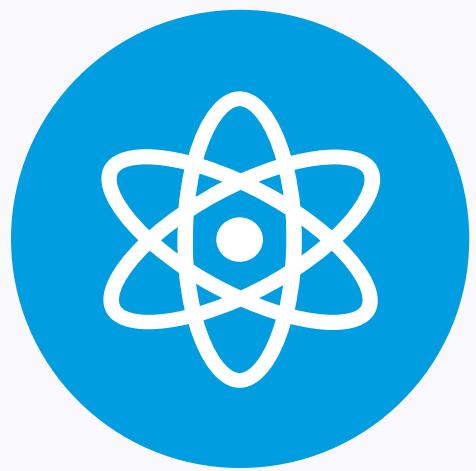


Dynamic Emergency Monitoring System

Revolutionizing Emergency Triage with Real-Time Monitoring

1. Advisors and Mentor



Scientific Advisor:
Prof. Teresa Vazão



Scientific Co-advisor:
**Prof. Dr. Rui Tato
Marinho**



Mentor:
Gerson Ferreira



Medical Advisor:
Dr. João Gouveia

Emergency Triage is Failing Patients Are at Risk

“66-year-old man found dead in the emergency room of Coimbra Hospital after waiting 12 hours” (DN, 2024)

“Regulator says hospital “did not monitor” elderly woman who died in the emergency room” (Observador, 2024)

“Évora Hospital confirms death of user in the emergency service urgency” (Expresso, 2023)

2. Problem

- ⚠️ Manual triage systems are **outdated** and **static**.
- ⚠️ Critical patients can **deteriorate unnoticed**.
- ⚠️ Healthcare staff are **overwhelmed** and **resources misallocated**.



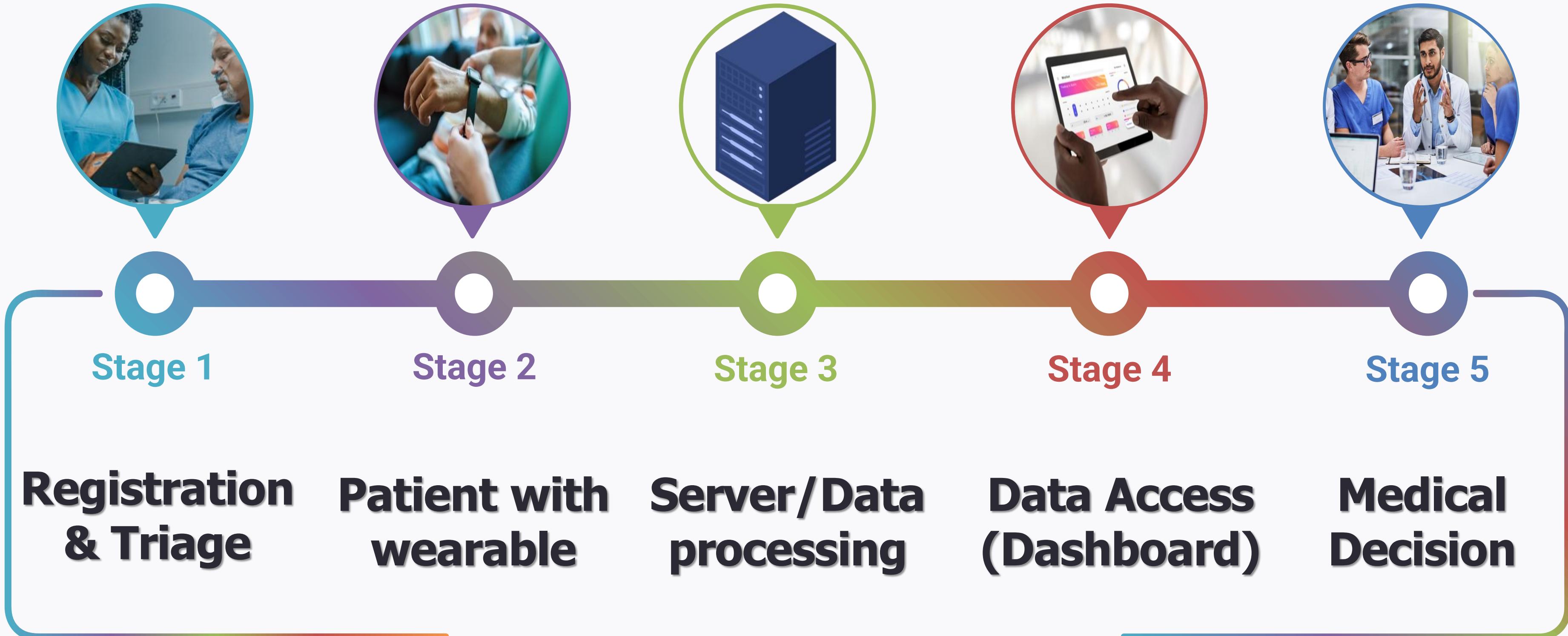
“ it's time for health facilities to embrace new patient monitoring technologies to support them in caring for patients” (O’Malley, T. , 2020)

