Group 3 Real Time Earthquake Alarm System

Problem solving 3

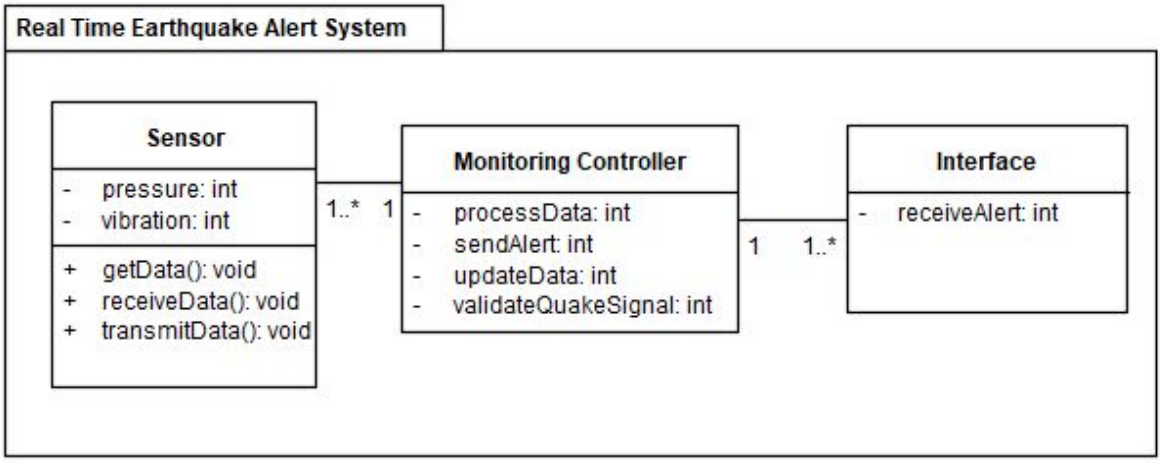
A.

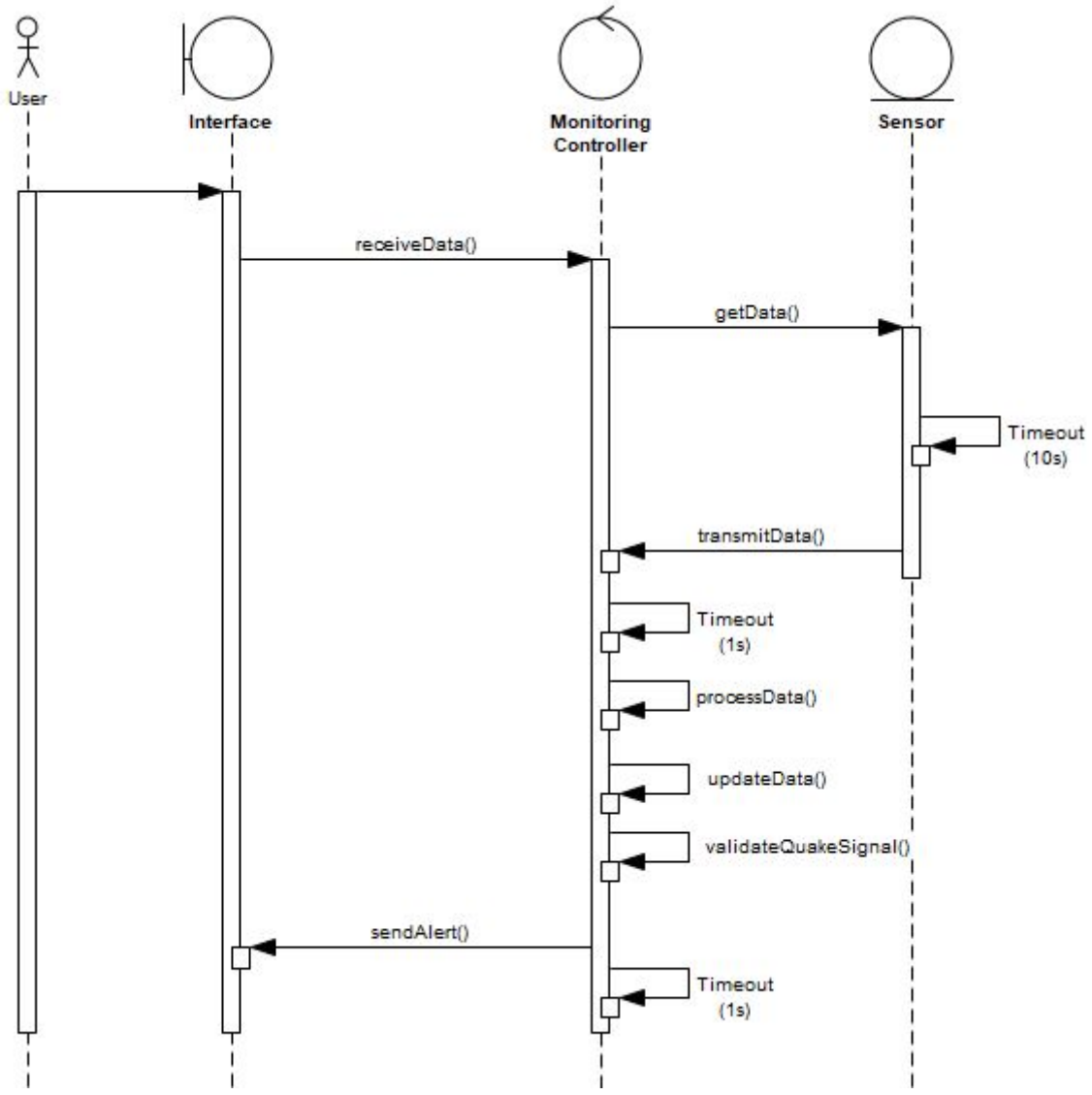
I. Select a Real-Time Modeling Profile and a tool to model real-time structure and behavior based on the selected profile (The tool must support real-time design). Refer to Dayang's Chapter 3.

