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# Assessment Management System for Maties CS

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# The Problems facing Maties CS



## SunLearn:

- Can confuse students
- Overcomplicated?
- Does not cater to Computer Science
- Alternatives?

## Assessment Environment:

- Ubuntu test accounts
- No network restrictions
- No guarantee that online submissions came from the test account

# High Level Requirements



- The project **MUST** address the problems mentioned.
- The solution **MUST** be easy and intuitive to use for lecturers, markers and students.
- The solution **MUST** be maintainable.

# What's Inside?



## Submission System:

- Submission time frame manipulation
- Automated marking
- GitLab Integration
- Logging

## Assessment Environment:

- Isolated file system
- Completely customisable

# Basic Information



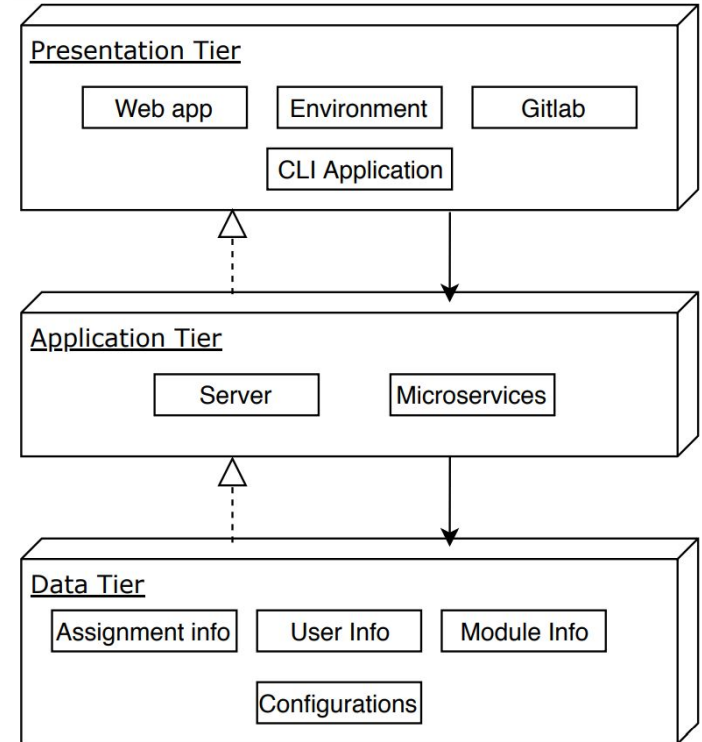
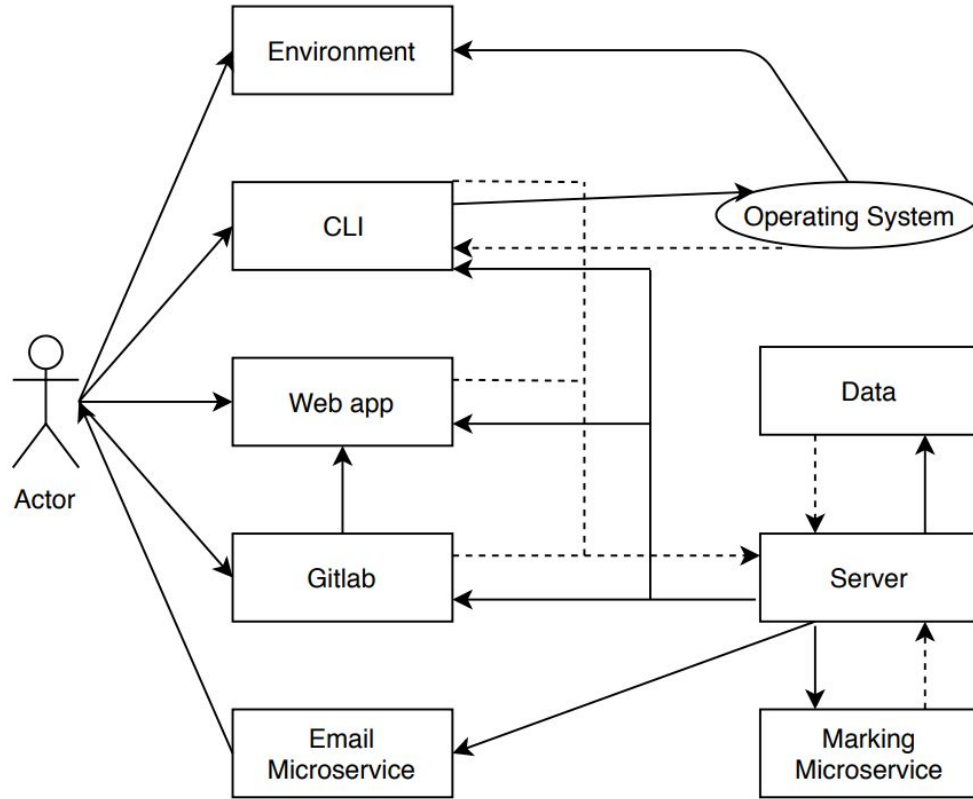
A user of the Assessment Management System can have one of the following roles:

