

Assignment 1: Monitoring Machines

A company uses several production machines. For the production process to function optimally, the machines need to regulate their temperature and pressure. If one of them exceeds the thresholds, the products are unlikely to have the required quality. The temperature must range between 80 C° and 120 C°. The range of the pressure must be between 60 MPa (Mega Pascal) and 80 MPa.

Normally the machines are able to regulate their own temperature and pressure. However, it does happen that something malfunctions (the heat/pressure regulation units break, the machines vent heat/pressure from gaps due to wear or production mistakes, etc.). Therefore, it is important for maintenance engineers to keep an eye out for these situations.

In reality, every machine sends its state periodically to an application which would usually contain a lot of information. However, in this assignment we are only going to focus on the temperature and pressure.

You are going to develop an application to keep track of the state (temperature and pressure) of the machines. The user will be able to simulate several machines by being able to add machines and change their temperature and pressure.

In the image below you may find the GUI:

Monitoring

Machine Data

Name of machine S22B

Temperature

Pressure 75

Add Machine

Start logging

Simulate temperature data from machine

Load from file

Simulate pressure data from machine

Save to file

Output

Company and Machines

Company: VDL assembling Mini Cooper with 2 machines.

name: ABB_robot5; current temp: 95; current press: 72;

name: S22B; current temp: 90; current press: 68;

Warnings

ABB_robot5 temperature is too high!

S22B pressure is too low!

ABB_robot5 temperature is too high!

ABB_robot5 pressure is too low!

Figure 1: the provided GUI

User Interaction:

When the user starts the application they will find that the Textboxes are empty. The Listbox “Company and Machines” above it will only contain the entry: “Company: VDL assembling Mini Cooper with 0 machines.” because no machines have been added yet. If the user wants to add a machine, they can do this by filling all Textboxes in the Groupbox “Machine Data” with the desired values in and then clicking on the button “Add Machine”. This will add the machine to the system and update the Listbox “Company and Machines”.

Now this Listbox will have two entries:

- "Company: VDL assembling Mini Cooper with 1 machines."
- The machine that the user added according to the following format:
 - o name: {machineName}; current temp: {machine Temperature}; current press: {machine Pressure};

The user can also simulate a change in temperature or pressure. They do this by typing the name in the textbox "Name of machine" and typing their desired temperature or pressure below it. Then they can click the related button "Simulate temperature/pressure data from machine". This will attempt to apply the change to the machine with the desired name and display the new situation in the Listbox "Company and Machines". However, if the machine does not exist, an appropriate message should appear.

If the temperature or pressure are outside the above-mentioned acceptable ranges, a warning should appear in the Listbox "Warnings" according to the format of figure 1.

If a machine often functions outside the acceptable range, it might be a faulty machine. In such cases the user may want to log the warnings to a text-file and send them to the company that sold them this machine to find a solution.

Therefore, the button "Start logging" should allow the user to log all warnings (of existing and added machines). The button text should toggle between "Start logging" and "Stop logging" and perform the related action when clicked (start logging or stop logging).

Extra notes:

- Machine names must be unique. If the user attempts to add a machine with a name of an already added machine, an appropriate message should be displayed.
- Exceptions should be handled appropriately. E.g.: A user should not be able to crash the app if they type text in a Textbox that expects a number.
- In order to Serialize, make sure that you have unsubscribed to all events.

Steps:

Step 1:

Make a class diagram.

Identify the various entities/classes that should exist in this application.

- What are their responsibilities?
- Is SRP applied?
- Are your entities separated over the three layers?
- What data should they store?
- What should they be able to do?
- How do they relate to each other?
- Are all possible scenarios covered in your diagram?

Step 2:

Implement the application.

- Can you implement it without deviating from your class diagram?
- If not, stop implementation and change your class diagram before continuing.

There is a class diagram available on Canvas. *But for your own benefit, only use this as point of reference **after** finishing this exercise yourself (all steps)!*