What We're Bringing to Emergency Care

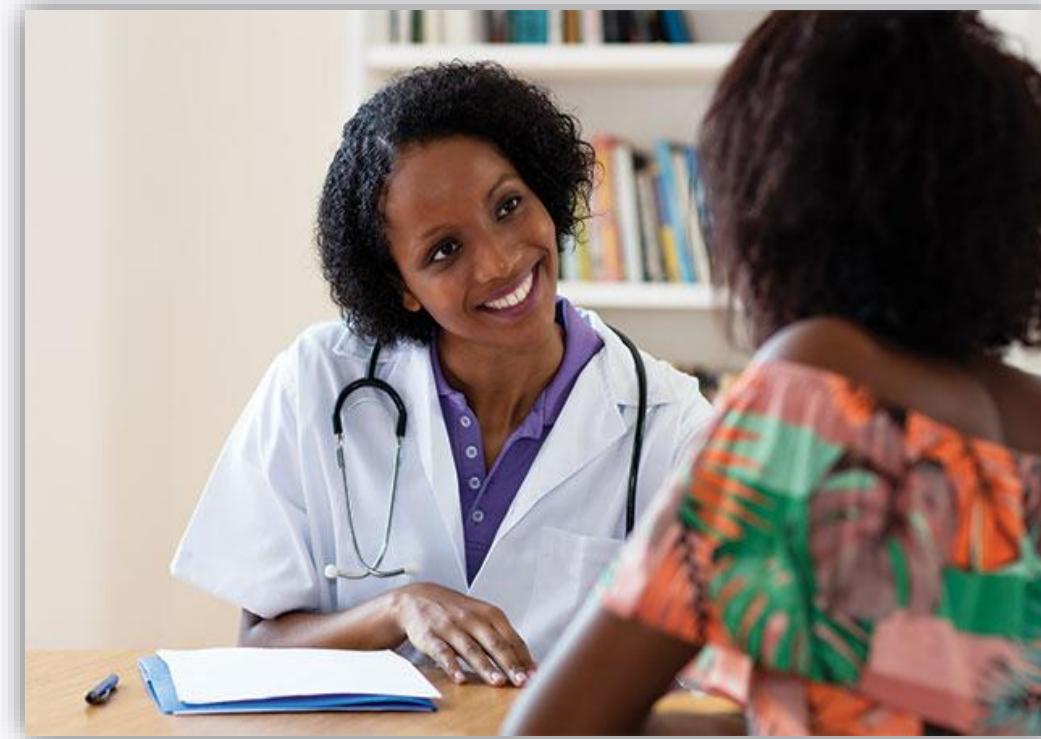
- ❖ Real-time emergency patient monitoring with wearable sensors for improved efficiency, accuracy, and prioritization in emergency care.



3. Technological solution



4. Solution beneficiaries

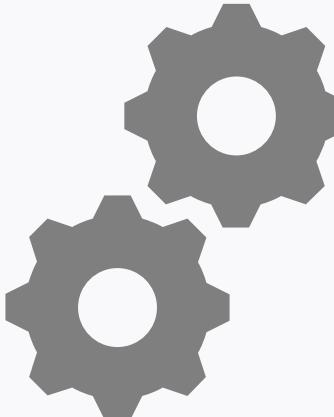


**Patients in
emergency room**

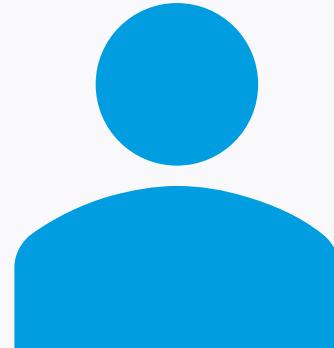
**Healthcare
providers**

**Families and
caregivers**

5. Solution requirements



**Real-Time Vital Sign
Measurement**



(Re)usability and Comfort



Low Latency Alerts

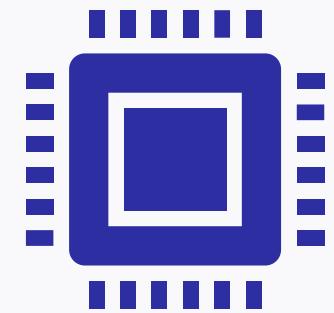


**Scalability and Cost-
Efficiency**

6. Technical challenges



**Sensor
Accuracy and
Reliability**



**Real-Time
Data
Processing**



**Connectivity
Issues**



**Dynamic
Alert
Algorithm**



**Regulatory
compliance**

7. Testing and validation metrics



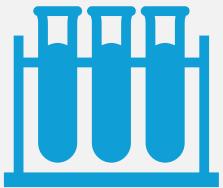
8. Partners



**Santa Maria Local
Health Unit**



**Engagement with
Healthcare Providers**



**Testing in Real-life
Scenarios**



UNIDADE LOCAL DE SAÚDE
SANTA MARIA

9. Current solutions and previous work

Traditional triage systems

ICU monitoring systems

Wearable devices(smartwatches)

CEIIA 2.0 project

**Real-Time Monitoring Electronic
Triage Tag System**



10. Competitors

LOW INTEGRATION

SIMPLE + REUSABLE

Securitas
Healthcare



PHILIPS
Healthcare



BioIntelliSense

MASIMO

Sotera
DIGITAL HEALTH

Our Solution

ZOLL
®

Medtronic

H U M A

CONTEC

COMPLEX + NON-REUSABLE

HIGH INTEGRATION

11. Team



Filipe Esteves
Software Engineer



João Veríssimo
Research Manager



Marco Matos
Algorithms & Backend
Engineer



Tomás Modesto
Hardware Engineer



João Ferreira
App Developer



Gustavo Zacarias
Web Developer

12. Division of labor (I)

João Veríssimo

**Research/
Interviews**

Bracelet (S)

App

Algorithms

Filipe Esteves

Bracelet(S)

Server & Comms

Website

Research

Marco Matos

Algorithms

Server & Comms

Bracelet (H)

Research

13. Division of labor (II)

Tomás Modesto

Bracelet (H)

App

Research

Bracelet (S)

João Ferreira

App

Server & Comms

Bracelet (H)

