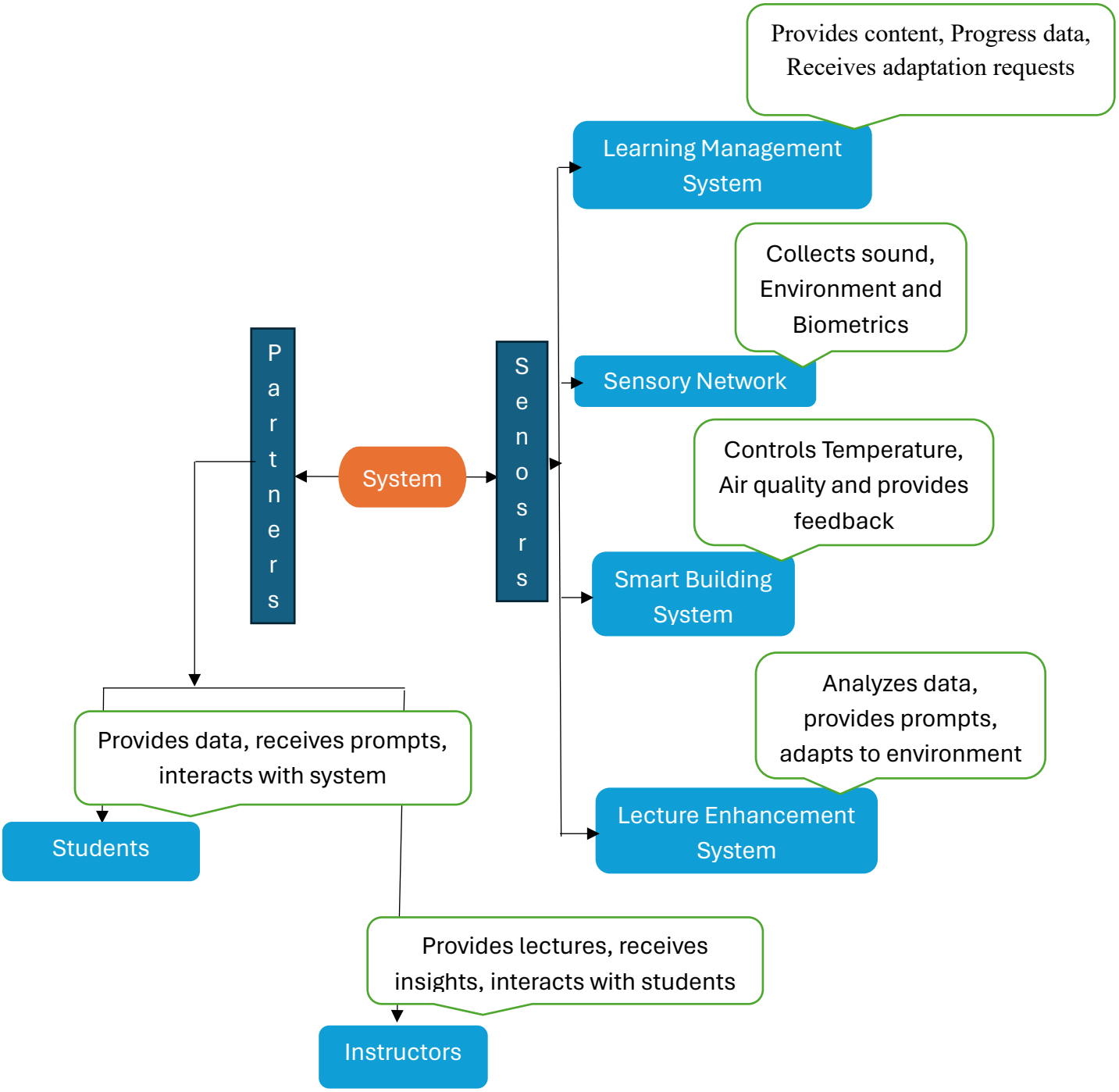
HOMEWORK 2

(Software Engineering CS487)

1. Context model showing the system and its partners

- Analyzes data from multiple sensors and partners, personalizes opinions to individual needs, and delivers personalized assistance for student participation.



2. Binary protocol for all C-C-I communication

- The binary protocol enables efficient communication between the LES controller (C) and its subsystems (C), such as NFS, TCS, and AMS, allowing them to interact(I) and share data.
- Example Binary Commands:

  '01' - Request the current noise level from NFS.

  '10' - Request the current room temperature from TCS.

  '11' - Request current student awareness level from AMS.

- Response codes:

  00: No action required.

  01: Action necessary (Example: Adjust Noise levels, temperature, or prompt student)

Implementation

- **The Noise Filtering System (NFS)**
  Function: Filters away unwanted sounds via active noise cancellation.
  CCI Communication:
  - LES sends '01' to request noise level.
  - NFS responds with noise level information. If the threshold is met, LES instructs NFS to Activate Noise Cancellation.
- **Temperature Control Systems (TCS)**
  Function: Maintains a suitable temperature through smart HVAC integration.
  CCI Communication:
  - LES sends '10' to request the current temperature.
  - TCS responds with temperature data. If the temperature is outside the comfort range, LES commands TCS to adjust HVAC settings.
- **Awareness Monitoring System (AMS)**
  Function: Monitors student awareness using wearable devices that track indicators like heart rate or eye movement.
  CCI Communication:
  - LES sends '11' to request awareness level.
  - AMS responds with awareness information. If a student's participation falls below the threshold, LES encourages them to increase it.

- **Security and Privacy**

  Given the sensitive nature of data, especially with AMS, the system includes encryption within the binary protocol and implements data protection standards to ensure privacy and security.

3. LES-to-student protocol (C-H-I)

- The LES-to-student protocol would be focused on seamless and intuitive engagement, ensuring that the system improves the learning experience while not being a distraction. The protocol could include:

  - **Noise Filtering:** Install a *Headphone that uses Active Noise Cancellation* technology to filter out background noise, allowing students to hear the lecture clearly.

  - **Temperature Control:** Integrate a *smart HVAC system* to keep the learning environment at a comfortable temperature. This system should be able to modify the temperature in real time using temperature sensors and student preferences.

  - **Awareness monitoring and Prompting:** Use *wearable watch or non-intrusive sensors* to monitor student engagement levels, such as biometric sensors (heartbeat). When a decrease in awareness or engagement is detected, the system should alert the student discreetly, possibly via a vibrating wearable gadget or a personalized message on their device.

  - **Real-Time Feedback:** Create a feedback loop for the LES to learn and adjust to each student's unique needs over time. Use machine learning algorithms to personalize engagement techniques.

  - **Privacy and consent:** All student data gathered by the LES must be securely maintained and processed in compliance with privacy laws and regulations. Students should have control over their data and be allowed to opt out of monitoring if necessary.

  - **Personalization Settings:** Upon initial use, students could adjust their unique preferences for noise levels, temperature, and types of awareness reminders via a user-friendly interface on their devices.

4. Flow Chart to explain detection and handling of Noise, Uncomfortable, and Lack of Awareness