G5

PROJECT DOCUMENTATION

Project Plan

Aerial Imagery Initiative

Ver. LCAM

Index

Introduction

The Project

The NSW Spatial Services division of the DCS collects aerial and LiDAR images of the NSW landscape and is responsible for providing reliable spatial information to NSW Emergency Service Organisations. In order to better facilitate rapid responses and recovery efforts to emergency events such as bushfires and floods, this project aims to develop a machine learning platform that will analyse aerial and LiDAR imagery to detect areas affected by natural disasters.

The objective of the students is to develop a service, alongside DCS/Spatial Services and Intellify, that is able to analyse LiDAR and aerial imagery and detect specific features using Machine Learning (ML). Initially the project will aim to focus on detecting features specific to those left after a flood or fire.The identification of these features will identify areas in need of assessment and resources. This information can be passed on to SES, RFS and other services that require on the ground information and mapping of affected areas.

The project is to be completed and incorporated by the end of 2021. Students will work alongside DCS/Spatial Services and Intellify to produce a final product with a budget of $50,000. The project will be developed in Amazon Web Services (AWS), utilising the Unified Process Framework. As students will be developing, using potentially costly AWS cloud computing services, they are required to pass the AWS Certified Cloud Practitioner Exam.

The Project Plan

This Project Plan will outline, in some detail, the plan, current skill set, practices and organizational structure that our team intends to use, to fulfill the requirements of our project. Additionally, we will explore the techniques used to plan, develop and implement the various iterative components, assessing risk, with a strong focus on our key deliverables. The Project Plan will also serve as a tool to analyse budget and expenditures, as well as track progress and plan & manage the team's schedule, through each iteration.

We will use these tools to structure our approach to planning and executing the ongoing development of documentation and works in Amazon Web Services.

Project Organization

Team Introduction

Our individual roles and responsibilities throughout this project, are initially outlined during our Team Charter (as available on Group 5's Team Wiki). In summary, our team consists of the following:

- Adam Blewitt - Our primary Wiki Editor and secondary Git Advisor, working as a Systems Integration Specialist, with a wide range of expertise, ranging from data management, computer networking and programming.
- Cameron Nyberg - Our primary Git Advisor, employing various levels of git and programming knowledge, to guide our workflow.
- Darren Sheehan - Our secondary Wiki Editor and vetted programming & project managing member, with over 9 years of experience in the corporate IT environment.
- Andrew Smith - Our secondary Style Advisor, with tested experience in programming and databasing as well as a budding interest in machine learning, through his exploration and work with artificial neural networks.
- Patrick Funnell - Our primary Style Advisor with seasoned experience in technical consulting, management, programming and problem solving.

Our communication channel for both text and voice will be Discord, throughout the duration of this project. A link to our push communication method can be found on our Team Wiki.

Team Prerequisites

In order for our team to embark, down the path to completing our Spatial Services project, we must all complete our Foundational Pearson VUE AWS Certification.

Project Brief

An outline, including some background on the project can be found via our Project Proposal.

The goal for the project is for students to develop a system, by which LiDAR and aerial imagery can be analysed via a Machine Learning model to produce an identified affected flood area, to assist emergency services in identifying ground areas most in need of help, in the case of floods. Ideally, the project will then include the ability to identify fire affected areas, however this is not the primary goal at this stage and may be out of scope for this project.

There are 3 primary stakeholders at play here: the DCS/NSW Spatial Services, Intellify and the CSU Students, or the 'Students'. The DCS aims to be provided with a system at the end that is usable and appropriate for real world application. Intellify aims to assist the Students in developing a system that can fulfil the requirements, set forth by the DCS, through the passing of technical knowledge of AWS and other areas such as OpenCV and machine learning. Lastly, the Students aim to fulfil all requirements and produce a final product that has real world applications and provides a number of learning outcomes, towards understanding the Unified Process Framework and cloud compute solutions, including Machine Learning algorithms.