Research

Gustavo Zacarias

Website

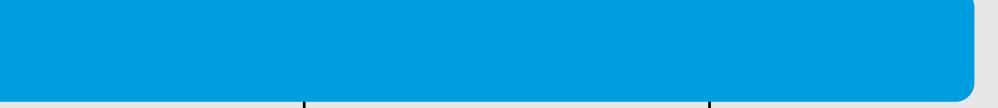
Algorithms

App

Research

H – Hardware | S – Software | Comms – Communications

14. Original Schedule

Tasks by field \ Months	Feb	Mar	Apr	May	Jun	July
Proposal						
Research/Interviews						
Bracelet (Hardware)						
Bracelet (Software)						
Algorithms						
Server						
App						
Website & Blog						

15. Mid-program status



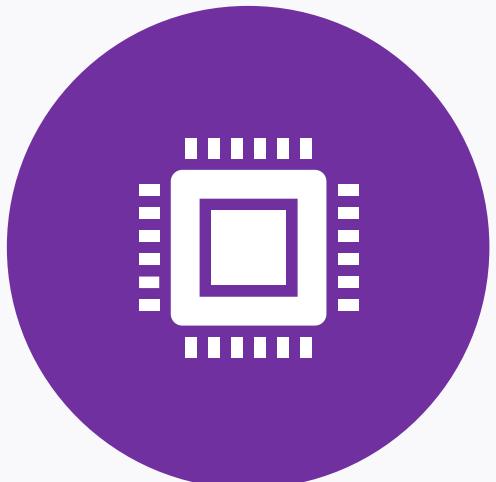
Refined Problem & Solution

Focus on real-time monitoring of yellow-category patients with wearable sensors for improved triage efficiency.



Requirements Analysis

Engaged with healthcare professionals to identify key challenges like system interoperability and real-time data accuracy.



System Design & Prototyping

Developing a modular architecture with edge computing; initial prototypes are being tested.



Project Management & Communication

Regular stakeholder feedback, structured communication, and iterative improvements to align with medical needs.

16. Achieved results



Project definition and scope



Background research



Requirements



**System design &
prototyping**



Project management



16.1 Project definition and scope

▪ Problem Statement:

Emergency departments struggle with patient overload, inefficient triage processes, and a lack of real-time monitoring, leading to delayed interventions and compromised patient outcomes.

Project Goals:

Real-time emergency patient monitoring system

Improve efficiency, accuracy, and prioritization in triage.

Seamlessly integrate with existing hospital workflows.

Scope:

Focus - yellow-category patients to prevent condition deterioration.

Ensure system scalability and interoperability

Validated data accuracy and (re)usability.

16.2 Background Research

■ Existing Challenges ! :

1. Manual triage → **Delays & errors**;
2. Vital sign monitors → **Lack of integration**;
3. **No real-time monitoring** for yellow-category patients.

■ Research Areas 📚 :

1. **Manchester Triage System (MTS)** & other triage models;
2. Wearable sensor technology in healthcare;
3. Edge computing & real-time data processing.

■ Innovation Opportunities💡 :

1. Wearable sensors → Continuous monitoring;
2. Hospital system integration → Streamlined triage process.

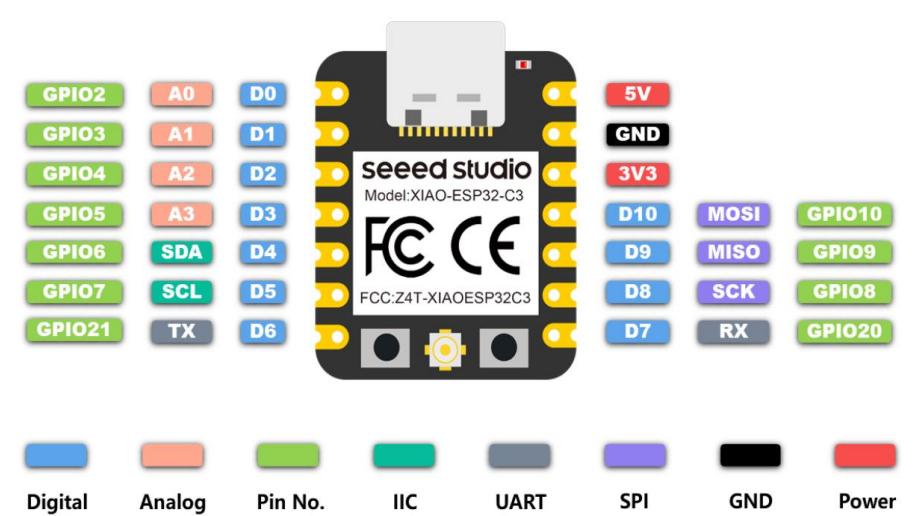
Emergency department acuity measurement
and process