- Lecturer
- Marker
- Student

An assignment can be made up with any permutation of the following options:

- Standard Submission
- GitLab submission
- Assessment Environment

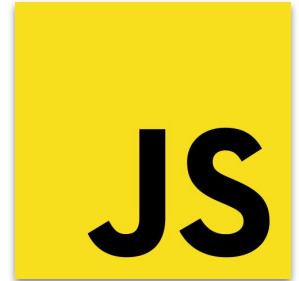
# System Design Overview



# Web Application



- Primary user interface for the Assessment Management System
- Requires Stellenbosch SSO login for communications with the server
- Permissions based on user data which is stored as session variables received from the server



# Pages Available for Each Role



	Lecturer	Marker	Student
Home	✓	✓	✓
Assignment	✓	✓	✓
Assignment Report	✓	✓	
Automated Marking	✓		
Create Assignment	✓		
Manage Modules	✓		



# Command-Line Interface



- Secondary user interface for the Assessment Management System
  - Communicates with the API provided by the server via HTTP requests
  - Also requires SSO login
- 
- Configures, monitors and controls assessment environments



# CLI: User Functionality



## Student:

- Download assignment files
- Submit assignments
- Start an assessment environment

## Lecturer:

- Download templates for creating an assignment
- Create assignment
- Add students to a module from a file

# Assessment Environment



- VirtualBox virtual machine locked in fullscreen mode
- controlled by the command-line interface
- The browsers and CLI notify the server if a submission has come from within it with cookies.



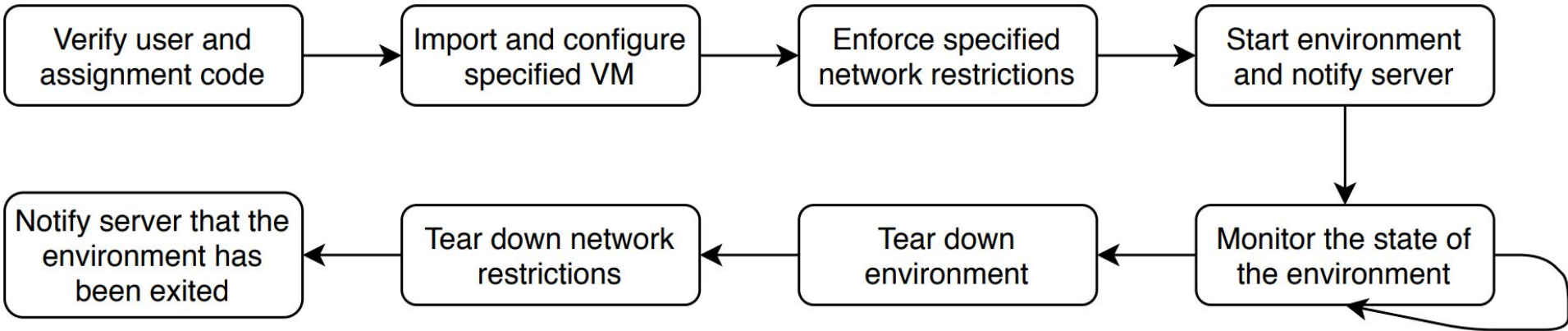
# Assessment Environment Configurations



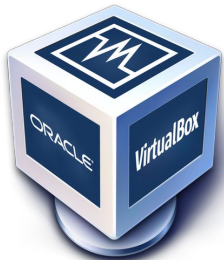
Available configurations:

- Preconfigured base operating system
- Time limit on the environment
- Network restrictions
- CPU and Memory restriction
- Shared folder with contents

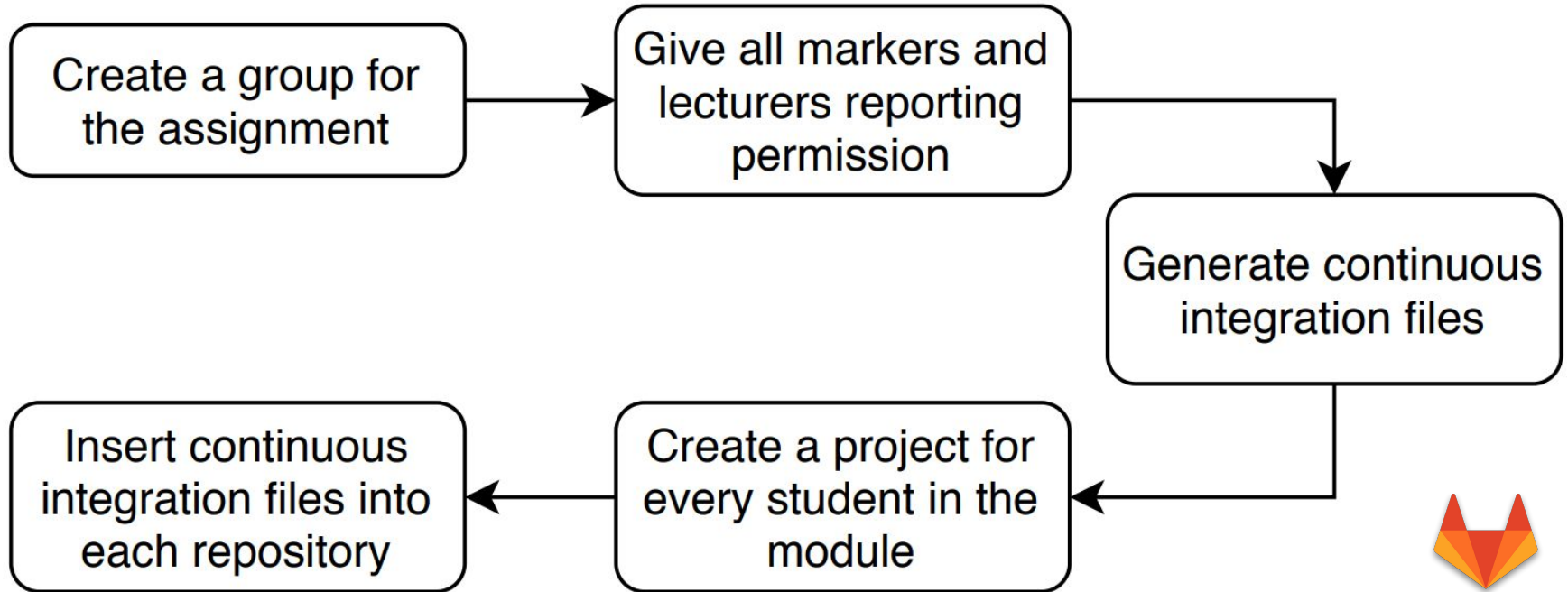
# CLI: Assessment Environment Pipeline



Until the specified time limit or unexpected behaviour is encountered



# GitLab Submission Creation



# GitLab Reporting



Student Number	Commits	Submissions	Submission Time	Submission IP	Pipeline Status	Download
amstest7	0	0				
amstest6	0	0				
amstest5	0	0				
amstest4	0	0				
amstest3	0	0				
amstest2	1	0	2019-11-20 14:11:52.735245			
amstest1	1	0	2019-11-20 14:11:28.565424			
amstest0	2	0	2019-11-20 14:07:55.546352			