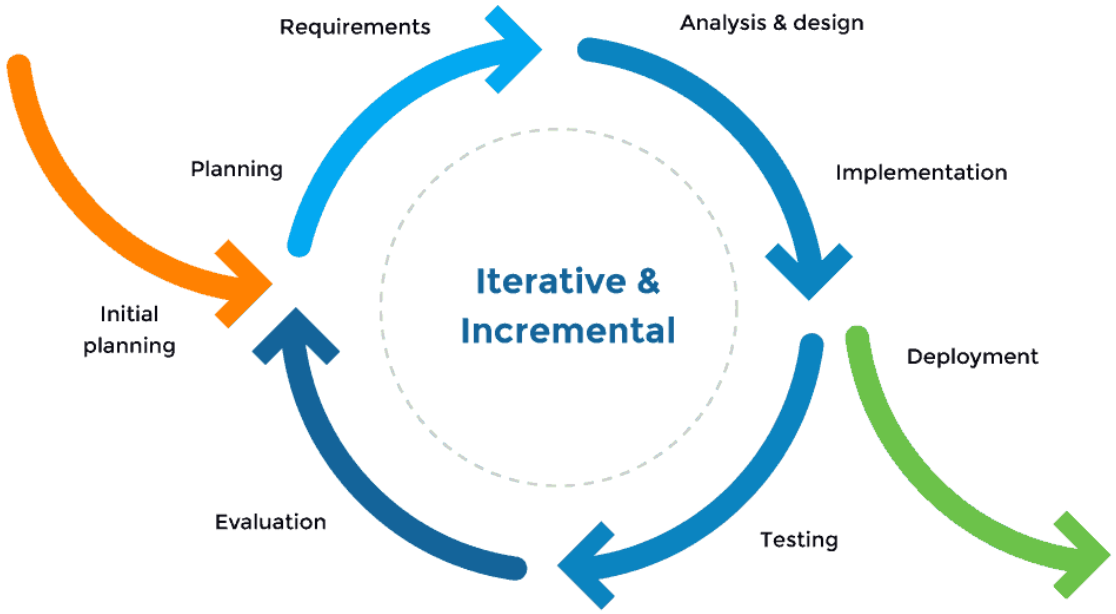
Project Status Reports (PSR's) are completed monthly by the Students, allowing for the demonstrable ability of the Students to critically analyse the project progress, as well as any identified risks and issues. Furthermore, Students will use the PSR reports to assess the status of the project, examining the schedule, scope of the project, resource usage, ongoing communication with other stakeholders and overall status of the project. The PSR (project status reports), allow the Students to encapsulate and report on incremental, monthly updates for the project, in all aspects.

The primary goal is for all of the technical aspects of the project to be implemented by the end of 2021. The Students are able to communicate with the DCS, as well as Intellify through the Slack and Teams platforms, with groups and associated links provided from each party. There are weekly meetings on Fridays held with the DCS, Intellify and the Students, in which technical components and goals can be analysed and constructed.

Project Practices & Measurements

Development Practices

Our project will use the iterative & incremental development process, wherein high level requirements can be realised, prioritised, planned, tested & implemented. This process will enable us to separate functional components and create necessary iterative changes, to ensure a satisfactory end product.



Our objective is to identify individual components of the project and devise an implementation approach that solves key problems, such as building a Machine Learning Model and efficiently processing large images, independently.

Our approach to planning can be discrete and realistic targets and goals for individual features of the project can be tracked, developed and reviewed. Our review process will require that another engineer (separate from those that are writing and submitting a code change), review and approve code for deployment.

Tracking Progress

During our iteration planning phase, features and functional objectives for our use cases can be identified, planned and delegated to a team member (or team members).

