

Software Engineering I

Session 5

Portfolio Task

Topic:

Submission Format: System Modelling

1. Introduction

You are required to create a number of software models for the proposed Wilderness Weather Station.

2. Deliverables

Re-read the Wilderness Weather Station case study and the related stakeholder interviews.

After study of the requirements and further consultation with stakeholders the developers have come up with the following summary of the required components and functionality for the new Wilderness Weather Station system, and a general description of how the system will work.

Each Wilderness Weather Station consists of:

- A central controlling system. This system:
 - Reads data from sensors every five minutes (Sensors are connected via fixed cabling).
 - Stores sensor data temporarily in a local MySQL database.
 - Every 24 hours, processes sensor readings into weather data reports in JSON format.
 - Sends back summary weather data reports at 23.59 to the Data Archiving and Management subsystem of the National Weather Information System via satellite link. This includes the following data: maximum, minimum, and average ground and air temperatures; the maximum, minimum, and average air pressures; the maximum, minimum, and average wind speeds; the total rainfall and snowfall; and the wind direction as sampled at five-minute intervals.
 - Deletes locally stored data after confirmation a sent report has been received by the National Weather Information System .
 - Monitors and manages the station power supply unit. If power falls below 33.3%, the system switches itself to power-saving mode. Power-saving mode involves taking and storing only one reading per-hour for each sensor. If power falls below 15%, the system switches itself to hibernation mode. Hibernation

mode means no readings are taken until available power reaches $\geq 15\%$.

- Monitors and manages all sensors (windspeed reader, wind direction reader, barometric pressure reader, air temperature thermometer, ground temperature thermometer, rainfall gauge, [snowfall gauge](#)):
 - If two consecutive scheduled readings are not received from a sensor, the system switches to a back-up sensor. Each sensor has a single back-up sensor running on exactly the same firmware.
 - Reports faults to the Station Maintenance subsystem of the National Weather Information System.
 - Installs firmware fixes and updates into sensors.
- An array of sensors. These sensors:
 - Take weather data readings at one minute intervals.
 - Are connected via a network cable to the Wilderness Weather Station system.
 - Are connected via a power cable to the station power unit.



- A power supply unit. The PSU:
 - Supplies power to all components of the Wilderness Weather Station.
 - Generates power through a combination of solar panels and a small wind turbine.
 - Powers all weather station components, including itself.
- A satellite communications unit. The sat comms system:
 - Transmits data to the National Weather Information System.
 - Receives data from the National Weather Information System.
 - Consists of a parabolic dish and a transmission unit.

a. Class Diagrams

Using the UML class diagram notation:

- Identify the classes in the WWS system.
- Add attributes and operations for each class
- Create a class diagram which shows associations and multiplicity in the WWS system.
- Identify any generalisation relationships in the system.

b. Activity Diagrams

Using the UML activity diagram notation:

- Create an activity diagram that shows the process by which data is collected from sensors and transmitted to the Data Archiving and Management subsystem of the National Weather Information System.

c. Sequence Diagram

Using the UML sequence diagram notation:

- Create a sequence diagram to represent the interaction between the Wilderness Weather Station and the power supply unit.

d. State Diagram

Using the UML state diagram notation:

- Identify the various states of the Wilderness Weather Station air temperature sensor.
- Create a UML state diagram that models the triggers and states for the Wilderness Weather station air temperature sensor.

3. Submission

- Submit your portfolio task via the appropriate dropbox in Moodle.
- Name your portfolio file *username_se1_s6_portfolio_task.docx*

4. Assessment

Your work will be assessed on the following criteria:

Completeness	All the required components of the work have been completed. Conforms to stated length guidelines. Does not contain notable circumlocution or repetition.
Appropriateness and depth of research. Use of research.	Uses appropriate sources for HE. Uses a suitable range of sources. Displays clear evidence of in-depth research. Where appropriate, research is used to support arguments and facts contained in the work. Is able to synthesise disparate sources into a coherent whole. Techniques for practical exercises have been carefully researched.
Quality of task	The work is clear and the central narrative is well constructed and easy to follow. There are no factual or logical errors. The work is well structured, and there is a clear sense of development from start to finish. The work is engaging and shows excellent evidence of understanding of the topic. Displays excellent problem-solving skills when appropriate.
Academic skills	The work evidences a high level of academic skills. Grammar, spelling, punctuation and presentation are excellent throughout. Referencing and citation is done to a high level. The work is appropriate for a higher education audience. The work follows best-practice guidelines for the completed task (e.g. essay, presentation, report, modelling, etc.).

