ |
| <hr/> | |
| ▸ Load Testing | ✓ |
| <hr/> | |
| ▸ Performance Evaluation | ✓ |
| <hr/> | |
| ▸ MCP Testing | ↻ |

DEMO



Questions

Thank you for listening!