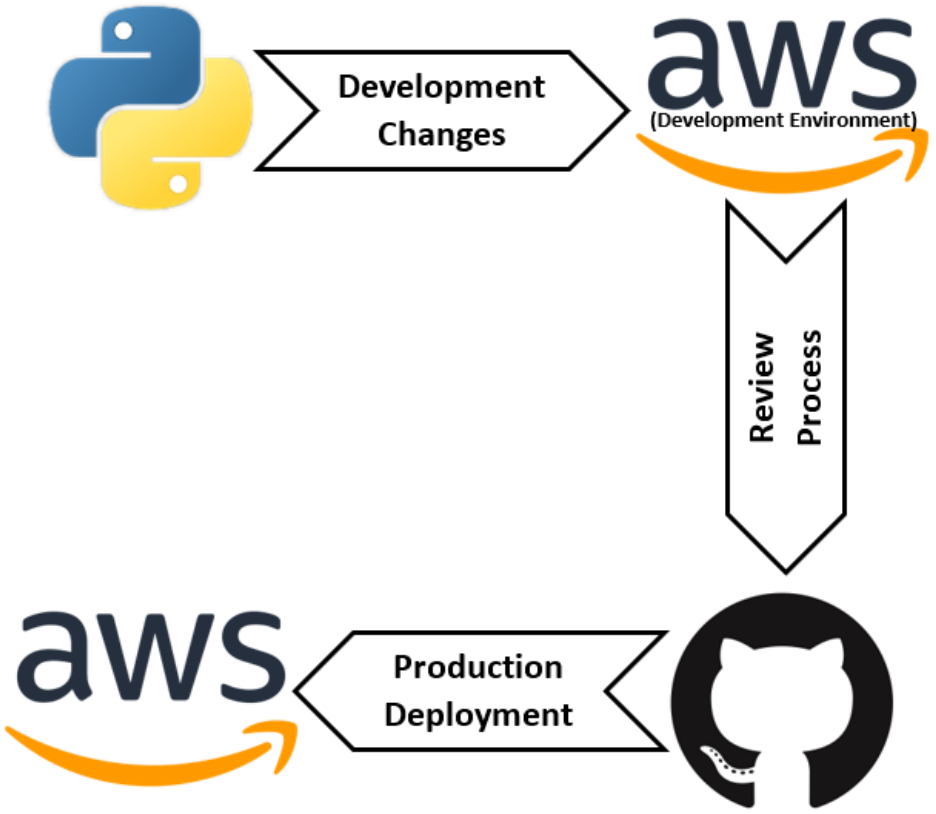
As part of our planning, we will set goals for when our functional objectives will be implemented, as well as smaller milestones, that will assist in tracking progress and identifying any potential help areas, to assist in keeping the iteration on track.

These milestones will enable our team to gauge whether we are falling behind, or require assistance and will also enable the team to report status to any stakeholders, if required.

Deployment

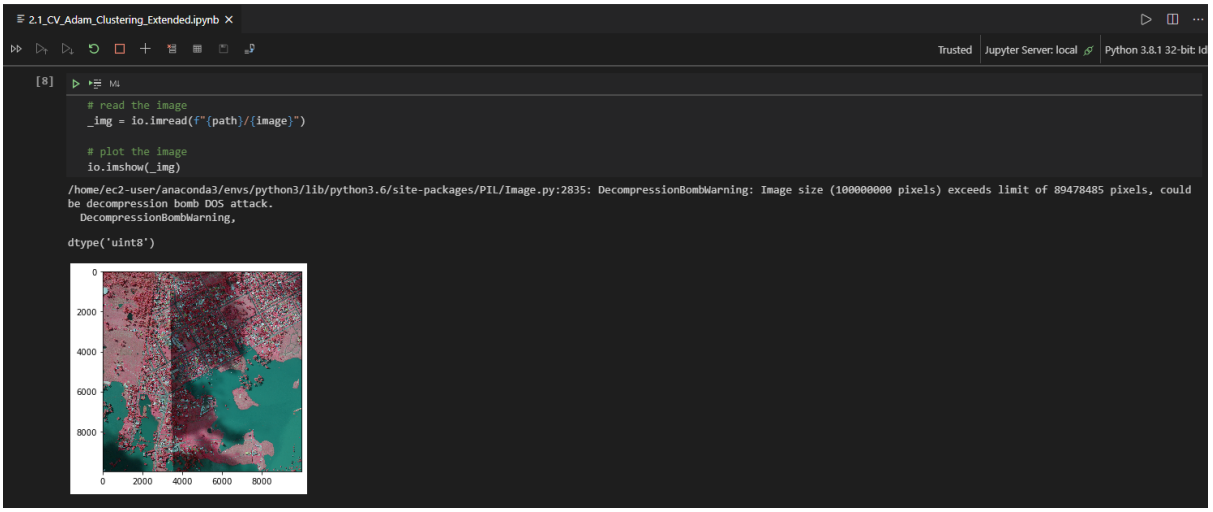
Our primary method for deploying updates, as well as establishing new features and implementing them outside of a final production solution, is through Git. Amazon provides some documentation on this integration, in their source control docs.