Quick Scoping Review

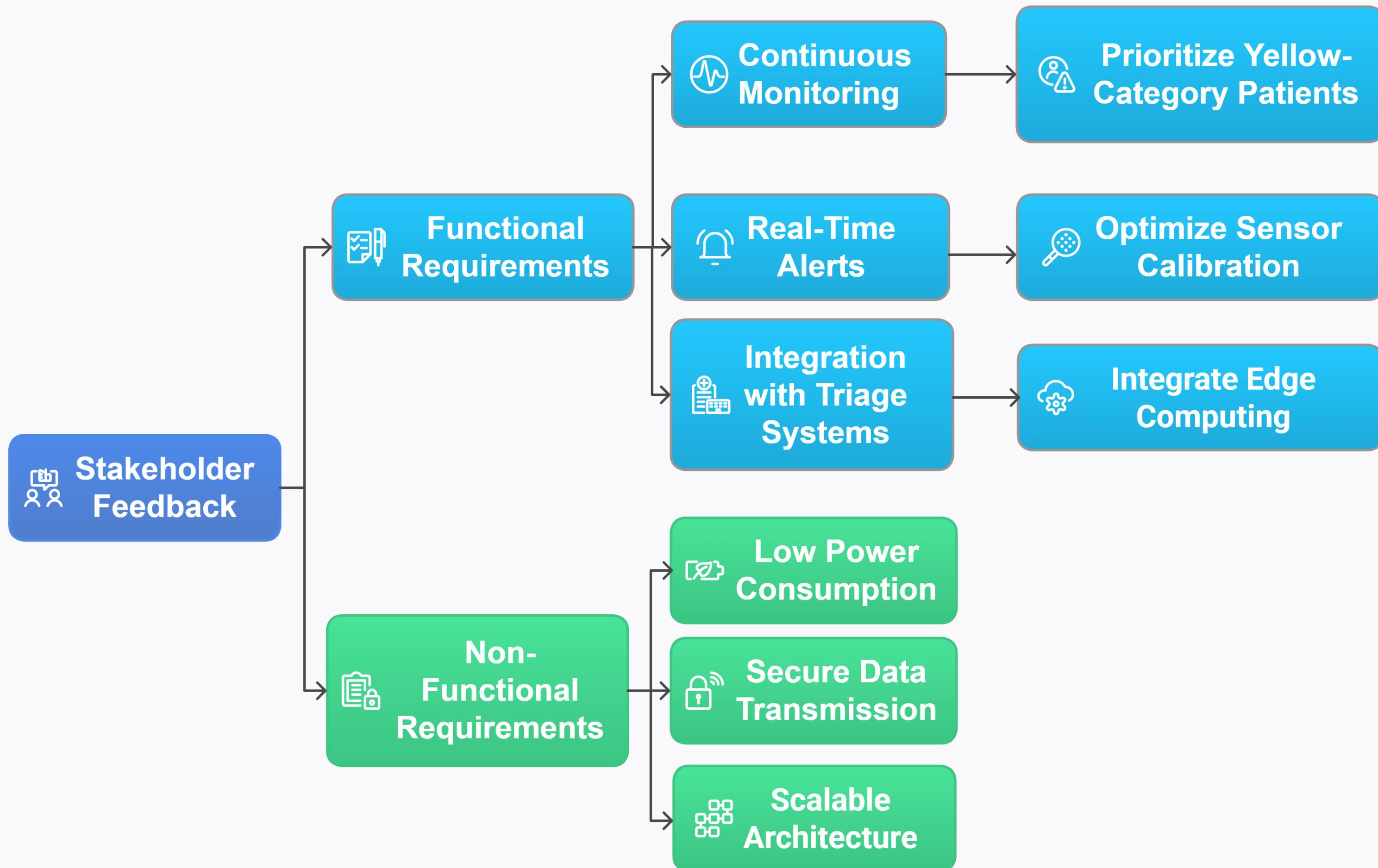
March 2023



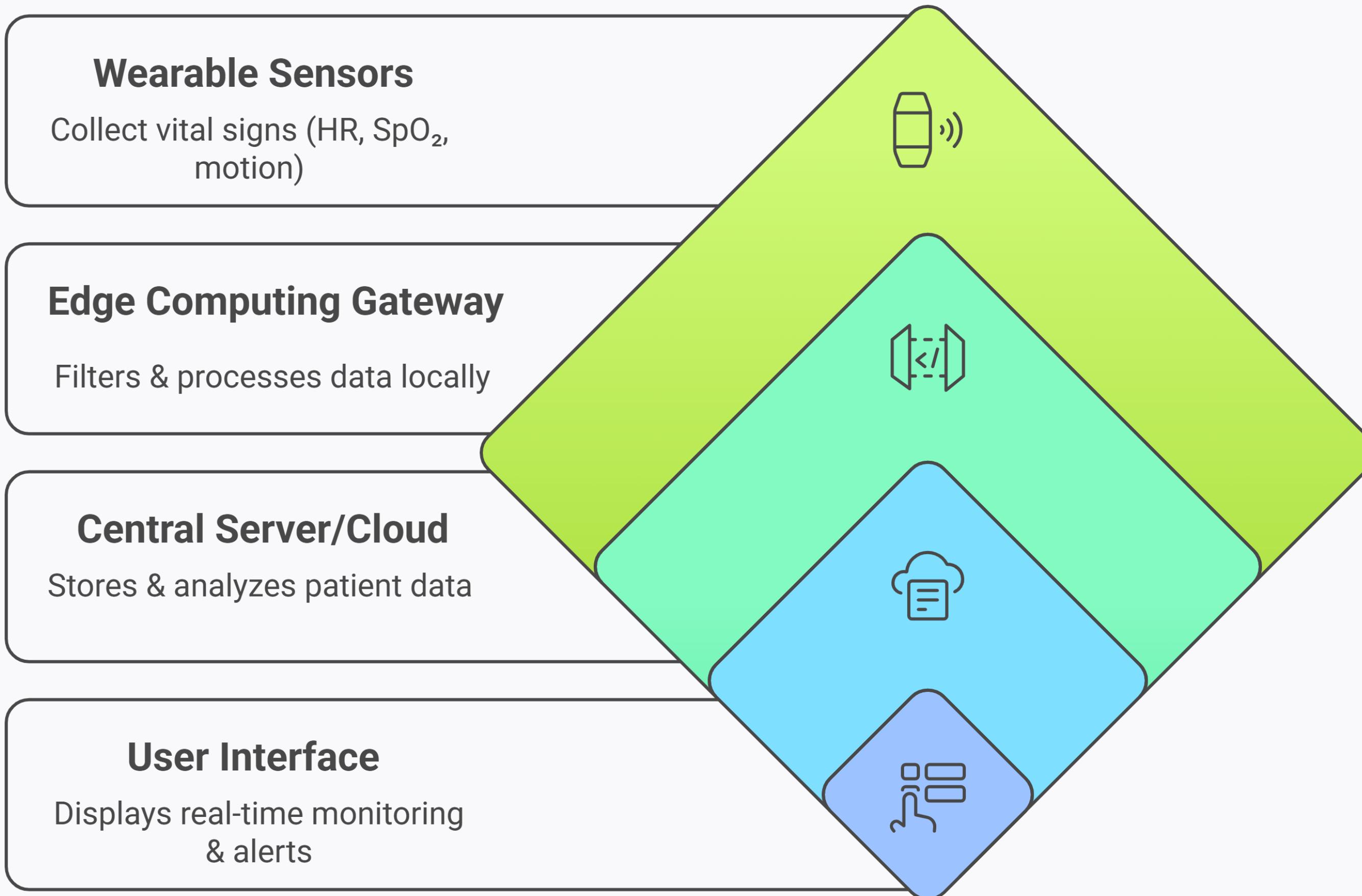
Midlands and Lancashire
Commissioning Support Unit



