We Byte- Deliverable 1

Note: Data source is promedmail.org

1.1 API Development

Describe how you intend to develop the API module and provide the ability to run it in Web service mode

1.1.1 API Web Scraping & Libraries

Since our data source (promedmail.org) doesn't have an API, we will be developing a web scraper in order to extract any appropriate information and aid with the development of our own API. Through this process, we'll be able to download the html from a given page using headers and/or parameters and ultimately query this information to build our database.

We plan to use BeautifulSoup and Urllib in order to create the web scraper and use the libraries, Flask and Flask-RESTful, to build our REST API.

1.1.2 API Testing & Documentation

To comply with the project specification, we intend to use stoplight.io to document our API, and have all endpoints return JSON objects.

Additionally, to make sure our API functions as desired we will be utilising Python's testing modules to ensure the API is free from bugs, is reliable, and easy to use guaranteeing the quality of our product. In particular, we will be using pytest for unit testing, and the requests module for automated testing of our endpoints. To ensure thorough testing, we will also be using the pytest-cov library to ensure maximum (as close to 100% as possible) code coverage. Finally, we will be using Postman for manual verification and debugging during development. By using stoplight.io to map out the expected behaviour of our API prior to implementation, we can ensure that the endpoints are implemented the way clients (the other groups) expect them to be and that the API serves its purpose.

1.1.3 API & Information Storing

We plan on using an SQL database, more specifically Amazon's dynamoDB, to store the information that our API provides. The web scraper we will develop in conjunction with the API will extract relevant data from promedmail.org and further store the information in the database.

To ensure the efficiency of our API, and reliability of the information, we intend on running the web scraper once a day to update the database and reflect current statistics regarding any outbreaks.

1.1.4 API as a Web Service

To run our API as a web service and allow other users to gain access to it, we plan on hosting our API using AWS Lambda.

1.2 API Parameters

Discuss your current thinking about how parameters can be passed to your module and how results are collected. Show an example of a possible interaction. (e.g.- sample HTTP calls with URL and parameters)

WeByte Stoplight.io
[https://sim.stoplight.io/docs/seng3011-webyte/PHASE_1/API_Documentation/reference/WeByteAPI.v1.json/paths/~1search_keywords/get]

To get an even more detailed code view of this (and our models) please view out github repository master branch (SENG3011-WeByte/PHASE_1/API_Documentation/reference/WeByteAPI.v1.json).

1.2.1 Parameter Passing

Parameters will be passed to our API through URL parameters. For example, passing parameters 'location' and 'keywords' to a keyword search API route hosted at webyte.com, would be done using a GET request with the path:

www.webyte.com/keyword_search?location=sydney&keywords=covid&time=2021-03-03

This utilises the standard URL format to query our RESTful API.
A request like this will return a JSON object whose exact format will be defined in our stoplight.io docs for each API route. We plan to use the return data types laid out in the project specification so as to assist integration with other teams API's, but we may expand on this list of types with our own as necessary.

1.2.2 Example API Interactions

As per the specification, all API requests will generate JSON outputs, an example route and response(s) is available on our stoplight.io page.

1.2.3 Location & GeoCoding

As per the specification, one of the parameters a user can input will be the location of an outbreak. Our current plan is to store these locations as a string, however during phase 2 of the project we plan on researching possible APIs that will return a standard map reference/id. In using such a method, we can guarantee that our API will reflect current and more accurate data, ensuring the reliability of our source and compatibility with API's from other teams who also choose to use similar location lookup methods.

The various methods in which a location can be accessed are discussed below:

Method	Cost	Taxonomies	Source
String	Free	No	
Geonames	Free	Yes	https://www.geonames.org/export/ws-overview.html
Google Places	Free with low usage, but requires billing information	Yes	https://developers.google.com/maps/documentation/places/web-service/search

From our preliminary research, we have determined Geonames to be the stronger option as it has taxonomy functionality and it is simpler to set up and use when compared to Google Places. This method could work as it uses the "searchJSON" endpoint to find the ID of a location, and "hierarchyJSON" endpoint to find all locations above it in taxonomy hierarchy. Further, we can link this API through storing all these locations in the database under their ID and ensure each article maps to a one or more location IDs..

1.3 Development and Deployment Environment

Present and justify implementation language, development and deployment environment (e.g. Linux, Windows) and specific libraries that you plan to use.

