1. ***Scenario : 10% Briefly describe your chosen scenario and its future importance/significance in Scalable Computing terms.***

We have implemented patient health monitoring inside a hospital.

**Why**

The patients are equipped with at least 7 body sensors each-

-Pacemaker

-Blood insulin/glucose

-Blood oxygen

-Blood pressure

-Alcohol level

-Breathing rate

-Temperature

Each patient has an individual sink attached to their body, which is capable of sending the data collected from each sensor to a nearby edge node; the edge node being a server within the hospital. The edge node is where a doctor can monitor the status of all his patients using a dashboard. This dashboard is built for all patients across days and time of day.

1. ***Key Challenges selected, addressed (and solved?): 30% (min 3) Identify at least three challenges that you chose to address, explain why, explain your approaches, explain your achievements, explain what worked and what didn’t – and how and why they are appropriate challenges.***

**Challenge 1: Optimizing power usage**

**Why**?

Power is always a limitation when considering wireless comms technology. Since whole topology is wireless, it’s imperative that we optimize power usage. We needed to employ a duty cycle so that power losses are minimum, and at the same time information loss doesn’t happen.

**Approach**?

A duty cycle has been assigned for each sensor. Sink always remains active so that it can receive data. However, it sends transmits data only when in charging phase.

Tried different combinations of duty cycles, selected the most efficient one.

**Other approach?**

We were keeping the sink always active to send as well as receiving data. This leads to higher power losses.

**Achievements**?

Minimum power loss

**Challenge 2: Security of patient data**

**Why**?

Health data is considered Protected Health Info (PHI) and organizations are legally bound to ensure privacy of patient’s medical records.

**Approach**?

Standard encryption and decryption at sink and Edge node. The encryption key is shared between the sender and receiver only.

**Other approach?**

Tried encrypting at sensor node, but since intra-communication is extremely small range peer-to-peer, encryption lead to overhead complications.

**Achievements**?

Successfully transferred encrypted info.

**Challenge 3: Scalability to cater to future needs**

**Why**?

The patient count can increase over a period of time. The system needs to be robust to be able to support any number of patients without breaking.

**Approach**?

The comms approach makes sure that failure of one sensor doesn’t hamper the working of other sensors while sending data to sink. If the intermediate sensor goes to sleep or malfunctions, the sensor can directly send data to sink. Short range communication ensures there is minimum to no data loss.

Implemented the topology on socket network.

**Other approach?**

All sensors send directly to sink- energy cost high

**Achievements**?

A large number of sinks can now connect to the edge node.

1. ***Platform: 20% Explain the platform solution you chose, why, why not other available options, how did it work, what would you do differently next time, what would you advise a new group to do if starting now. Some freeform discussion on aspects of other approaches/platforms IF I asked you to implement on or for them.***

We chose to work on own machines to simulate sensors, sinks and edge nodes. For communications, we rely on socket programming over TCD WiFi. Other possible approaches such as using AWS lambda would have slowed us down. We wish we had enough time to be able to learn and use AWS as that would have enhanced our learning and experience.

1. ***Alternative Scenario: 20% You will be given an alternative challenge scenario and asked to talk it. Some general scalable computing observations initially. Then moving onto how your platform can be used with it; strengths and weaknesses; what will work and why, what won’t and why; any key or significant points you wish to make on the alternative scenario. Note: You will not be provided with this scenario in advance so please don’t ask.***
2. ***Broader contexts: 20% Discuss your thoughts, considerations, etc on one or two broader contexts we will ask you about. Explain how they have and/or might impact on your system and implementation. Discuss what the broader contexts are for each, and how future research, design and implementation in these specific broader contexts should advance and evolve in your views.***