

CS4271 Homework 1, 10 marks

1 Notes

- This assignment is due before **11:59 PM, Friday, 26st February, 2010**. *No late submissions, please.*
- This is an individual assignment.
- *Submission Instructions:* (Failure to follow these instructions may result in deduction of marks)
 1. Create a folder named your matriculation number YourMatricNumber, e.g. U123456M. Create the following files in this folder:
 - **assignment1:** Rhapsody project folders of your assignment. The animated sequence diagrams must be included.
 - **report.pdf:** Please include your particulars (matriculation number and NUS email address), assumptions you made in system modeling (if any), and a brief description of the bug you found in the air-traffic controller specification.
 2. Zip (using WinZip) the entire YourMatricNumber folder (including the folder itself and all files in it) into a file YourMatricNumber.zip.
 3. Submit YourMatricNumber.zip to the IVLE Workbin Folder **HW1-Submission**. *Please note the correct folder, and please submit only once.*

2 Problem Description

A weather update controller is consist of a weather control panel (WCP), a number of weather-aware clients, and a communication manager (CM) which controls the interactions between the WCP and all connected clients. Initially, the WCP is enabled for manually weather updating, the CM is at its *idle* status, and all the clients are disconnected. Two standard behaviors of this system are as follows.

- *Client initialization*
 1. A disconnected weather-aware client can establish a connection by sending a connecting request to the CM.
 2. If the CMs status is *idle* when the connecting request is received, it will set both its own status and the connecting clients status to *pre-initializing*, and disable the weather control panel so that no manual updates can be made by the user during the process of client initialization. Otherwise (CMs status is not *idle*), the CM will send a message to the client to refuse the connection, and the client remains disconnected.
 3. When the CM is *pre-initializing*, it will send a message to instruct the newly connected client to get the new weather information, and then set both its own status and the clients status to *initializing*.

4. If the client reports success for getting the new weather, the CM will send another message to inform the client to use the weather information, and then set both its own status and the clients status to *post-initializing*. Otherwise, if getting new weather fails, the CM will disconnect the client and set its own status back to *idle*.
5. If the client reports success for using the new weather, this initialization process is completed. the CM will set both its own status and the clients status to *idle*, and re-enable the WCP so that manual weather update is allowed again. Otherwise, if using new weather fails, the CM will disconnect the client, re-enable the WCP, and set its own status back to *idle*.

- *Weather update*

1. User can manually update new weather information only when the WCP is enabled. By clicking the update button on the WCP, a update message is sent to the CM.
2. When the CM is idle and receives update request from the WCP, it will set its own status and all the connected weather-aware clients status to *pre-updating*, and disable the WCP from any further updating requests before the completion of current update.
3. When CMs status is *pre-updating*, it will send messages to instruct all connected clients to get the new weather information, and then set its own status and the clients status to *updating*.
4. If all the clients report success for getting the new weather, the CM will send messages to inform the clients to use the new weather information, and then set its own status and the clients status to *post-updating*. Otherwise, if any of the connected clients reports failure for getting the new weather, the CM will send messages to all clients to use their old weather information, and then set its own status and the clients status to *post-reverting*.
5. When CMs status is *post-updating*, if all the clients report success for using the new weather, the updating is completed. The CM will set its own status and the clients status to *idle*, and re-enable the WCP. Otherwise, if any of the connected clients reports failure for using the new weather, the CM will disconnect all connected clients, re-enable the WCP, and set its own status back to *idle*.
6. When CMs status is *post-reverting*, if all the clients report success for using the old weather, the reverting is completed. The CM will set its own status and the clients status to *idle*, and re-enable the WCP. Otherwise, if any of the connected clients reports failure for using the old weather, the CM will disconnect all connected clients, re-enable the WCP, and set its own status back to *idle*.

3 Questions

1. (6 marks) Use **Rhapsody in C** to model the weather update controller system according to the specification given above. Your model should contain the class diagram and state diagram for all classes. Your class diagram should contain the three classes-the WCP, the CM, and clients, as well as corresponding multiplicities and associations. Please state clearly in the report any assumptions you make during modeling of the system.
2. (2 marks) Suppose a system has three weather-aware clients - c_1 , c_2 and c_3 . Generate an animated sequence diagram named q2Sequence for the following scenario.
 - c_1 connects to the CM successfully.
 - c_2 connects to the CM successfully.
 - After that, a weather update request is sent to the WCP.

- Both c_1 and c_2 report success in getting new weather information.
 - At meantime, c_3 tries to connect to CM. The connection request *fails* due to the weather update is in progress.
 - c_1 successful uses the new weather information, but c_2 *fails*, which causes both of them disconnected from the CM.
3. (2 marks) For the above system, produce a sequence of events that leads the system into a state such that:
- c_1 is connected to the system; c_2 and c_3 are disconnected.
 - the CM is in the *idle* state.
 - and the WCP is disabled from manual update.

Generate an animated sequence diagram named *q3Sequence* corresponding to this scenario. Note that in this state, even when the CM is idle, no weather update can be made, which is obviously not desirable. Find the bug in the specification that causes such a situation and discuss how to fix it in your report.

END OF HOMEWORK 1