**NON-FUNCTIONAL REQUIREMENTS**

**1. Performance**

* **Quick Response:** The system should respond to user actions (like turning a light or fan ON/OFF) within 2 seconds in normal conditions.  
  *Example: When a user taps “Turn ON Light,” the light should react almost instantly.*
* **Handling Requests:** The system should smoothly handle at least 100 appliance control requests per minute without slowing down.
* **Multiple Users:** At least 50 people should be able to use the system at the same time without issues.
* **Real-Time Updates:** Sensor data, like power usage or appliance status, should update in less than 1 second.

**2. Reliability**

* **Always Available:** The system should work at least 99% of the time each month (excluding planned maintenance).
* **Fault Handling:** If there’s a hardware or network failure, the system should automatically switch to a backup option.
* **Data Backup:** Usage logs and system settings should be backed up every 24 hours.
* **Quick Recovery:** If the system crashes, it should be back to normal within 5 minutes.

**3. Security**

* **Safe Login:** Users must log in with a strong password (minimum 8 characters, with at least one uppercase letter, one number, and one special character).
* **Access Control:** Admins can manage appliances, while normal users can only control them.
* **Data Protection:**
  + Sensitive information (like passwords) should be encrypted with strong methods (AES-256).
  + All communication between users and the system should use secure channels (like HTTPS).
* **Intrusion Alerts:** If someone tries to log in incorrectly 3 times in a row, their account should be locked, and the attempt logged.

**4. Maintainability**

* **Modular Design:** The system should be built in separate modules (Authentication, Appliance Control, Monitoring) so updates are easier.
* **Clear Documentation:** Each part of the system should come with full design details, API references, and troubleshooting steps.
* **Helpful Error Messages:** Instead of confusing codes, users should see simple messages like *“Device not connected”* rather than *“Error 404.”*
* **Easy Updates:** Bug fixes and updates should not take more than 10 minutes of downtime.

**5. Other Qualities**

* **User-Friendly:**
  + 90% of first-time users should be able to operate appliances within 5 minutes of basic training.
  + Buttons, icons, and menus should be intuitive, consistent, and well-labeled.
* **Cross-Platform:** The system should work on Windows, Linux, and Android with minimal setup.
* **Expandable:** It should support up to 500 appliances without needing a complete redesign.
* **Works with Others:** The system should integrate with popular smart home platforms (like Alexa and Google Home) using standard protocols (MQTT, REST APIs).

**6. Compliance**

* **Industry Standards:** The system should follow IEEE 830/29148 standards for software requirement documents.
* **Quality Assurance:** It should meet ISO/IEC 25010 quality standards (covering usability, reliability, performance, security, etc.).
* **Legal & Safety Rules:**
  + Must follow data privacy laws to keep user info safe.
  + Should comply with electrical safety standards (like IEC) for device communication and control.