By using Git, we enable the ability for major systematic changes, through separate branches, that don't change or affect the master branch, before going through the Git review process.

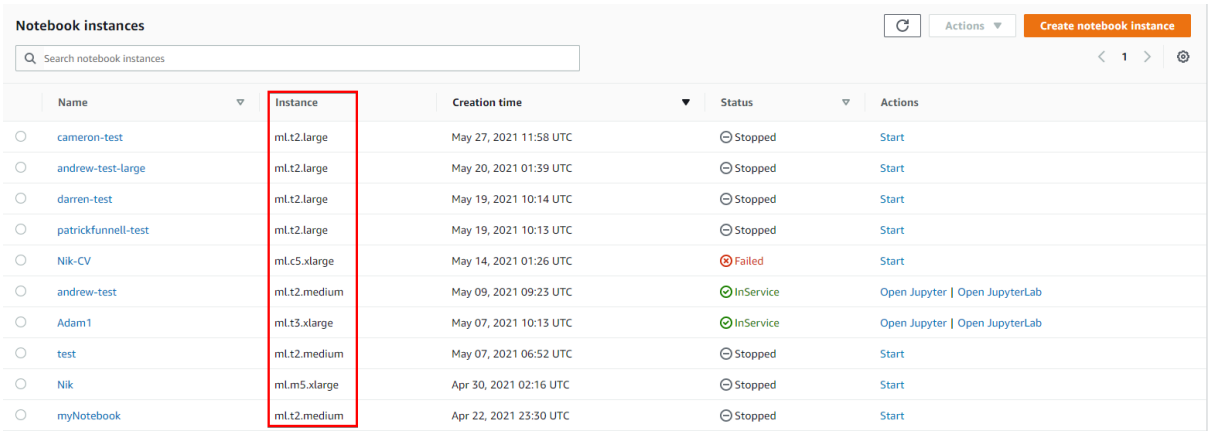


Reducing Computational Requirements & Costs

As the requirement for more computational power increases, while the project is still in its very early development stages, Students have elected to take their work off of the cloud (AWS) and work locally (through Visual Studio Code). This process has boosted usage and thus the effectiveness of version control for the project.



The current list of SageMaker instances can be observed below:



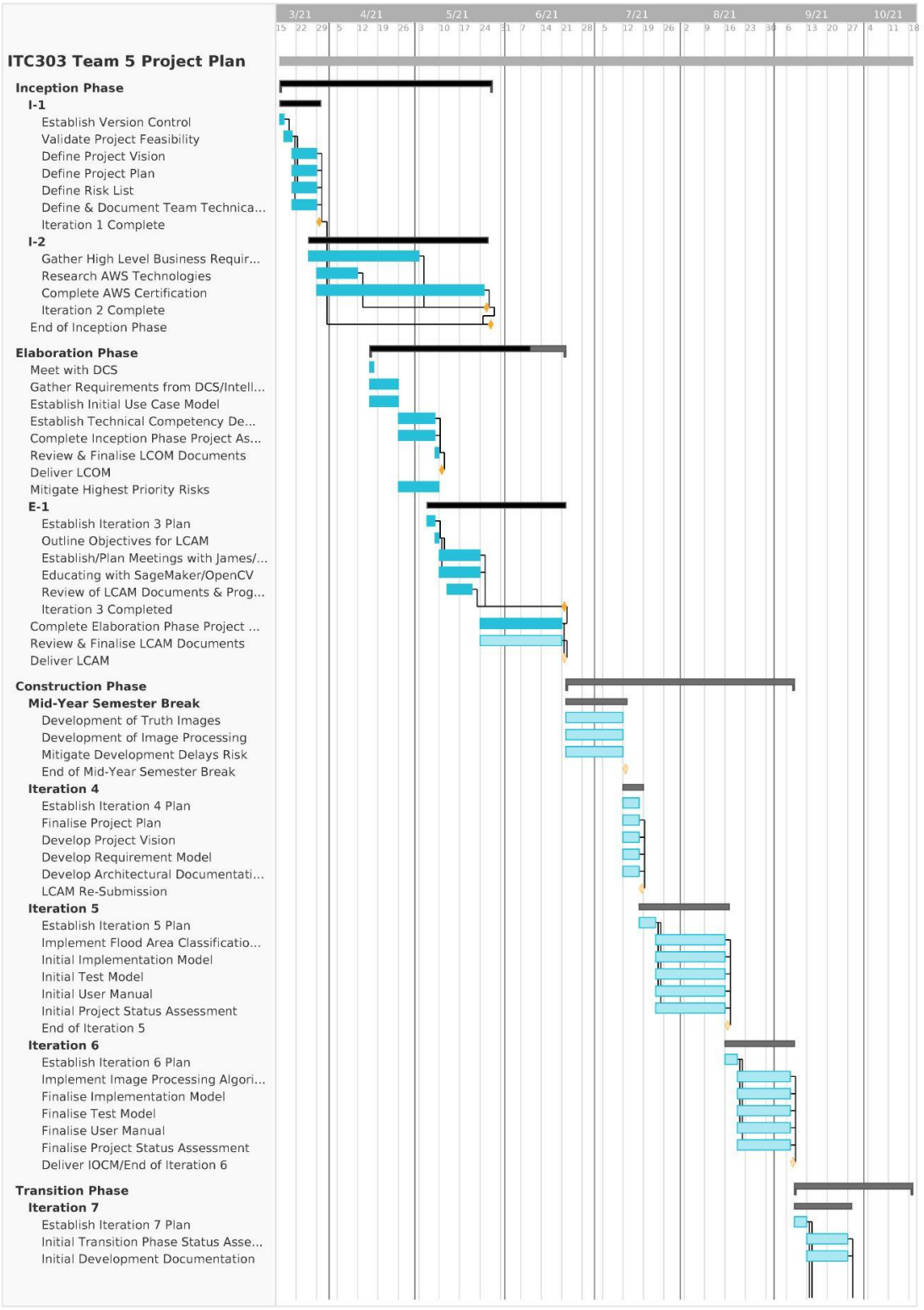
The costs associated with these instance types are as follows:

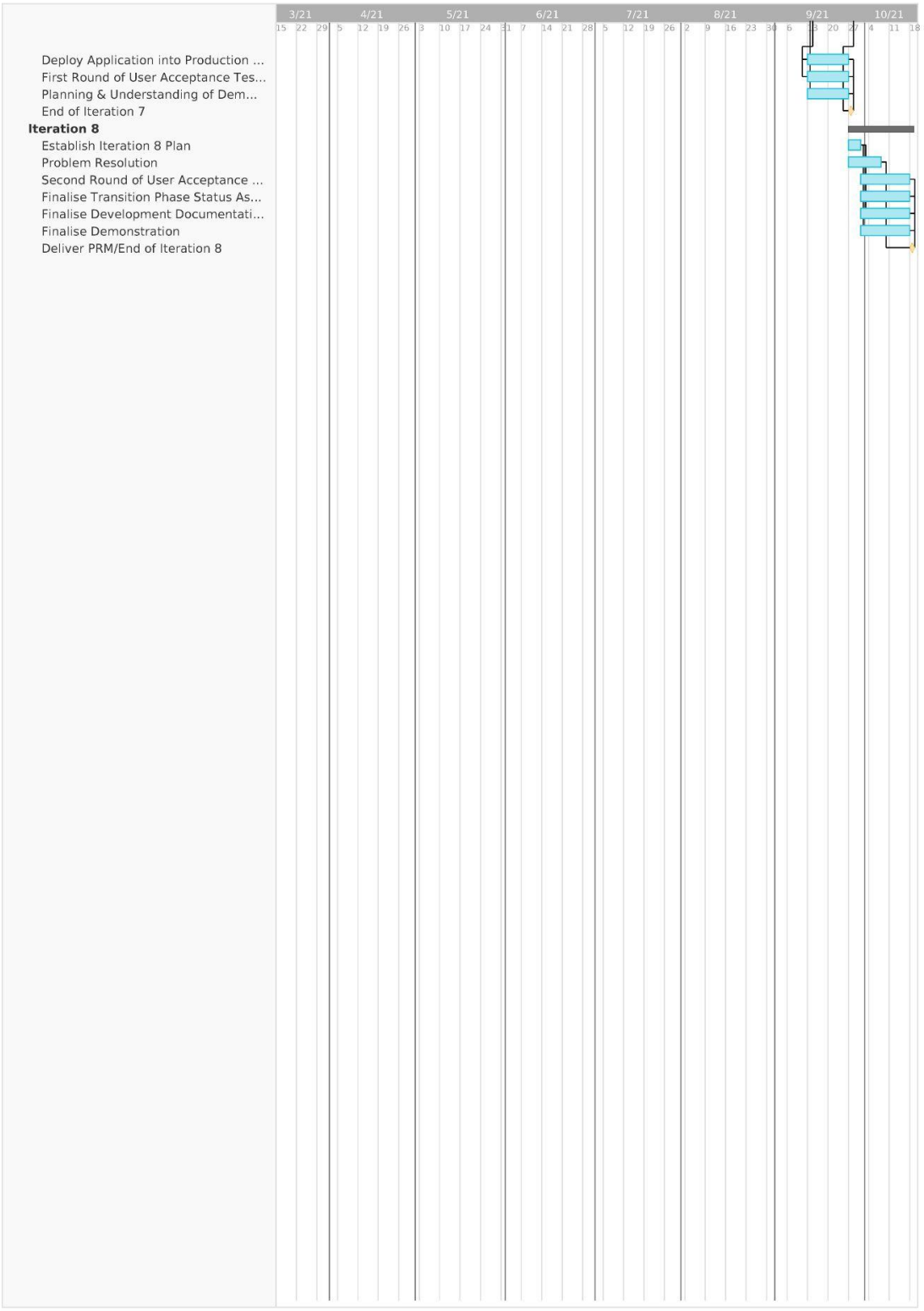
- ml.t2.medium - $0.0464/hour
- ml.t2.large - $0.111/hour
- ml.t3.xlarge - $0.20/hour
- ml.c5.xlarge - $0.204/hour
- ml.m5.xlarge - $0.23/hour