# Server



- Facilitates communication between the data tier and presentation tier through HTTP requests
- Protected by the Stellenbosch University SSO system
- Stores SUID and role as session variables
- Outsources work to microservices





# Email Microservice



- Used to email students to confirm that they have made a submission without blocking the main server.



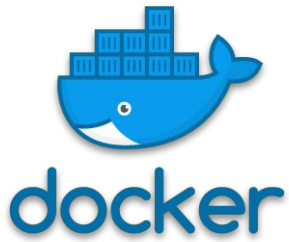
# Marking Microservice



Marking script requirements:

- Takes no arguments
- To be run in a directory with each submission

The output of the marking script per submission is made available as logs.



# Marking Pipeline



Verify Token and  
Request

Directory Setup

Extract Submissions

Directory and Docker  
Teardown

Build and Run  
Docker Container

Generate Marking  
Script and Dockerfile

# User Testing: Submission System



40 unique users participated, of which 22 gave feedback. 54.5% of the feedback respondents were Computer Science students.

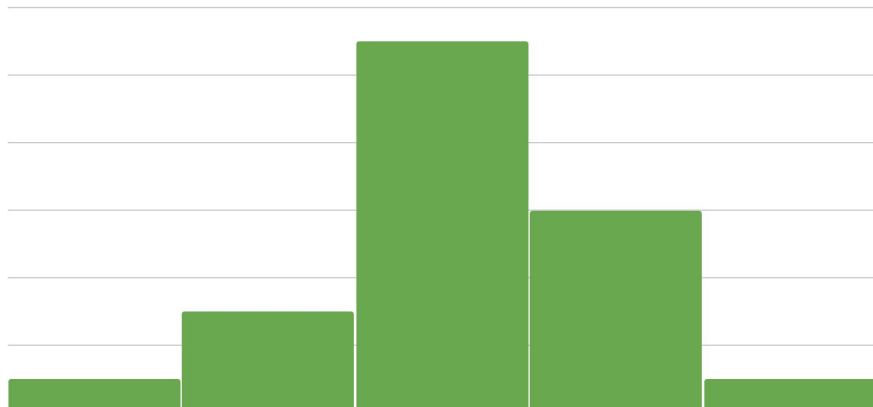
## Problems:

- Four respondents reported Issues.
- All issues were minor and easily fixable.
- No issues were reported by the third iteration.

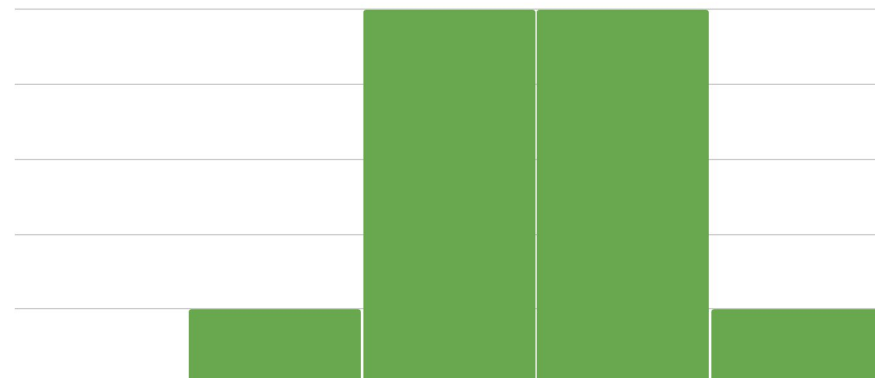
## Suggestions:

- Students being able to download their own submissions was from a suggestion.
- The colour scheme was from multiple suggestions.