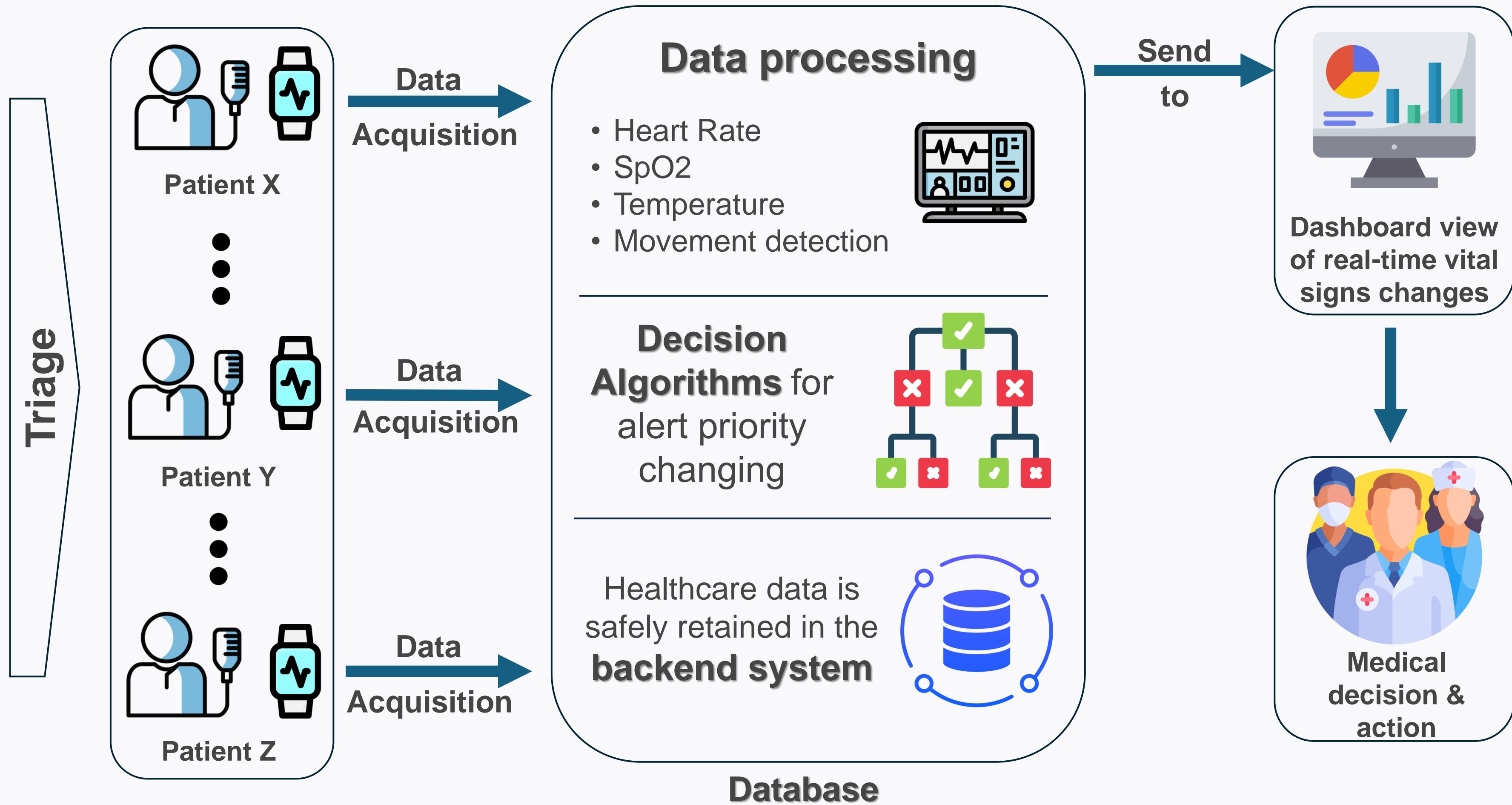
16.3 Adjusted requirements: Feedback-based refinements



