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ICT2211 – Integrated Team Project

Project Plan

AY 2020/2021, Trimester 3

Team 10

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# Project Objective

## Problem statement

Graphics processing units (GPUs) have been increasingly used in various IT aspects, such as Artificial Intelligence (AI), Machine Learning (ML) as well as Information Security (IS), with an example being hash cracking. With increased usage of GPU in these fields, it is important to find a suitable approach to efficiently complete these tasks.

To correctly identify the most efficient method to conduct these tasks, a proper standardization of benchmarks should be identified and carried out to various approaches such as the usage of a multi-GPU system or a traditional approach of GPUs being plugged into the computer directly. Analysis as well as documentation of different results would help the team in understanding more and will give us an edge to optimize the usage of GPUs in these related fields.

## List of Objectives

### Prototype

At the end of the project, a prototype that is the most effective in handling tasks such as Artificial Intelligence, Machine Learning as well as Information Security aspects will be delivered. The creation of the prototype should be backed by intensive research, data and test cases that have been done throughout this project.

### Documentation

Documentation of research work done, analysis as well as test cases that have been performed throughout the entirety of the project will be well documented in the form of a final report. The report should be clear and concise, and supported with visual aid where necessary to help readers understand the data that is presented.

### Optimization

Optimization should also be done throughout the projects to ensure maximum efficiency when doing test cases for the project.

### Academic paper

An academic paper will also be submitted with the objective of sharing with the community the team’s findings, with hopes that it will help the community who has interest in the project.

# Tasks

## Hardware Research

Before looking into the benchmarks that the team will use to perform, it is vital for the team to understand the nature and limitations of the hardware the team is provided with. The academic supervisor has given the team information on some of the tools that will be used in the research. The team will do some background research on these tools to help us in our research.

## Benchmark Research

Research on which benchmark to use, and justify the decision of choosing them. Also to research and determine which operating system and platform to run it on.

### Defining Project Specs

After researching on benchmarks to be used, define test cases to be performed. Benchmarks have to be able to run on all test cases defined. The specifications may be changed mid-way to accommodate changing requirements if any, as well as adapt to the current COVID-19 situation.

### Testing/application

Basic testing will be conducted on our own machines at home initially, to pick out benchmarks to use. An operating system will also have to be selected as a platform to carry out the benchmarks.

## Defining Test Cases

It is important to understand the different ways GPUs can be connected to the system. With some background knowledge on the subject, the team has decided to use the following setups possible. Test cases may change along the way if the team feels that an extra setup is viable and critical to our research.

### Baseline

Directly connected GPUs are usually the recommended method to install in a system, thus for our baseline, we will be connecting 4 of them directly to the motherboard.

### Risers

Riser cables/cards are usually not recommended, the reason being workload saturating the available bandwidth of the cables/cards and also more proneness to errors, thus reducing effective speed. Some sources also quoted cable length affecting the error rate.

### PCIe Switch

PCIe switches connect multiple GPUs to a single PCIe x16 slot. In theory, it should cause a bottleneck, so we are testing this to see if it is true, and if so, by how much.

## Implementation

### Environment Setup

The environment setup includes setting up the different hardware configuration based on each test case defined. Each hardware setup will be installed with three categories of benchmarking tools, AI, Machine Learning, and Information Security.

## Consolidation of data

Running the benchmark tools to collect data and scoring results. Exporting the collected data for further analysis.

### Data Analysis

Performing a comprehensive analysis of the acquired data to gather insight by comparing the difference of scores and results from each environment and make a conclusion.

## Optimisation

The conclusion of each finding will result in further test cases and different hardware environment setup to further optimise and determine the accuracy of the collected data. By analyzing and understanding the data obtained, it may be possible to improve the results of the benchmark.

## Conclusion

Present the results and scores from the various test cases and detailing what each score and result are. Drawing a conclusion and determining the most optimal setup. Documenting each step and process of the project in the form of a report and academic paper.

# Gantt chart

Refer to appendix A.

# Org structure / roles of members

## Team Leader

Overall in-charge for the project, coordinates deliverables to ensure the team is heading in the correct direction. The team lead also manages team performance and sorts out any issues the team faces with the lecturer in charge.

## Data Analyst

The data analyst takes charge in analyzing the data obtained from the benchmarks to understand and make sense of the data obtained. The data obtained can then be compared with other setups, where information could be drawn from the results obtained.

## Hardware Analyst

The Hardware Analyst takes charge in researching the specifications of our machine, the hardware differences between the different setups and makes use of the data analyzed to correlate it to the hardware side of the project.

## Safety Officer

As team members deal in hardware for this project, the team may be required to switch the setups around for different benchmarking. It is critical for team members to look out for one another in terms of safety. The safety officer takes charge of ensuring the environment is safe before working on the machine.

| Team Member | Roles Assigned | Responsibilities |
| --- | --- | --- |
| Foo Chang Jie | * Team Leader * Data Analyst * Safety Officer | * Ensure team is on the right track * Keep track of deadlines, plan for mitigations * Assign tasks * Perform allocated task |
| Muhammad Azfar Bin Adam | * Data Analyst | * Perform allocated task |
| Nicholas Koh Wei Xuan | * Hardware Analyst * Safety Officer | * Perform allocated task |
| Wong Chong Peng | * Hardware Analyst | * Perform allocated task |

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# Appendix

## Appendix A - Gantt chart