1.3.1 Implementation Language: Python

	Python	**PHP**
Team familiarity	5/5	0/5
Web Frameworks:	Many web frameworks	Access to mature frameworks
Speed	Interpreted language, slower	Faster than Python
Open Platform	Designed with features/libraries to facilitate data analysis and visualisation	Platform independent
Web Service Libraries	Easy integration with flask and/or django	Large array of libraries available
Industry Relevance	Industry Leader, many deployment options	Open source, easy development
DataBase	Doesn't support database connectivity as much as PHP but RDBMS like PostgreSQL, MySQL, SQlite are still accessible	Able to access more than 20 different databases
Dependency management	Pipenv	Php composer
Readability:	Indentation requirements makes it makes it very readable	Highly documented- classic approach
Debugging:	Faster	Slow
Usability	Very versatile- able to use it for web development, robotics, science etc	Mainly used for web development

Python has the greatest appeal for developing an API given its flexible nature, ability to integrate seamlessly with many web frameworks, cross-platform design and simple integration into the rest of the chosen web stack. Additionally, all team members are highly familiar with Python, making it the best language to use to ensure our team is easily able to collaborate and develop across multiple platforms. Finally, the abundance of modules and libraries that come alongside Python means it has added versatility and will aid with adding any additional features. Despite the advantages that come along with using PHP and other backend programming languages like access to mature frameworks, speed and community support, the teams' familiarity with Python and simultaneously its simple integration with Flask means it would be the best suited language for our project.

1.3.2 Web Framework: Flask

	Flask	Django
Team familiarity	5/5	1/5
Size of project	Preferred to develop smaller apps esp REST apps as minimal coding is required	Preferred to develop larger applications with a good code base
Flexibility	Large range of external libraries and add-ons	In built features and modules → less freedom and control but Django is older → more support
Support	Inbuilt support for sessions	Larger community of users
Structure	Allows freedom to implement whichever modules/libs desired. Implements bare minimum upon use	Consists of all tools and/or packages for full stacked applications and provides database interfaces, directory structure etc immediately
Difficulty	Simple, minimalist, easy to learn	“Steeper learning curve”
Database	Supports relational DBs & noSQL	Supports a number of relational DB including SQLite, PostgreSQL, MySQL, Oracle
Python	Both easy to integrate with python	
Routing	The request object is global in Flask and much easier to access	request matches a URL pattern → request object(HTTP request) is passed to a view → view is invoked → must pass request object around to access it
Other	-Easier for rapid prototyping and stand alone tasks -easy to bootstrap and maintain	-need experienced resources to maintain

Given the entire team has interacted with Flask and Python together, and the simplistic nature of the framework, we decided to use Flask. In addition to this, the ability of Flask to use a large range of external libraries and modules with it and its easy integration with both relational databases and no SQL means it would satisfy the versatility required to build both the API and web application for our project.

1.3.3 Development Environment

Not ensuring consistent operating systems is a risk as there is the potential for something to not work on another person's machine, making collaboration difficult. In order to resolve this, we will be using a virtual machine like Docker or the CSE machines to ensure consistency.

Docker is used in most companies and would prove useful however it has a steep learning curve which could be problematic given the short duration of the project and may be unnecessarily powerful. Further, although CSE machines would be an easy alternative, TigerVNC is slow to use compared to simply coding on a local machine.

Finally, use of venv will ensure consistency of packages across python versions as it provides support for creating "lightweight virtual environments"

1.3.4 Deployment Environment

Amazon Web Services

There are many cloud platforms to choose from, however, AWS was chosen over the others due to the reasons listed below:

- **Prevalence in industry**: it is by far the most used singular cloud service. With a market share of 33%, with its next biggest competitor Azure at 13%.
- **Large ecosystem**: of over 200 cloud products. Making it easy to deliver more complex microservices.
- **It's free tier:** offers an abundance of database storage and compute time. More than enough for this project
- **It is very heavily documented:** and has many tutorials, which will help make it easier to learn

AWS Lambda

Deciding between which kind of server product to use ultimately came down to what deployment architecture we wanted to implement: server or severless. We chose a **serverless architecture,** thus deciding to run the majority of our API via **Lambda** functions. The reasoning for this is listed below:

- **Easily scalable**: We expect that the usage of our API will have long periods of inactivity then spikes of high activity (such as demo day). Using Lambda provides a lot of horizontal scaling, it defaults at 1000 concurrent requests.
- **Cost effective**: It only gets run when it is triggered, this saves on a lot of expense compared to using a server model in which the server must have long periods of uptime. The free tier of Lambda includes 1 million requests and 400 000 GB-seconds of compute

time a month, as long as each function is limited to a compute time of 5 minutes. This plenty for the scope of this project

- **Modular**: Each Lambda function is designed to serve a singular purpose. This allows us to design a much more decoupled design, making it much more simpler and more manageable. As opposed to an entire EC2 container which would run many different aspects of the API, and therefore a simple bug could compromise the entire API more easily.
- **Frameworks**: There are multiple serverless frameworks such as Zappa and Serverless, which are compatible with our chosen language Python, that handles the dependencies, containerization and deployment of Lambda functions succinctly and easily.