The selected Real-Time Modeling profile is UML-SPT. Due to its schedulability, performance and time, the profiling technique for UML-SPT will be suitable for the Real Time Earthquake Alarm System as the measurement on quake needs to be scheduled in real time and performance and time is critical for this system. In addition, the action execution within the UML is able to show a series of actions using the statechart and activity diagrams when this profile is used.

The tool to model this real-time structure and behaviour will be the Enterprise Architect from SparxSystems as it supports illustration of UML needed for UML-SPT Profile.

II. Model structure and behavior of the selected system. The model must include the timing specification in the model. Refer to Dayang's Chapter 4.





iii.Requirements

- System should be able to detect earthquake severity.
- System should be able to monitor earthquake status in real time.
- System should be able to detect earthquake approximate locations.
- Users should be able to receive the real time quake alert.

iv. *Highlight the strength and weaknesses of the selected tool to support your system modeling.*

The strength of using the enterprise architecture tool is that the model can be abstracted to three elements which is Activity, Role and Entity. Enterprise Architecture is also able to produce activity diagrams and sequence diagrams which is important for schedubality and performance. Enterprise Architecture "acts as a collaboration force" between aspects of business planning such as goals, visions, strategies and governance principles, aspects of business operations such as business terms, organization structures, processes and data in aspects of automation such as information systems and databases. Enterprise Architecture helps to generate from the design of the UML diagram which consists of entities, role and

activities. The weakness of enterprise architecture is formal notation is not necessary which is UML is not really necessary to communicate your designs. You can have the same impact and effect with informal, box-and-line diagrams created in PowerPoint, Visio, or a whiteboard. As coding is a formal language by itself, a lot of developers don't prefer the complexity and the formality at the architectural level, which discourages the use of UML and has become one of its disadvantages.

v.

Compare the capability of the tool with the any ONE tools presented in Chapter 3 of Dayang's.

Tool	**Enterprise Architect**	**Rhapsody**
License	Not open source	Not open source
Language support	Java,C,C++,C#,Php,Python, Visual Basic and Visual Basic.Net	Java, C and C++
UML element	Two elements (class model and interface model)	Three elements (diagram tools, commons and free shapes)
Diagram support	State machine diagram, sequence diagram and activity diagram	Class Use Case, Sequence, Component Deployment Activity, Collaboration Object Model, State chart and Structure Panel

b. *Referring to your model in question a, discuss the quality of modular design elements of your model.*

i. Modules

We have 3 modules which are Sensor, Monitoring Controller, and Interface.

