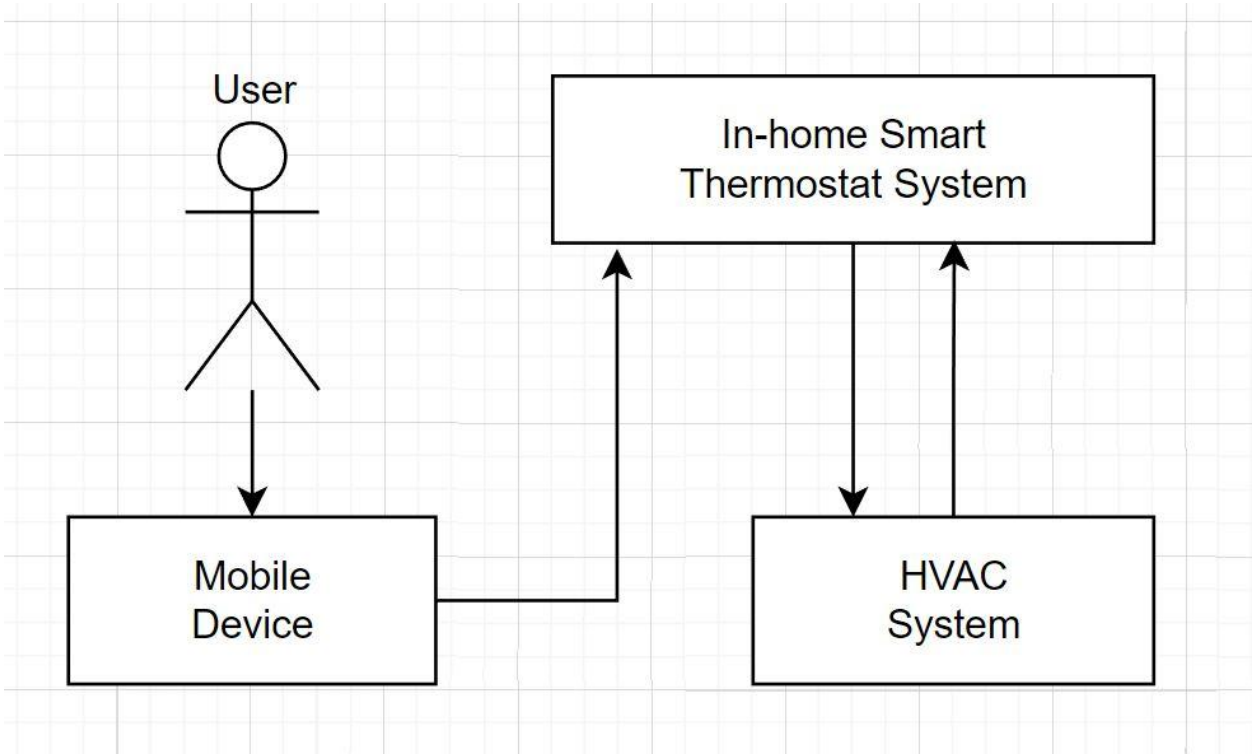
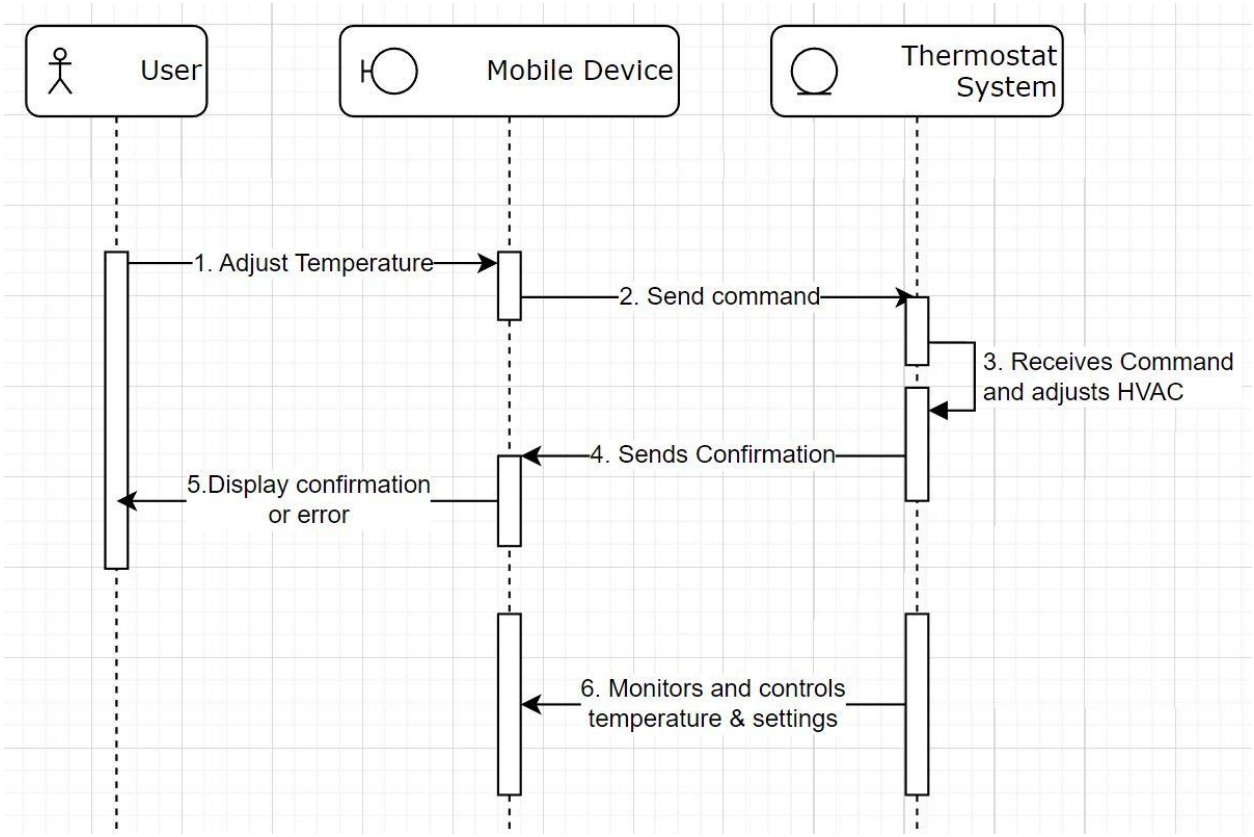
UML Case Diagram:



The UML case diagram represents the main actors and their interactions in the in-home smart thermostat system:

- The "User" represents the homeowner who interacts with the smart thermostat system.
- The "HVAC System" represents the heating, ventilation, and air conditioning system installed in the user's home.
- The "Mobile Device" represents the user's smartphone or tablet that acts as an interface to control and monitor the smart thermostat system.

UML Sequence Diagram:

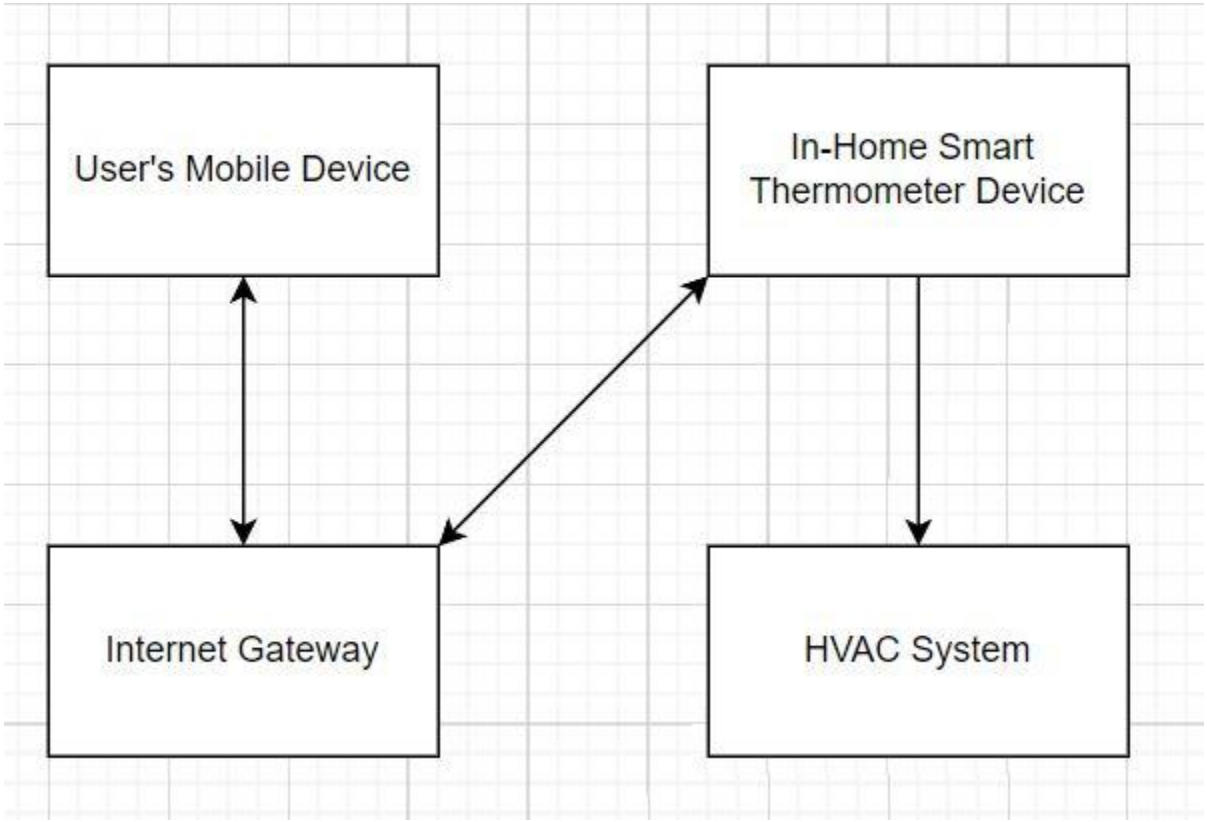


Explanation:
The UML sequence diagram illustrates the interactions between different components in the thermostat system:

- The "User" adjusts the temperature on the mobile device (step 1).
- The "Mobile Device" sends a command to the in-home thermostat system (step 2).
- The "In-Home Thermostat System" receives the command and adjusts the thermostat settings accordingly (step 3).
- The "In-Home Thermostat System" sends a confirmation back to the mobile device (step 4).
- The "Mobile Device" receives the confirmation or error and displays it accordingly (step 5).
- The "In-Home Thermostat System" continuously monitors and controls the temperature and settings and sends information to “Mobile Device” (step 6).

Please note that the diagram represents a simplified sequence of interactions for illustration purposes. Obviously, this can be expanded to be very complex but the assignment is unclear about how comprehensive this needs to be.

UML Deployment Diagram:



Explanation:

- The "User's Mobile Device" communicates with the "In-Home Smart Thermostat Device" via the "Internet Gateway" (which connects to the internet).
- The "In-Home Smart Thermostat Device" interacts with the "HVAC System" to control the heating and cooling.
- The "Internet Gateway" serves as the communication bridge between the user's mobile device and the thermostat device.

Report:

a) UML Case Diagram:
The UML case diagram provides a high-level understanding of the in-home smart thermostat system. It identifies the main actors involved, such as the User, HVAC System, and Mobile Device. The diagram demonstrates that the User interacts with the system through the Mobile Device, which in turn controls and communicates with the HVAC System. This diagram helps in identifying the key functionalities and system boundaries.

b) UML Sequence Diagram:
The UML sequence diagram showcases the flow of interactions between the User, Mobile Device, and HVAC System. It illustrates how the User adjusts the temperature on the Mobile Device, which then sends a command to the HVAC System. The HVAC System receives the command, adjusts the settings accordingly, and sends a confirmation back to the Mobile Device. This diagram provides a detailed view of the message flow and the order of interactions between the system components.

c) UML Deployment Diagram:
The UML deployment diagram presents the physical arrangement of the in-home smart thermostat system. It shows that the User's Mobile Device connects to the In-Home Smart Thermostat Device via an Internet Gateway. The In-Home Smart Thermostat Device interacts with the HVAC System to control the heating and cooling. This diagram highlights the distribution of components across nodes and their communication paths.

d) Design Justification:

The UML case diagram is designed to showcase the key actors and their relationships in the system. By including the User, Mobile Device, and HVAC System, it provides a clear understanding of the system's boundaries and the main interactions.

The UML sequence diagram focuses on the user's interaction with the system and the flow of messages between components. It highlights the steps involved in adjusting the temperature and the confirmation flow, allowing for a detailed understanding of the system behavior.

The UML deployment diagram emphasizes the physical distribution of components and their connections. It demonstrates how the User's Mobile Device communicates with the In-Home Smart Thermostat Device through the Internet Gateway, which facilitates the control of the HVAC System. This diagram helps in understanding the system's architecture and deployment requirements.