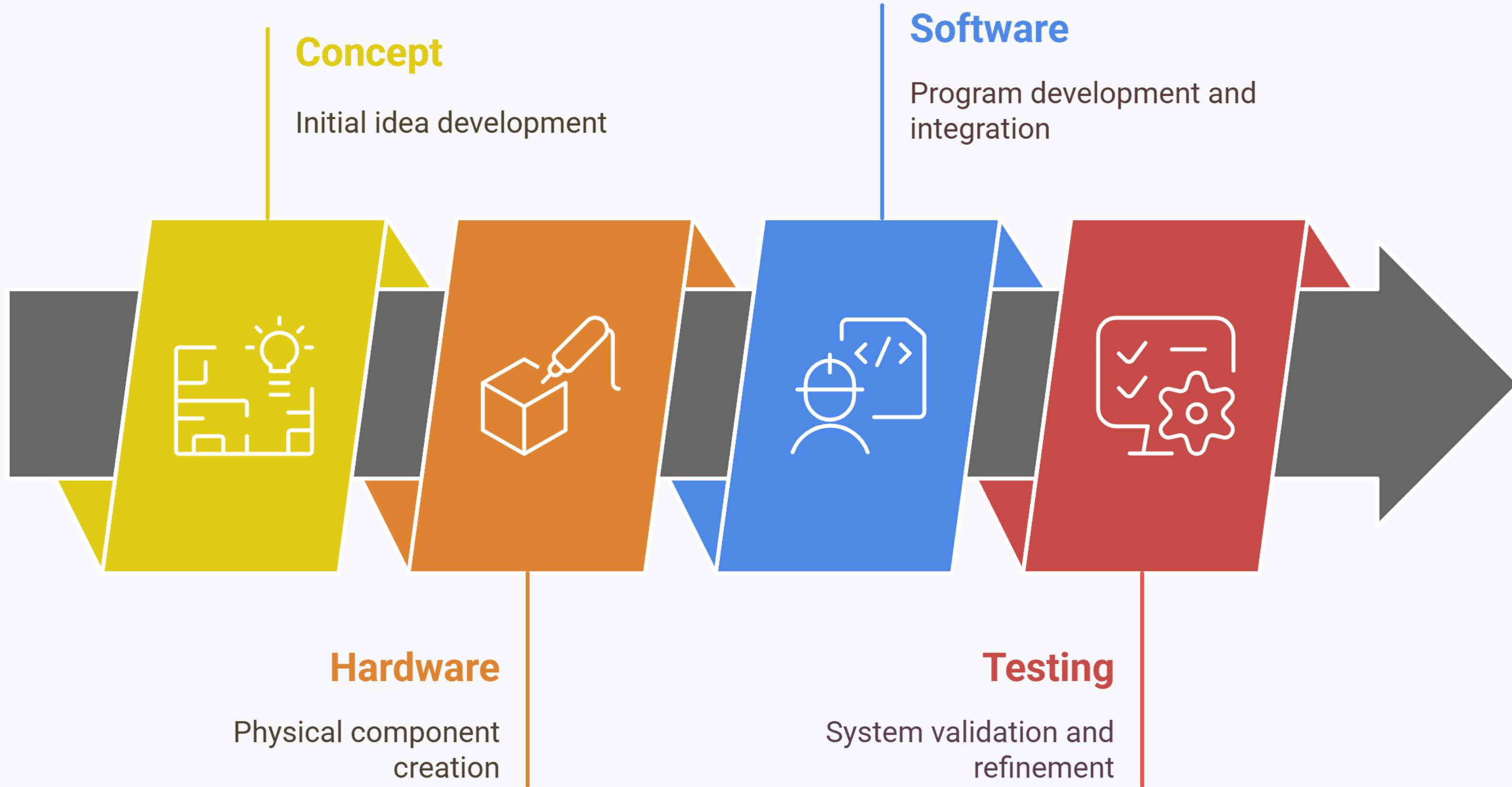
16.4 System design



System Architecture Diagram - DEMS



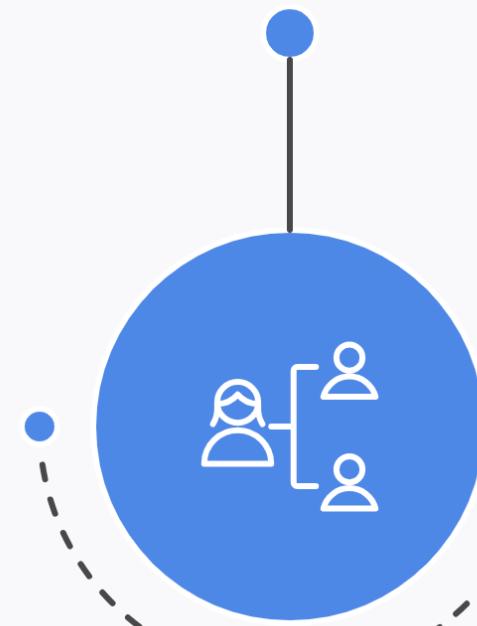
16.5 Prototyping



16.6 Project management

Define Roles & Responsibilities

Establishing team roles for efficiency



Conduct Regular Meetings

Implementing agile methodologies for development

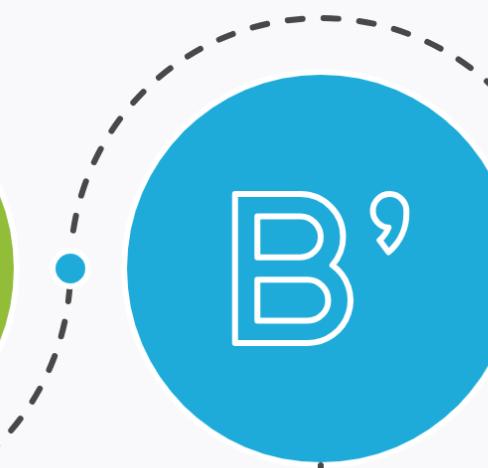
Engage Healthcare Professionals

Collaborating for real-world insights



Maintain Public Blog

Documenting progress and findings publicly



Complete Problem Definition & Research

Finalizing initial research phase