ii. Coupling

Modules dependency with each other by sending data values, for instance sensor data between seismographs and the main system controller can be defined as coupling in the real time earthquake alarm system. The modular design elements of the system has high level of coupling as the dependency between systems is high and one relies on another for information.

iii. *Cohesion (Coincidental, logical, temporal, procedural, communication, sequential, functional)*

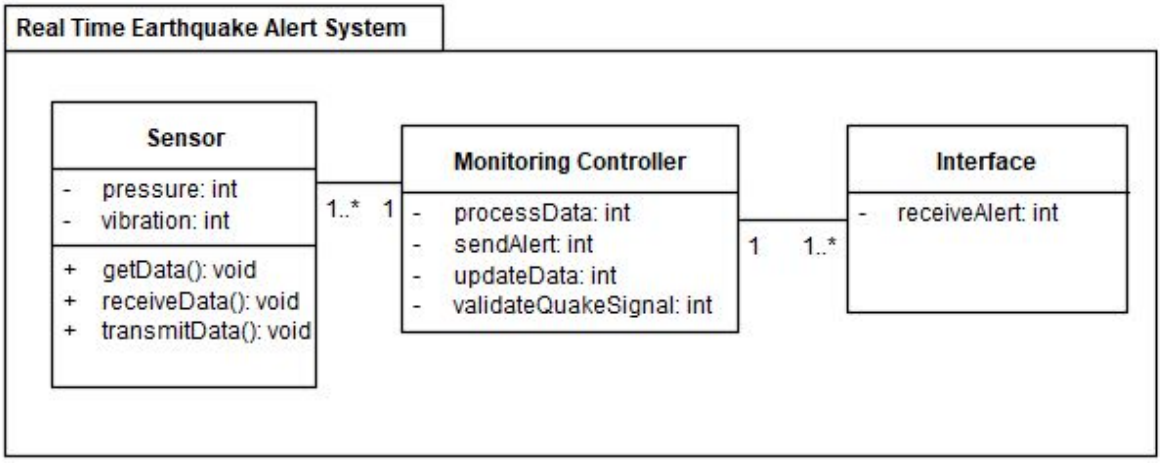
Our model has procedural cohesion because all elements of a procedure must be present if it's to perform its desired function. For example, before the monitoring controller module can process data it needs to get the data first from the sensor module that can transmit data to monitoring controller module.