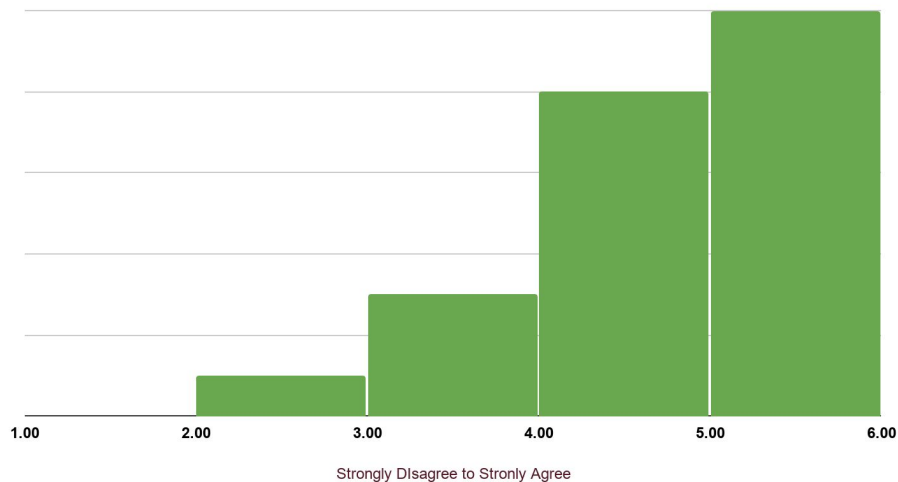
**All respondents comparison to the Scientific Computing system.**



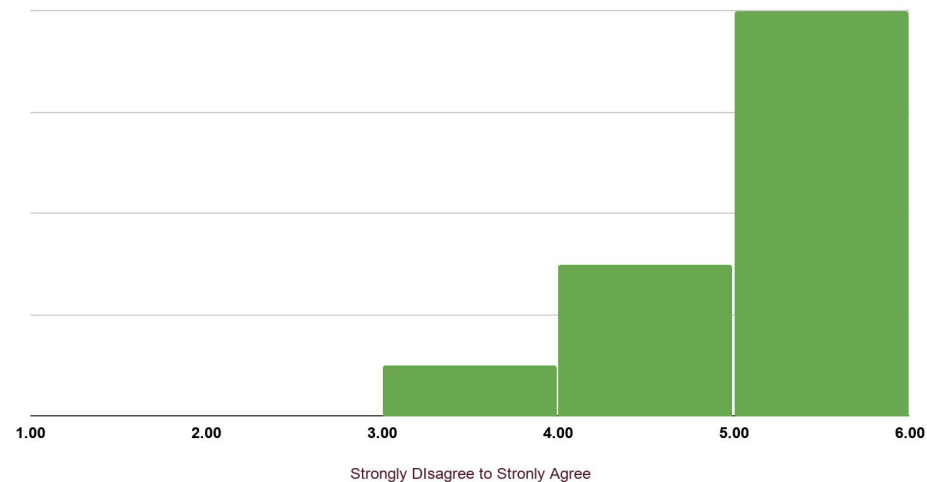
**Computer Science students comparison to the Scientific Computing submission system**



**All respondents comparison to SunLearn.**



**Computer Science students comparison to SunLearn**



# Conclusion



- The responses indicate that a more intuitive solution for submissions is needed.
- The responses also show us that the Assessment Management System has the potential to be that solution.
- The goal of intuitiveness was achieved, which means that the submission system is a successful product.
- The goal of maintainability was kept in mind throughout the development process.
- The assessment environment is an acceptable product that requires user testing before it can be used in a real world environment.



# Questions?

\*If anyone would like to see images of the web application, the slides after this one contain screenshots of all of the different pages.

