# Problem Description

The Team Challenge addresses the emerging problem of airports charging car drivers to enter the terminal drop off area to collect arriving passengers.

The charges are significant. For example, the charges at Glasgow International to use the quick pick-up/drop-off area are:

* Up to 10 minutes: £2
* 11-15 minutes: £4
* 16-20 minutes: £6
* 21-30 minutes: £10
* 31-60 minutes: £30
* 61-180 minutes: £90

The charges for 5-10 minute deviations from expected timings are punitive. Even with the best intention it is not always possible to arrive at just the right time and minimise the charge.

* It can be difficult to accurately predict aircraft arrival times (at Aberdeen, Glasgow, and Edinburgh an average 25% of flights are delayed)
* Local traffic conditions can significantly vary the duration of car journeys to the airport

For drivers arriving early there are various combinations and permutations of off-site car parks which they can use to run down the clock before entering the terminal but most are either also charged or simply inconvenient. Many drivers simply resort to waiting it out in local industrial parks and housing estates if they happen to arrive early, causing a nuisance to local traffic, businesses, and residents.

# Project Objectives

* Create a public facing web service and/or app which will provide users with an accurate calculation of when they should leave for the airport to collect an arriving passenger assuming that they are driving from their current location. Users will identify the specific incoming flight which is carrying the passenger they wish to collect.
* Conduct a feasibility study into maximising the commercial potential of the service.
* Launch the service and try reaching as many users as possible.
* Gain visibility through local media outreach as a means of promoting the service and also the Graduate Level Apprenticeship.

# Technical Stack

To achieve the project objectives we will integrate real-time flight tracking with real-time traffic information. The project is enabled by the following key features:

* If smartphone users have their location services switched on, the Twitter API can extract their exact location from a tweet.
* The Google Maps API can convert a user’s location and desired destination (the airport) into an estimated journey-time.
* Flight tracking information can be retrieved from the FlightAware API to determine the expected arrival time of a specific incoming flight.

From these sets of data a driver departure time can be generated which will minimise their waiting time at the airport and thus pick-up charges.

The service should be made available through a Twitter account which members of the public can tweet with the original departure location of an incoming flight or the actual flight code and the account will respond with the time they should set off for the airport.

With Twitter location services activated the Twitter API will detect the user’s location as required by the Google Maps API. This location information will be fed to the Google Maps API as well as the destination airport. The flight information will be used to harvest the expected real-time arrival time of the incoming flight from the FlightAware API.

The service back end will perform the journey time calculation and estimated flight arrival time and the Twitter account will respond with the time they should leave for the airport.

It is required to also implement this as a standalone App.

The team challenge is decomposed into sub-group tasks and each group will use Raspberry PI hardware as the platform.

A flight tracking antenna is also provided to complement the FlightAware API - the UWS main reception building in Hamilton a high rise with excellent sky visibility.

# Project Materials

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| **Raspberry Pi 3**  **(x5 units)**  16GB Raspberry Pi 3 Starter Kit  Includes protector case and power supply  16 GB SD card for memory  Wi-Fi and RJ45 connector with 2m Ethernet cable  HDMI video output | https://images-na.ssl-images-amazon.com/images/I/717noToGGxL._SL1000_.jpg |
| **Video convertors**  **(x5 units)**  HDTV HDMI to VGA adapter Converter Male to Female with Audio and Micro USB Charging Cable  RPI is HDMI output – HDMI to VGA videos adaptor | https://images-na.ssl-images-amazon.com/images/I/71qzlkTQ6xL._SL1500_.jpg |
| **Keyboard & Mouse combo**  **(x5 units)**  Logitech MK270 Wireless Keyboard and Mouse | https://images-na.ssl-images-amazon.com/images/I/410msUQdVoL.jpg |
| **SD Card Reader**  **(x5 units)**  KiWiBiRD® USB 3.0 (3.1 Gen 1) Super-Speed Card Reader 8-in-1 for SDXC, SD, MMC, RS-MMC, SDHC, Micro SD, Micro SDXC, Micro SDHC Cards [Supports UHS-I Cards] | https://images-na.ssl-images-amazon.com/images/I/71tZHyWlT3L._SL1500_.jpg |
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# Areas of Investigation

What is the Minimum Viable Product from this team challenge?

How should we account for the extra time that passengers will require for disembarking, passport control, transiting through the terminal, etc. and passengers known to require a wait at baggage reclaim to collect checked-in luggage?

How could the accuracy of the platform be improved?

* For example, could user information be collected somehow to build up analytics on how long it typically takes passengers to get to the drop off area once their plane has been recorded as landed?
* Could the arriving passenger be tracked by somehow linking the smartphones of the user and arriving passenger?