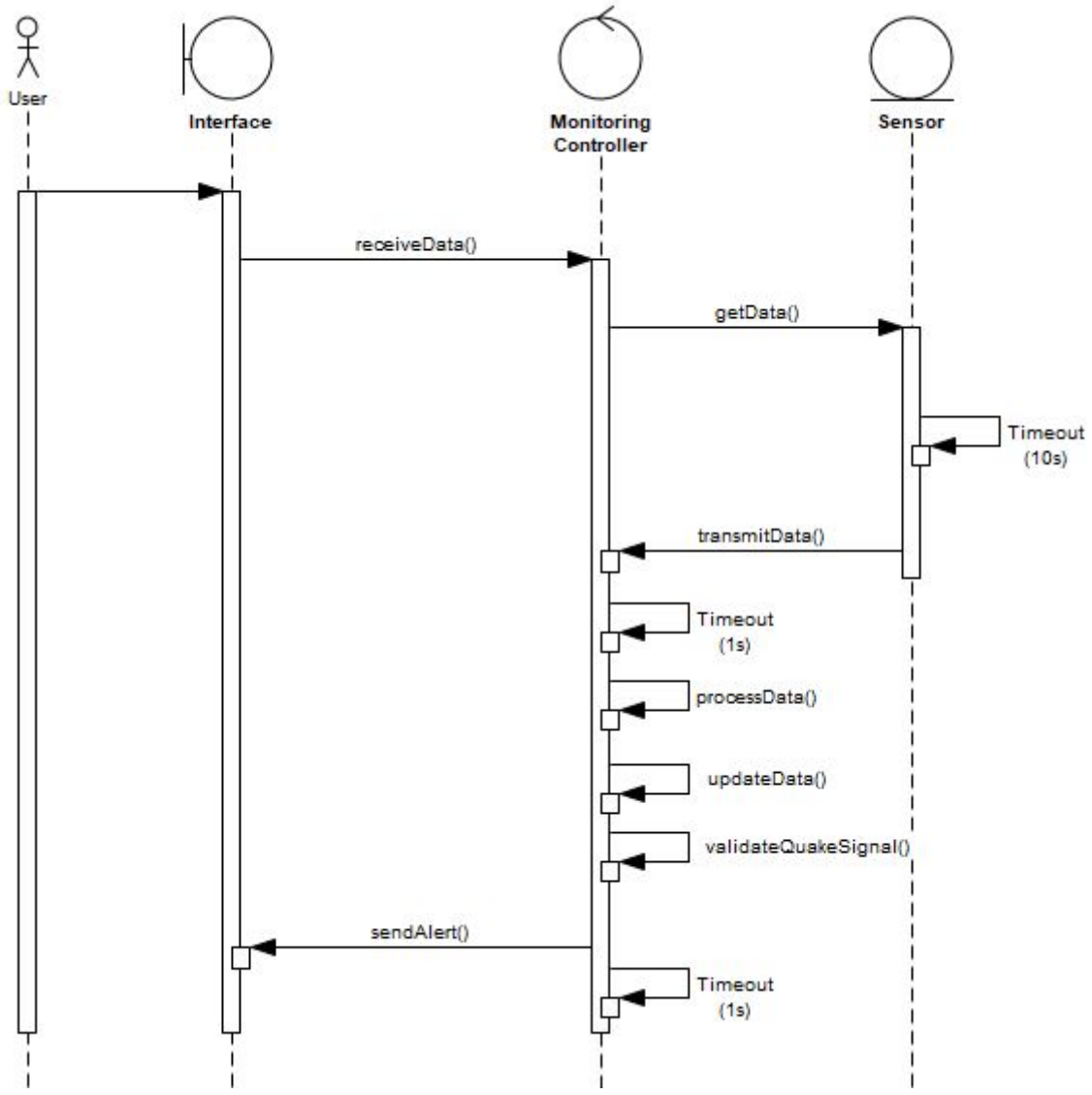
iv. Size and Complexity

Using a high-level language, one would expect to see a listing of between 60 and 100 lines of code. This equates to two pages of source code per program module. Our model has three program modules, that means we have around six pages of source code and the maintenance won't be a big problem if documented well.

C. Submit in elearning the following material before class session end

1. *Structure and behavior model of your system.*





2. *Report consist of*
    a. *Review (strength and weaknesses) of the selected tool*

Strength	**Weakness**
Load extremely large models in seconds	Pay to able fully utilize all the features
Collaborate effectively globally	User interface is outdated
Complete traceability	
Built-in source code editor and generator	

    b. *Tool comparison*

Tools **Features**	**Papyrus**	**Rational Rose RT**	**Enterprise Architect. (Selected tool)**
Licence	Eclipse Public License	Node-locked and Floating Licence	Proprietary
Programming language used	Java	Java C and C++	C and C++ C# Java PHP Python VB.Net Visual Basic
Diagrams	Class Use case Sequence Component Deployment Activity Composite	Class Structure State Sequence	Class Use case Sequence Component Activity State Timing Deployment
Standards Support	UML 2.0, SysML	UML 2.0	UML 2.5, SysML, MARTE
Full Code Generation	Yes	Yes	Yes

3. *The latest set of functional and non-functional requirements of your selected system.*
   a. *Functional*
      - System should be able to detect earthquake severity.
      - System should be able to monitor earthquake status in real time.
      - System should be able to detect earthquake approximate locations.
      - Users should be able to receive the real time quake alert.

   b. *Non-Functional*

      Performances

      - Computation Time: This must be achieved in 10 seconds for earthquake detection and alarm system.

- Computation Accuracy: The system shall be able to pass three levels of accuracy test to minimize false detection.
- Noise Level Detection: The system shall be able to detect noise level as low as 45g√hz from the real quake.
- Sensitivity Level Detection: The system shall be able to detect sensitivity level as high as 0.080mg/digit

Interface

Smart Device: The system shall be able to sends and display a warning message to nearby devices such as a smartphone or TV that pops up appropriate emergency procedures

Design Constraints

Accelerating sensors or seismograph that meet the minimum requirements specification needs to be used.

Others

Safety: The system shall be able to automatically shut off connected home-automation devices such as electricity, gas and tap water according to the level of strength.