

Software design assignment 1

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Section 1 (3 marks)

- Create user and system requirements for AirVisual/IQAir

Your SRS must contain at least:

- § 1 user requirements
 - § 2 functional requirements according to your user requirements
 - § 1 non-functional requirement according to your user requirements
 - § Your requirement must follow Ex-User-Requirements_student.docx
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Section 2 (7 marks)

Please answer these 2 questions below according to your assigned software in the first part.

1. According to your assigned mobile application in part 1 (AirVisual/IQAir), please answer the questions below.
 - 1.1. What is the software process model to develop your assigned software? Please provide a reason to support your answer. (1 marks)
 - 1.2. What is the interactor viewpoint? Who are the interactor viewpoint's stakeholders for your assigned software? Please explain. (1 marks)
 - 1.3. What is the indirect viewpoint? Who are the indirect viewpoint's stakeholders for your assigned software? Please explain. (1 marks)
2. According to your assigned mobile application, please draw the diagrams below.
 - 2.1. Draw the use-case diagram of your assigned software. (2 marks)
 - 2.2. Draw the activity diagram of the process of
 - Finding the 7-days forecast of air quality index (AQI) in Mae Rim, Chiang Mai. Your diagram must contain all main activities/actions on the client side (only on mobile application side) and you do not need to provide the activities/actions on the server side. (2 marks)
 - If you do not want to install the software, there are many videos on Youtube explaining about checking the AQI by AirVisual/IQAir.

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User requirements

- The application shall have the “map” mode, the main style of the map mode shall be in the style of a flat 2D cartographic world map with circular icons scattered around the map representing the air quality testing stations around the world, in the middle of the icon there shall be air quality value in the unit of AQI, with icon colors varies based on the color code of air quality index. Users can also see further information by clicking on the icon.
- The application shall include the “My air” mode. My air shall be the mode that allows users to add information of measured air quality from any air quality measuring stations around the world. The information from added stations shall appear in main page after being added.

FOR WEBSITE VERSION

- User shall be able to browse through the main webpage that is organized in the world map style, with different shades of colors painted on different regions of the world map indicating the overall air quality of that region in the style of heat map.
- User shall be able to see where each air quality inspection stations are located on the map to see the source of information of the overall air quality, and also the more detailed information of air quality, such as, potential health risk as related to different air quality level, the exact air quality measured by using the unit AQI, main types of dust (such as PM10, PM2.5) and the level of it measured in AQI unit.

Functional requirements

Map mode

- Actors involved : users, systems
 - The application shall have the map mode, the main style of the map mode of the application shall be in the style of a flat 2D world map with minimal information limited to the location of streets, types of terrains in the region (just enough to separate cities from forest and mountains) in the style known as "cartographic map".
 - With circular icons scattered around the map representing air quality measuring stations. The icons shall be in a shape of small circle with numbers of the air quality value measured in AQI unit in the middle, displaying the air quality through the number in the way that users don't have to click on the icon specifically to see. The background color of the circle icons shall be in a color that represents the air quality according to the air quality index color code.
 - The users shall be able to click on the icons to see more detailed information about the measured air quality from the stations represented by the icon. Further information must include air quality value measured in AQI unit, main type of dust in the area and their measured amount in the unit of $\mu\text{g}/\text{m}^3$. With additional related information, such as, weather forecast and potential health risk related to the measured air quality value and amount of dust.

My air mode

- Actors involved : users, systems
 - The main function of the mode shall be the list of locations around the world, with each location displays their respective air quality information which is gathered from multiple air quality testing stations that are considered to be within the area of each location. The list shall also be customizable, starting with nothing, but allows users to add as many locations as they wish to the list.
 - The default appearance of the mode shall be an empty list, with a button in the middle allowing users to add new locations to the list. By pressing the button, a search bar shall appear, with this, users can type in the name of their desired locations, which can be both the name of a country or a city. If users found their desired location already, they shall be able to add them through add button located on the right side of each location to add them to the list. The list shall also be able to save its information on what the current list should contain even if the application is restarted.

FOR WEBSITE VERSION

Heat map

- Actors involved : users, system
- The main webpage will display the 2D flat world map, with different shades of colors being painted on the map showing the air quality of each region of the map in the style of heat map.
 - To determine the level of air quality, the system would use the value measured in the AQI unit from different air quality inspection station, different values yields different shades of colors.
 - There will be only 5 shades of colors available to see, with green yellow orange red purple dark purple showing from the best air quality to worst respectively, the threshold can be referred from air quality index levels of health concerns.
 - Users can zoom in and out using scroll key on the mouse to see different painted region of the world map in more or less detail.
 - Users can use mouse to navigate through different parts of the map, as the entire map some times cannot fit the entire screen (the map is too large).

