# IoT Mold Prevention System

## Scenario

Mold formation is a common problem in homes with poor ventilation, especially during cold and damp seasons. Excessive indoor humidity contributes to mold growth, which can damage property and pose health risks.
By monitoring environmental conditions and guiding users on optimal ventilation times, this system aims to create a healthier living environment.

A typical use case involves:

- Monitoring temperature and humidity in rooms such as the living room, bedroom, and kitchen.
- Fetching outdoor climate data from sensors or APIs.
- Computing absolute humidity for both indoor and outdoor conditions.
- Comparing humidity levels to recommend when windows should be opened.
- Providing notifications trends via a user-friendly dashboard or mobile app.

| **Functional Requirements** |
| --- |
| **FR1 – Indoor Temperature and Humidity Monitoring**<br>**Requirement:** The System can measure the temperature and humidity in multiple indoor rooms.<br>**Input:** Current room temperature and humidity<br>**Output:** System status update |
| **FR2 – Outdoor Temperature and Humidity Monitoring**<br>**Requirement:** The System can fetch the outdoor temperature and humidity using API's or sensors.<br>**Input:** Current outdoor temperature and humidity at a specific location<br>**Output:** System status update |
| **FR3 – Absolute Humidity Calculation**<br>**Requirement:** The System can calculate the Absolute Humidity for indoor and outdoor conditions<br>**Input:** Temperature and Relative Humidity<br>**Output:** System status update |
| **FR4 – Compare Indoor and Outdoor Absolute Humidity**<br>**Requirement:** The System can compare the Absolut Humidity for indoor and outdoor conditions. Raises a flag, if the user should open a window.<br>**Input:** Absolute Humidity<br>**Output:** System status update, Flag |
| **FR5 – User Notification to recommend when the window should be opened**<br>**Requirement:** Notify the user when outdoor Absolute Humidity is lower than indoor Absolute Humidity.<br>**Input:** Absolute Humidity Comparison<br>**Output:** Notification to the user |

| Functional Requirements |
| --- |
| **FR6 – User Warning for high indoor Relative Humidity**<br>**Requirement:** Send a warning to the user, when the indoor Relative Humidity exceeds a defined threshold.<br>**Input:** Indoor Relative Humidity<br>**Output:** Alert notification to the user |
| **FR7 – Update Sensor Configuration**<br>**Requirement:** Allows the user to dynamically add or remove sensors<br>**Input:** Sensor Configuration Data<br>**Output:** Updated System |
| **FR8 – Update Thresholds**<br>**Requirement:** Allows the user to dynamically update thresholds for alerts and notifications.<br>**Input:** User Input<br>**Output:** Updated System |
| **FR9 – User registration**<br>**Requirement:** Allow user registration.<br>**Input:** User data<br>**Output:** Registered User |
| **FR10 – House registration**<br>**Requirement:** Allow house registration. A house contains one or more rooms.<br>**Input:** House data<br>**Output:** Updated System |
| **FR11 – Remote Window Opening**<br>**Requirement:** The user can open the windows remotely or start a ventilation system.<br>**Input:** User command<br>**Output:** Window opened, or ventilation system started |

| Non-Functional Requirements |
| --- |
| **NFR1 - Cost-Effectiveness**<br>The system must be affordable to ensure accessibility for a broad range of users. |
| **NFR2 - Energy Efficiency**<br>Sensors must operate with low power consumption to ensure extended battery life.<br>Data transmission must be optimized to reduce energy usage. |
| **NFR3 – Real Time Notifications**<br>The system must send real-time notifications to users about updates or issues, ensuring timely actions. |
| **NFR4 - Environmental Conditions**<br>Indoor sensors must operate reliably within 0°C to 50°C and 10%-90% Humidity.<br>Outdoor sensors must operate reliably within -20°C to 50°C and 0%-100% Humidity.<br>Outdoor sensors must withstand environmental conditions such as rain, frost, and heat. |