In moving the development environment from AWS to the Students' local PC's, the running costs generated are nullified.

While a large portion of the development work is completed, Students can avoid any sort of budget constraints, for computational usage, reducing the risk for experimentation.

Project Milestones & Objectives




3/21
4/21
5/21
6/21
7/21
8/21
9/21
10/21
Deploy Application into Production ...
First Round of User Acceptance Tes...
Planning & Understanding of Dem...
End of Iteration 7
Iteration 8
Establish Iteration 8 Plan
Problem Resolution
Second Round of User Acceptance ...
Finalise Transition Phase Status As...
Finalise Development Documentati...
Finalise Demonstration
Deliver PRM/End of Iteration 8

Change Log

Version	Date	Change	Author
1.0	-	Created document and majority of the original content	Cameron Nyberg
1.0.1	15-06-21	Addition of the Change Log	Cameron Nyberg
1.1	16-06-21	Touch-Up of Introduction	Cameron Nyberg
1.1.1	16-06-21	Implementation of Project Brief	Cameron Nyberg
1.2	17-06-21	Project Milestones & Objectives Overhaul (Gantt Chart Implementation)	Cameron Nyberg
1.2.1	17-06-21	Added discussion of reducing computational requirements & costs	Cameron Nyberg
1.3	18-06-21	Initial Construction Phase Iteration Assessment	Cameron Nyberg
2.0	18-06-21	LCAM document release	Cameron Nyberg

References

Tech Target. (2011). *Iterative Development*.
https://www.digital.nsw.gov.au/policy/cloud-strategy-and-policy/cloud-policy

Plutora. (2020). *Software Development Life Cycle (SDLC): Making Sense of the Different Methodologies*.
https://www.plutora.com/blog/software-development-life-cycle-making-sense-of-the-different-methodologies

Wrike. (2019). *How to Write a Project Plan*.
https://www.wrike.com/blog/how-to-write-a-project-plan-easy-steps/

asana (2021). *What is a project brief?*
https://asana.com/resources/project-brief

Title page cover photo.
Basin Pocket (Ipswitch) flooded. (2011). Retrieved from
https://www.abc.net.au/news/2011-06-03/brisbane-floods3a-before-and-after-article/2742794?nw=0