Twitter and many other social media services use GPS enabled location services to identify where users of their platform are situated in real-time. Are there privacy concerns to using these services and how does it affect our service?

List all potential users of the service and identify potential commercial user profiles

# Timetable

The following facilitated sessions are scheduled as part of the extended on-campus induction:

Session 1 Wednesday 6th

11:30 – 15:00

Session 2 Thursday 7th

15:00 – 17:00

Session 3 Thursday 14th

15:00 – 17:00

Session 4 Thursday 21st

15:00 – 17:00

**Recommended Tasks to Complete During First Session**

* Get to know your fellow group members and the other groups
* Name your group
* Get the group Raspberry PI up and running
* Discuss the Project Description – USP – Minimum Viable Product
* Select and agree an online collaboration platform so that you can communicate off campus - This should be agreed amongst all groups preferably
* There is only one Raspberry PI per group - suggest roles within the team and nominate individuals responsible for specific tasks (e.g. research, design, implementation, marketing, test, communication with other teams, any other roles)

**Recommended Tasks to Complete Before Second Session**

* Ensure that the Raspberry PIs work at home (plug into monitors, internet, etc.)
* Do a trial run with the communication platform – is an alternative required?
* Think on suggestions for the product name
* Do some market research to understand the commercial landscape
* Explore candidate methods to technically implement the project

**Recommended Tasks to Complete Before End of Second Session**

* Agree the Requirements – Project Description – USP – Minimum Viable Product
* Name the product
* Produce a project plan and assign responsibility for tasks
* Plan and prioritise what you will achieve while you are together on campus
* Schedule an offline meeting with a stated purpose

# Deliverables

Each team is required to submit three deliverables

* a report on their technical implementation
* a short Project Commercialisation Plan
* a presentation on their product (technical & commercial)

# Commercialisation Plan Ideas

Produce a brief executive summary of the Project Commercialisation Plan (2-3 pages) focusing on information relevant to the following three sections:

Product / Service

* Focus on the user’s requirement rather than the technical description
* Clearly describe what you’re selling, emphasising the customer benefits.
* What are the Unique Selling Points?
* Are there any R&D activities that may lead to new products and services

Strategy and Implementation

* Summarize your sales and marketing strategy – provide details about costs, pricing, and how you’ll promote the product to customers – what is their return on investment
* How will revenue be generated? – App store, paid subscriptions, sponsorship, tiered accounts, etc.
* What are the envisaged costs of operating the system –subscriptions to 3rd party services, hosting, and capital expenditure – do these scale with the number of users or are some costs fixed?
* What is the break-even point to make this profitable

Market Research

* Are there any competing products or services
* What are the targeted customer segments
* Did you receive feedback from end users – any conclusions?

# Online Resources

Setting up the Raspberry Pi

<https://www.raspberrypi.org/help/>

<https://www.youtube.com/watch?v=gbJB3387xUw>

<https://www.raspberrypi.org/learning/hardware-guide/quickstart/>

<http://lifehacker.com/the-always-up-to-date-guide-to-setting-up-your-raspberr-1781419054>

Raspberry Pi Operating System

<https://www.raspbian.org/>

Raspberry Pi Twitter bot

<https://www.raspberrypi.org/learning/getting-started-with-the-twitter-api/>

<http://www.instructables.com/id/Raspberry-Pi-Twitterbot/>

<http://www.makeuseof.com/tag/how-to-build-a-raspberry-pi-twitter-bot/>

Twitter Location Services

<https://support.twitter.com/articles/78525>

<https://dev.twitter.com/overview/terms/geo-developer-guidelines>

Google Maps API

<https://developers.google.com/maps/>

Flight Tracking and Flight Status API

<https://uk.flightaware.com/commercial/flightxml/>

<https://uk.flightaware.com/commercial/flightxml/documentation2.rvt>

ADS-B Decoding Guide

<https://adsb-decode-guide.readthedocs.io/en/latest/>

SketchUp Pro Trial - design, document and communicate your ideas in 3D

<https://www.sketchup.com/products/sketchup-pro>

Raspberry Pi Networking

<https://www.raspberrypi.org/learning/networking-lessons/>

Hosting a website on a Raspberry Pi

<https://medium.com/@thesabareesh/host-your-own-website-on-a-raspberry-pi-3-e3c8fdb90f90>

Business Planning

<https://www.forbes.com/sites/patrickhull/2013/02/28/5-tips-for-a-great-business-plan>

<http://articles.bplans.co.uk/writing-a-business-plan/top-10-tips-for-writing-a-business-plan>