DocumentDB

DocumentDB is a noSQL structured database. The reasons why this noSQL database was chosen were:

- **Requires no predefined schema**: this is important considering that the data on promed is loosely structured
- **Since there are different data types on promed (reports, articles etc..)**: noSQL allows for the ability to store documents with different structures. This will also be helpful when we start to incorporate more unstructured data from other API's such as social media posts etc..
- **BASE compliance**: SQL is more suited for ACID compliance, whereas noSQL is better for BASE compliance. SInce the data being requested doesn't require such rigid compliance (unlike databases for bank transactions), the BASE compliance is more than enough to provide the necessary data for our users.
- **MongoDB compatibility**: Shares similar syntax to MongoDB, which is an area of expertise for our team.
- **Easily integrated into the deployment:** DocumentDB is an AWS product, making it very easy to use with our Lambda functions.

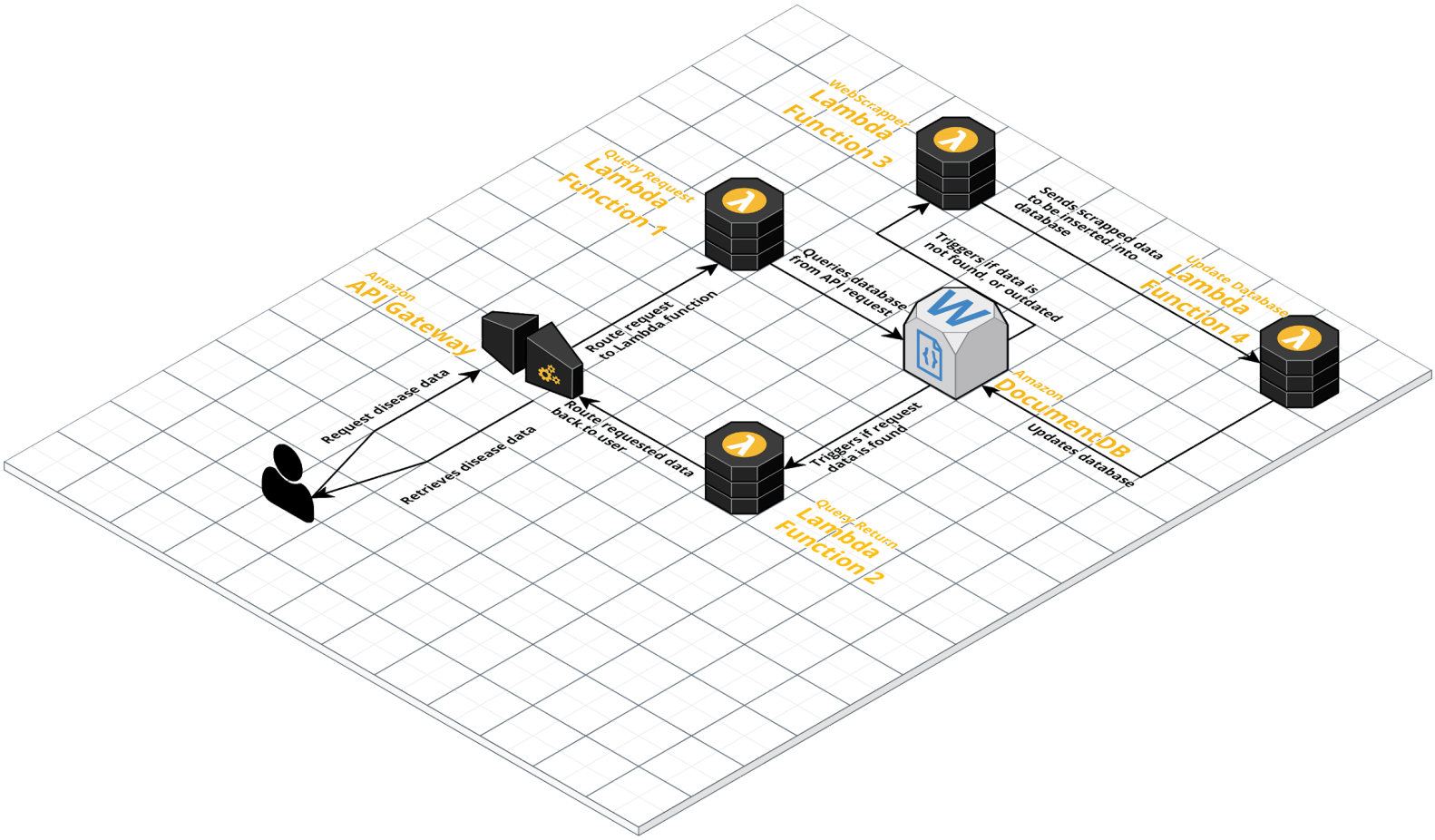
API Gateway

The AWS api gateway is a fully self managed scaling service which makes it easy to develop API's. The reasons it was chosen were:

- **Simplicity:** creating a basic REST API is very simple. It can even directly import Swagger docs to create the API.
- **Price**: the free tier offers 1 million requests per month, with 750000 minutes of connection time. This is plenty for this project.
- **Integration with Lambda**: easy to connect to Lambda functions, thereby easily able to maintain a serverless architecture.

Deployment Architecture

The below architecture describes an initial draft of how our serverless API could be implemented.



1.3.5 Libraries

As mentioned in section 1.1, in order to aid with the web scraping functionality, Python's Urllib and Beautiful Soup libraries will be used. Additionally, spaCy is an open sourced natural language processor which can be used to pull locations out of text, aiding with the process of taking in location as a parameter. However, it is to be noticed that as the development progresses, there is an increased likelihood of the libraries being used changing.

1.4 Project Plan

Provide a project plan showing team member responsibilities, work arrangements and any information team members will be using to coordinate their activities. You should also mention any software tools used by the team to assist project management.