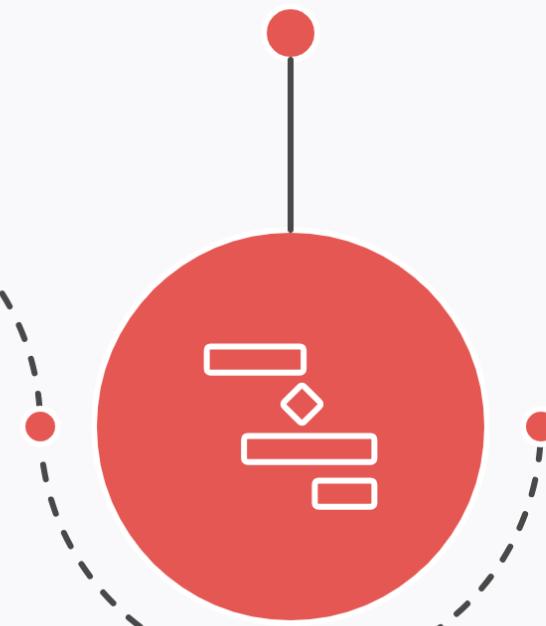
Progress System Architecture & Prototyping

Developing system architecture and prototypes

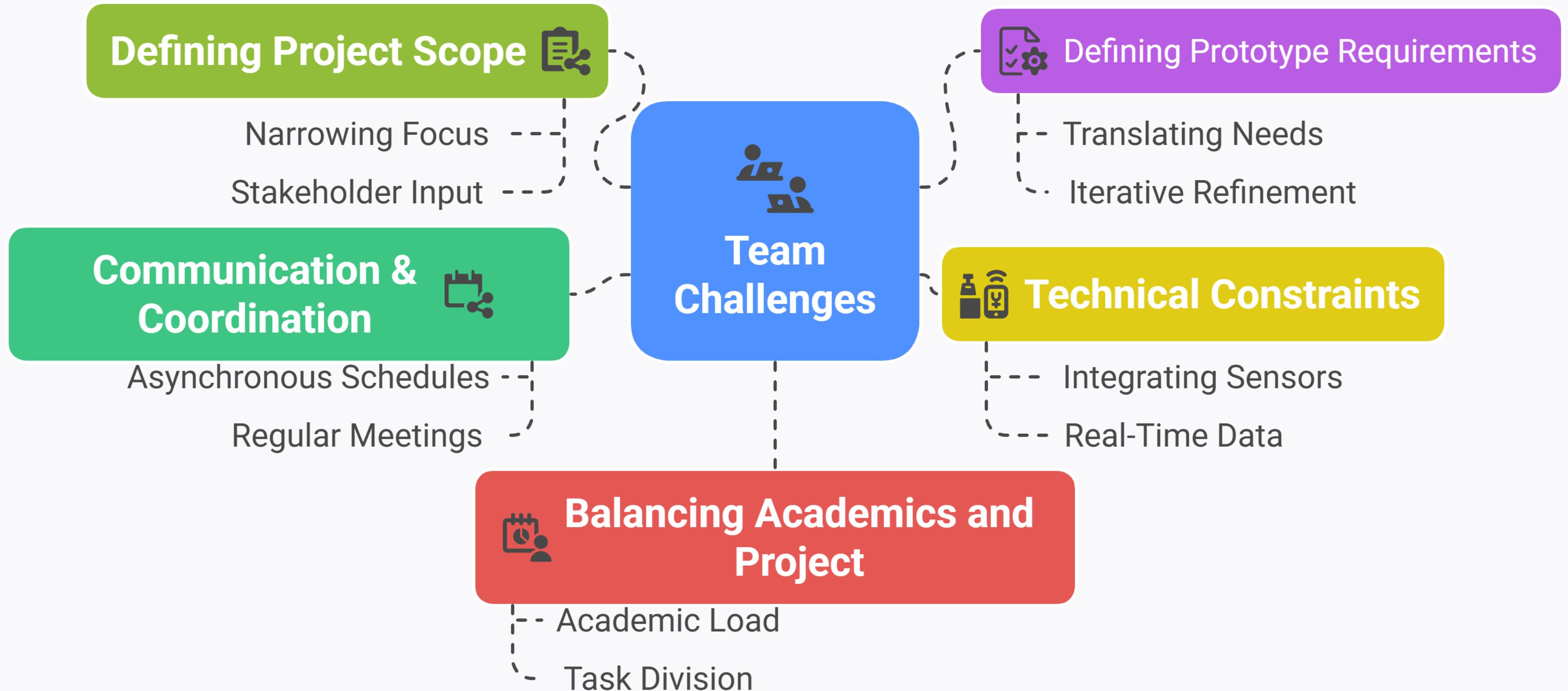


Plan Next Steps

Outlining refinement, testing, and validation



17. Challenges faced by the team



18. Deviations from original schedule

Initial Scope Uncertainty

Time spent refining goals and aligning with stakeholder expectations

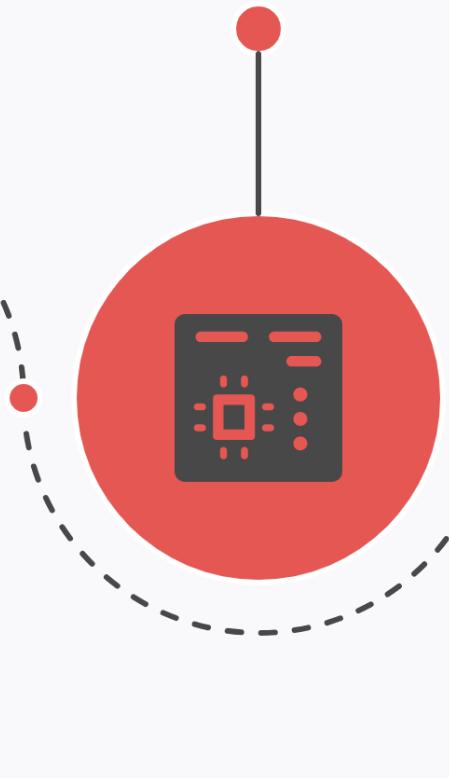


Underestimated Task Complexity

Sensor integration and data processing not initiated yet due to focus on system architecture and requirement gathering