# Student Home Page



*musiye phambili • forward together • saam vorentoe*

- logout
- Home
- Modules
- All Assignments

## Modules for 19059019:

wb272

### WB272 (2019) Assignment 9

View:

Due: Fri 25 Oct 2019 - 17:00

Submitted: ✗

### Scientific Computing 272: Comprehensive Test

View:

Due: Wed 30 Oct 2019 - 12:00

Submitted: ✓

wb372

### Scientific Computing 372: Comprehensive Test

View:

Due: Fri 01 Nov 2019 - 12:00

Submitted: ✗



# Marker Home Page



- logout
- Home
- Modules
- All Assignments
- Assignment Reports

## Modules for 19059019:

wb272

### WB272 (2019) Assignment 9

View:

Due: Fri 25 Oct 2019 - 17:00

Late Submissions: ✗

Reports:

### Scientific Computing 272: Comprehensive Test

View:

Due: Wed 30 Oct 2019 - 12:00

Late Submissions: ✗

Reports:

wb372

### Scientific Computing 372: Comprehensive Test

View:

Due: Fri 01 Nov 2019 - 12:00

Late Submissions: ✗

Reports:

# Lecturer Home Page



- logout
- Home
- Create Assignment
- Automated Marking
- Modules
- All Assignments
- Assignment Reports

## Modules for 19059019:

wb272

### WB272 (2019) Assignment 9

View: Due: Fri 25 Oct 2019 - 17:00 Late Submissions: Reports: Automated Marking:

### Scientific Computing 272: Comprehensive Test

View: Due: Wed 30 Oct 2019 - 12:00 Late Submissions: Reports: Automated Marking:

wb372

### Scientific Computing 372: Comprehensive Test

View: Due: Fri 01 Nov 2019 - 12:00 Late Submissions: Reports: Automated Marking:

# Student Assignments Page



- logout
- Home
- Modules
- All Assignments

## Assignments

### Scientific Computing 372: Comprehensive Test - wb372

Assignment code - wb3720

✗ You have not yet made a successful submission

#### Duration:

Fri 01 Nov 2019 - 09:00 — Fri 01 Nov 2019 - 12:00

#### Submissions Available:

Unlimited

**NOTE:** Only files with a .tar.bz2 or .zip extension will be accepted. It is your responsibility to compress your submissions correctly.

UPLOAD SUBMISSION

☐ I declare that I have read the SU Policy on Plagiarism, and that I have abided by the rules.

☐ I have read and understood the declaration of consent in the [permission form](#) and agree to take part in this research study, as conducted by Michael Shepherd.

Submit >

[FILES FOR DOWNLOAD](#)

# Marker Assignments Page



- logout
- Home
- Modules
- All Assignments
- Assignment Reports

## Assignments

### Scientific Computing 372: Comprehensive Test - wb372

Assignment code - wb3720

**Duration:**

Fri 01 Nov 2019 - 09:00 — Fri 01 Nov 2019 - 12:00

**Submissions Available:**

Unlimited

[Download Submissions](#)

[View Report](#)

[FILES FOR DOWNLOAD](#)

# Lecturer Assignments Page



- logout
- Home
- Create Assignment
- Automated Marking
- Modules
- All Assignments
- Assignment Reports

## Assignments

Create New Assignment

### Scientific Computing 372: Comprehensive Test - wb372

Assignment code - wb3720

**Duration:**

Fri 01 Nov 2019 - 09:00 — Fri 01 Nov 2019 - 12:00

**Submissions Available:**

Unlimited

**Late Submissions:**

Not Allowed

 [Allow Late Submissions](#)

Download Submissions

View Report

 [FILES FOR DOWNLOAD](#)



# Reporting Page



- logout
- Home
- Create Assignment
- Automated Marking
- Modules
- All Assignments
- Assignment Reports

## Reporting - Scientific Computing 372: Comprehensive Test


[Mark Assignment](#)[Download Marking Logs](#)