As a team, we've decided to have weekly meetings from 1-1:40pm on Tuesdays, followed by our mentor session from 1:40-2pm. These meetings will be used to discuss progress, solve any imminent issues, as well as plan upcoming work and split tasks for any future deadlines.

In order to best articulate team member responsibilities and plan out any deliverables and/or sprints, Trello, Teams(and in built Microsoft OneNote) and TeamGantt will be used as all platforms allow for easy real time collaboration. Trello in particular will be used for the management of sprints and the breakdown of tasks amongst team members, whilst TeamGantt will allow for the careful planning and consideration of all project requirements .

A link to our Trello board is as follows: https://trello.com/b/1oBZ0DCl/seng3011-we-byte.

A link to our Gantt Chart is as follows: https://bit.ly/3bYwfdW

During the development of our applications we intend to use Figma (Web APplication frontend) and stoplight.io (API documentation) as it will allow our team to design,prototype, test and collaborate our ideas in real time.

Finally, to ensure seamless code collaboration and version control during the development of the API and web application, our team will be using GitHub.

A link to our GitHub repository is as follows:
https://github.com/Harsimran-Saini/SENG3011-WeByte.

As we get further into the project, the responsibilities of each team member for the relevant deliverable will become more apparent and hence will be updated accordingly.

Name	Email	Experience	Work Arrangements
Jaiki Pitt	z5213775@unsw.edu.au	• Backend: Python, Flask, SQL, noSQL, mongoDb, Java, C, OOP • Frontend: Javascript, ReactJS, jQuery	Tuesday-Friday. Except Thursday 12-1

James Bradley	z5210562@unsw.edu.au	● Backend: python, SQL, Java, C, C++, OOP, Optimization using Genetic algorithms. ● Frontend: ReactJS	Mostly available Wednesday, Thursday, Sunday. Can't do Friday / Saturday before 5:00pm
Sruti Desai	z5260319@unsw.edu.au	● Backend: Flask, Python, SQL, Java, PostgreSQL ● Frontend: JavaScript, jQuery, HTML/CSS	Available to meet after 6pm Monday, Tuesday, Thursday and Friday Weekends if necessary
Lachlan Harvey	z5258871@unsw.edu.au	● Flask, python, react, scraping	Mostly free Tuesday, Wednesday, and weekends if necessary Other weekdays free after 6pm
Harsimran Saini	Z5208912@unsw.edu.au	● Worked with using APIs with flask and Python in SENG2011. ● Confident with use cases and business requirements	Free to meet up on weekdays after 5 and on Tuesdays between 1 to 1:40.