**Requirements and Planning**

**Project Antarctica**

**User Stories – Antarctic Research Base**

1. As a worker I to adjust the base temperature so that I am not cold when coming from outside
2. As a worker I want to be alerted when a potential blizzard occurs, so I know to stay in the base.
3. As an engineer I want the wind-turbine blades to feather during a blizzard automatically, so it does not get damaged during blizzards. (shut-down)
4. As a service worker, I want to view all vehicles are so I can find the nearest one if an emergency occurs.
5. As a scientist I want to store collected data on the ice and the Earth’s magnetic field in a database, so I have a back-up of the information.
6. As a scientist I want to upload data commits do a central repository so my colleagues can view my results.
7. As a worker I want to view the various instruments count so I can determine how many instruments should be available for use.
8. As a worker I want to know the current temperature outside so that I know how many layers of insulation to wear.
9. As an engineer, I want to view the battery level so that I can determine when to replace it.
10. As an engineer I want to view the last time various structures were checked so I can determine when to next check them for maintenance.
11. As a service worker, I want to store the food level input into a database so I can how much food is left, and how much is required.
12. As a service worker, I want to view the current food stock so I can determine what meals I can prepare.

**Use Case 1: Vehicle Tracking System**

**Goal:** Find closest vehicle

**Primary Actor:** Worker (Human)

**Secondary Actor:** Database, Tracking system

**Precondition:** The vehicle is equipped with tracking device

**Trigger:** Worker runs vehicle tracking program **Flow of Events:**

1. Program asks for authorised log in
2. Map opens and loads all vehicles within 5 km
3. Vehicles displayed as flashing circles on a single zoomed out page
4. Vehicle nearest to workers current computer is pinged
5. Software shows current distance between workers computer and closest vehicle to within 20 metres of accuracy
6. Software outlines the fastest path to pinged vehicle
7. Worker ends program

**Extensions:**

**1A. 1** Log in incorrect

**1A. 2** Software asks user to re-enter details

**1A. 3** Use case resumes at step 2

**1B. 1** Workers details entered incorrectly a second time

**1B. 2** Program outputs message that details were entered incorrectly too many times

**1B. 3** Program ends and cannot be opened for half an hour

**1B. 4** Use case ends

**3A. 1** Vehicle nearest to worker is not automatically pinged

**3A.** **2** System reloads page

**3A. 3** Use case resumes at step 4

**Use Case 2: Store data collected in a central database**

**Goal:** Service worker wants to edit food stock levels

**Primary Actor:** Service worker (Human)

**Secondary Actor:** Database

**Precondition:** Service worker is authorised upon log in

**Trigger:** Service worker opens program **Flow of Events:**

1. Worker clicks edit on the column
2. Worker changes food stock amount for a specific food
3. Worker clicks confirm
4. Worker saves edits
5. Worker exits program
6. Worker logs out

**Extensions:**

**2A. 1** Worker enters food stock level above previous data entry

**2A. 2** System outputs error message informing them they have entered an amount above the previous stock level

**2A. 3** System tells worker to edit the previous stock level or enter an amount equal or lower to previous stock level

**2A. 4** Use case resumes at step 1

**Use Case 3: Automatic Wind-turbine Shut-Down**

**Goal:** Wind-turbine stops rotating and blades feather during blizzard.

**Primary Actor:** Sensor

**Secondary Actor:** Database, Actuators

**Precondition:** Wind-turbine is rotating

**Trigger:** Wind-turbine sensor detects wind exceeding 56km/h

**Flow of Events:**

1. Automated braking system triggered
2. Software is alerted
3. Blades stop rotating
4. Actuators calculate projected pivot angle of the blades edges so it’s against the wind
5. System outputs angles to feather-edges of the blades
6. Sensor detects wind-slows down to cut in speed of 9 – 14 km/h
7. Turbine powers up again
8. Blades begin rotating again

**Extensions:**

**1A. 1** Automated braking system does not trigger

**1A. 2** System alerts base that braking system did not trigger

**1A. 3** Engineer manually initialises shut-down

**1A. 4** Use case resumes at step 3

**2A. 1.** Software is not alerted

**2A. 2**. Use case resumes from step 3

**UML Use Case Diagram**

**Diagram

Description automatically generated**

**3 Usability Requirements**

* 1. The internal heating temperature must be able to be increased or decrease within 3 button presses.
* 2. Software must display all tracked vehicles on one zoomed out page
* 3. Software must display the current outside temperature at all times on the first page

**3 Performance Requirements**

* 1. Software must activate blizzard alert system within 10 seconds of receiving input from the wind-turbine sensors detecting high wind-speed
* 2. The software must shut-down the wind-turbine within 3 seconds of sensors detecting 57 km/h wind speed
* 3.The software must open the food database within 2 seconds of being run

**3 Reliability Requirements**

* 1. The software must display the remaining battery level within 50 milliamps of the actual battery level
* 2. Software must track vehicles within 15 metres of their actual location
* 3. Food data base must fail to open only 1 in 1000 times

**Work Breakdown Structure – Antarctic Base Software (Each user story is a task and broken down into set of subtasks)**

**(Time in weeks)(Dependencies)**

1. Food stock system (5)
   1. Construct User Interface (3)
   2. Create food stock database (1)
   3. Test functionality (1)
2. Scientific research database (1) (1.1)
3. System that displays instrument and equipment count (2) (1.1)
4. Last structure/maintenance check system (3) (1.1, 3)
5. Display current outside temperature (3) (1.1)
   1. Construct automatic thermometer (1)
   2. Connect thermometer results to software (1)
   3. Add to user interface (1)
6. Adjust internal base temperature (3) (1.1)
7. Display large battery level (4) (1.1)
8. Working access to online central repository (1) (1, 2, 3)
9. Automatic wind-turbine shut-down system (8)
   1. Install wind sensors in turbine (1)
   2. Install braking-system (2)
   3. Test braking system (1)
   4. Link blade-feathers to actuators (1)
   5. Connect wind sensor input to software (1)(1.1)
   6. Test turbine shut-down (1)
10. Install blizzard alert system (4) (9.2, 9.6)
    1. Install alarms (1)
    2. Install speakers (1)
    3. Link Alarm system to wind sensor input from wind-turbines (1)
    4. Test alarms (1)
11. Vehicle tracking system (4) (1.1) (7)
    1. Install GPS system on vehicles (2)
    2. Link GPS tracking to bases database (1)

**AON graph**

**Diagram

Description automatically generated**

**Critical Path:**

**1.1 -> 3 -> 4 -> 7 - > 11.1 - > 11.2  
  
Estimated Overall Project Duration:**

15 weeks