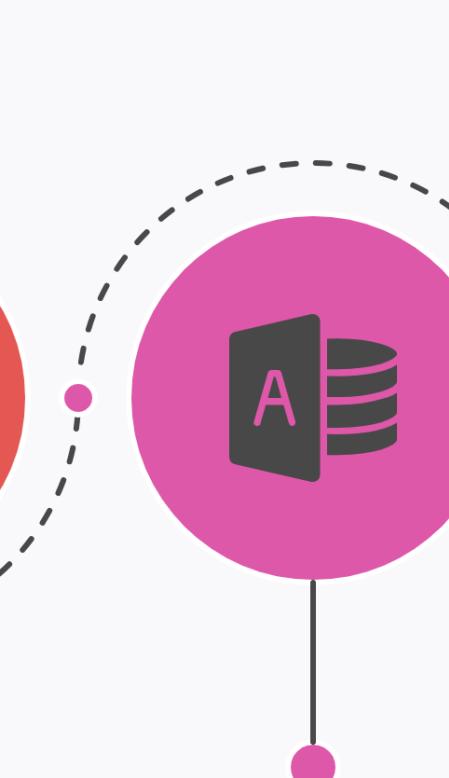
Technical Roadblocks

Difficulties finding the 'ideal' microcontroller for future setup and prototyping



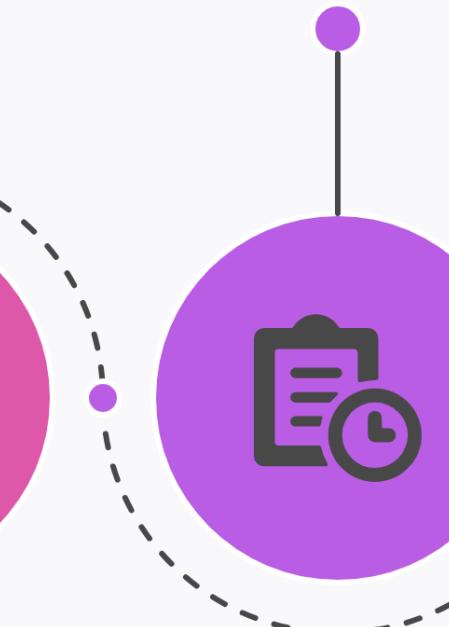
Limited Access to Resources

Delays in acquiring hardware and testing environments



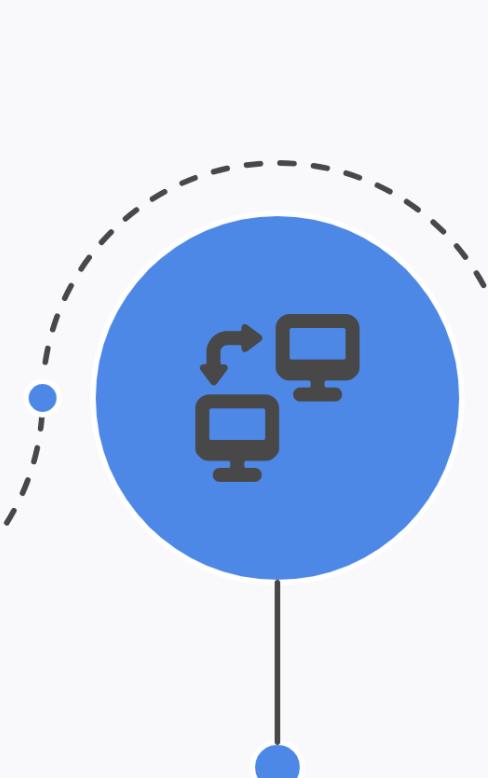
Time Management Challenges

Balancing coursework and commitments affected progress



Team Communication

Initial alignment and remote collaboration adjustments



19. Contribution of each team member (I)

João Veríssimo

Research (Triage)

Research (H)

App Design

Filipe Esteves

**Website & Blog
development**

App Design

Research
(Web development)

Marco Matos

Proposal

Blog

Research
(Triage, Server & H)

H – Hardware

20. Contribution of each team member (II)

Tomás Modesto

Research (H)

Proposal

App Design

João Ferreira

App Design

Research
(App)

-

Gustavo Zacarias

Website & Blog

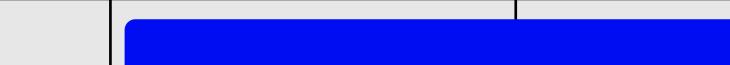
Research
(Web development)

App Design

H – Hardware

21. Corrected Schedule

 Revised Schedule
 Original Schedule

Tasks by field \ Months	Feb	Mar	Apr	May	Jun	July
Proposal	 					
Research/Interviews		 				
Bracelet (Hardware)			 			
Bracelet (Software)			 			
Algorithms			 			
Server			 			
App			 			
Website & Blog		 				

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Thank you