Non-functional requirements

- Performance requirement
 - Maximum loading time for the text and picture of the entire map should be no more than 5 seconds.
- Security requirement
 - The information should be automatically maintained by the system, but under constant surveillance of the system administrator. The only way to access the web database is by using a special website made for only administrator to login and manage the information, data, UX/UI. The main website will be in the “read only mode”, with no writing allowed to the database. The administrator website also uses 2 factor authentication to verify the admin.

- 2 factor authentication
 - With 2 factor authentication, in order for admin to login through the website, the website would send a confirmation code (6 digits) to the admin's SMS to verify the identity.
 - Creation of admin account, the admin account can only be created by inserting new admin account directly through the server room where the database is located.

1.1. What is the software process model to develop your assigned software? Please provide a reason to support your answer. (1 marks)

Air quality display system

Incremental model,

- Airvisual is a software that has a concept that exists already (a website/application that collects mass data from various sources and display it in a way that is easy to understand and easy to access, in a form of modified world map, like marinetraffic.com which displays the location and direction of ships equipped with AIS devices around the world in a form of scattered icons around the world map) so prototyping model is not necessary,
- the application, although displays mainly just the air quality, also displays other information as well, for example, the quantity of certain dust and weather forecast and also potential health risk related to the current air quality, meaning that a construction process can be divided in a form suited for incremental models (pyramid shape, developing the most barebone but also the most fundamental function of the application, but more fancy addons can be added later through later incrementals, for example, developing the barebone colorless world map that displays air quality testing station and their collected air quality value in AQI unit, but later added color, more information from each station, more functions like exposure which informs users of health risk related to the air quality of the user's current location)
- The application is also standalone (based on my assumption), it is not a critical software of other larger software, instead, it is built to be by itself, so there is no reason for rush development, so extreme programming and RAD is not needed here.
- The waterfall model can also be applied to the development process as well, but since incremental model has an advantage of being better of handling midway requirement changes, to handle with those, incremental model thus seems to be a better choice. Other than rush development, this is also another reason why incremental model would be more suited compared to RAD and extreme programming.
- Still, the end milestone of developmental process (exclude the maintenance) can still be set under the scope of " an app that displays air quality", so a developmental process with vague end goal of both the app development and

finished time like spiral model seems to be inferior compared to incremental model which has a clearer goal of a finished product.

1.2. What is the interactor viewpoint? Who are the interactor viewpoint's stakeholders for your assigned software? Please explain. (1 marks)

Integrator viewpoint is a way of structuring the requirements for a software development, based on the frustrations, pain, and need of different types of people that can potentially interact with the software regularly.

Simply speaking, the interactor viewpoint refers to the perspective or set of concerns of individuals or systems that interact with a software system.

Viewpoint's stakeholders (e.g. people that interact with the software) are

- People who have to work or live in a city, from street sweepers to students. Since many types of dusts originate from car exhaustion (combustion of fossil fuels or woods), it is typical for city, which is an area with large number of cars, to have a high number of these dust, which can cause serious health risk. Thus, people who live in said area would likely need and interact with an app that informs them about daily air quality and preventative measures to how they can combat these health threats from dust.
- Local school authority body (like headmaster, teachers, employees who work in a school), especially kindergarten where most of its population are not capable of accessing technology and lack clear understanding of the threat from bad air quality. The authority can use the information for many purposes, such as, halt all outdoor activities in a day when air quality is considered to be a potential health threat, or even shut the school down temporarily, to protect the health and well being of the kids.

1.3. What is the indirect viewpoint? Who are the indirect viewpoint's stakeholders for your assigned software? Please explain. (1 marks)

The **indirect viewpoint** is a perspective in system design that focuses on the **broader context and secondary stakeholders**, those who may not directly interact with the software, but who are still impacted by it in some way. While the **interactor viewpoint** focuses on the people directly interacting with the system (e.g., end users, administrators, external services), the **indirect viewpoint** considers those whose interests might be affected by the system's operation, even though they don't engage with it directly.

- Environmental researchers, these people don't interact with the system directly and regularly, but from time to time, the information from the app can be used as a source of information for their research papers, for example, Ph.D nominee health researchers who want to publish a paper related to rising rate of lung

cancer in the city area can use the information to reinforce his prove that dust from combustion engine really causes lung cancer.

- Ministry of public health, it can use the information from the app to assess the area with high level of dust which can pose a serious health threat to the local population, to further find the causes and solution to them, to ensure the good health and well being of citizens, which is actually the goal of the organization.
- FEMA, unusual spike in the amount of dust in certain areas (especially with unusual type of dusts) can indicate an accident or an emergency, such as, wild fire which usually causes a large amount of dust, or a chemical leak.
 - The reason why the ministry of public health and FEMA are considered to be an indirect viewpoint's stakeholders, is because they use Airvisuals data, but do not use the app directly like how civilians use.

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