8 out of 8 students have submitted


Student Number	Submissions	Submission Time	Submission IP	Download
	1	2019-11-01 11:40:44.869389	146.232.20.252	<a href="#">Download Submission</a>
	1	2019-11-01 12:08:44.984391	146.232.20.252	<a href="#">Download Submission</a>
	1	2019-11-01 10:53:15.799293	146.232.20.252	<a href="#">Download Submission</a>
	1	2019-11-01 11:56:05.350997	146.232.20.252	<a href="#">Download Submission</a>
	1	2019-11-01 11:59:43.383402	146.232.20.252	<a href="#">Download Submission</a>
	1	2019-11-01 12:08:18.012100	146.232.20.252	<a href="#">Download Submission</a>
	1	2019-11-01 11:57:13.767969	146.232.20.252	<a href="#">Download Submission</a>
	1	2019-11-01 11:44:34.891393	146.232.20.252	<a href="#">Download Submission</a>

# Create Assignment







UNIVERSITEIT  
STELLENBOSCH  
UNIVERSITY  
1918-2018  
*maaipe phambili - forward together - uiam tarentos*




logout




Home




Create Assignment




Automated Marking



Modules



All Assignments



Assignment Reports

## Assignment Creation

☐ Submission

☐ Environment

☐ Gitlab Repositories

Module:

☐ wb272 ☒ wb372


Settings:

Title for this assignment:

Description/Instructions for students:(optional)

# Create Submission





UNIVERSITEIT  
iYUNIVESITHI  
STELLENBOSCH  
UNIVERSITY  
1918 · 2018

*maaiya phanahili · forward together · suam varentse*

- logout
- Home
- Create Assignment
- Automated Marking
- Modules
- All Assignments
- Assignment Reports

Title for this assignment:

Description/Instructions for students:(optional)

## Submission Configuration

Start Date and Time:

01/01/2019, 00:00

End Date and Time:

21/11/2019, 08:00

✓ Allow Late Submissions?

✓ Allow Resubmissions?

✓ Limit Resubmissions?

1

✓ Make files available?

☐ Only make files available for the duration of the assignment?

**NOTE:** Only files with a .tar.bz2 or .zip extension will be accepted.

FILE

Create Assignment



# Create Git Submission



- logout
- Home
- Create Assignment
- Automated Marking
- Modules
- All Assignments
- Assignment Reports

## Git Configuration

CI Language and Version:

Python 3.5

✓ CI Stylechecker?

✓ CI Tests?

REQUIREMENTS.TXT

PYTHON TEST FILE

## Submission Configuration

Start Date and Time:

01/01/2019, 00:00

End Date and Time:


21/11/2019, 08:00

- ☐ Allow Late Submissions?
- ☐ Allow Resubmissions?
- ☐ Make files available?


Create Assignment

# Create Environment







*maaiye phambili · forward together · saam vorendoe*




logout




Home




Create Assignment




Automated Marking



Modules



All Assignments



Assignment Reports

## Environment Configuration

✓ Would you like internet restrictions?

Note that this website will be available to students at all times:

☐ Would you like to only block Inkety?

☐ Would you like to allow Stellenbosch University websites?

✓ Would you like to include your own websites to whitelist?

Comma separated list of websites to allow:

✓ Would you like to make use of a virtual environment?

☐ Would you like the virtual machine to have a time limit on it? Note that the virtual machine will self destruct after this time limit and anything not submitted will be lost

Operating System:

☒ Ubuntu 16.04

Number of CPUs:

8

Memory:


4GB

☐ Include Supplied Submission Files in the Virtual Machine?

Create Assignment








# Marking Page





UNIVERSITEIT  
STELLENBOSCH  
UNIVERSITY  
1918-2018

*maaiye phambili - forward together - sama vorentoe*

-  logout
-  Home
-  Create Assignment
-  Automated Marking
-  Modules
-  All Assignments
-  Assignment Reports

## Marking

Assignment:

wb2721

Language:

Python 3.5

REQUIREMENTS.TXT

MARKING SCRIPT

Mark Assignment

# Module Management Page



- logout
- Home
- Create Assignment
- Automated Marking
- Modules
- All Assignments
- Assignment Reports

## User Management

### Add User

SUID

☒ Student ☐ Marker ☐ Lecturer

Module/s:

- ☐ wb272
- ☐ wb372

Add User