# IoT Project 2023-2024

Wireless Sensing

- In the IoT environment, sensing plays a crucial role.
- Sensors are able to monitor remote and hazardous environment without the need of human personnel.
- Sensor devices are able to produce a great amount of data, which has to be delivered and processed by a central unit in order to ensure seamless operations.
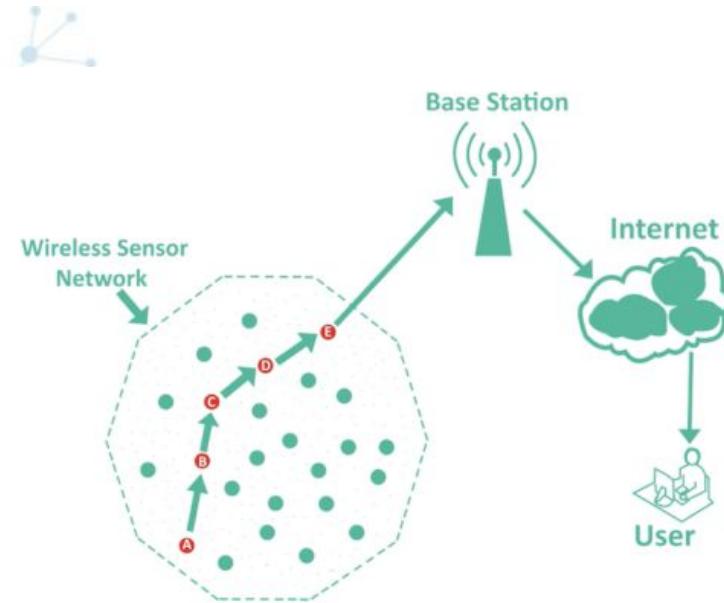
Wireless Sensing

- For operations to carry out smoothly, this network must remain consistently connected and online.
- The dynamic nature of wireless networks can compromise the availability and reliability of sensing services.
- Continuous data offloading is necessary to prevent a permanent loss of critical sensing data
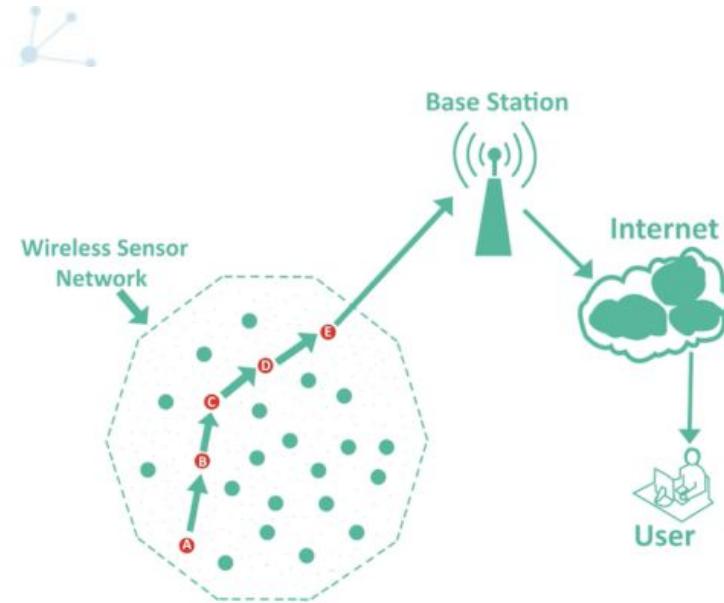
Your solution?

UAV-assisted Wireless Sensing

- We envision an IoT network where sensors' communications are supported by a network formed by drones and balloons, providing caching and network relay services.
- A central processing server is connected to a base station.
- Several balloons act as edge servers, and provide both data caching and relay service enabling multihop communications from the sensors or drones to the balloons and then to the base stations.
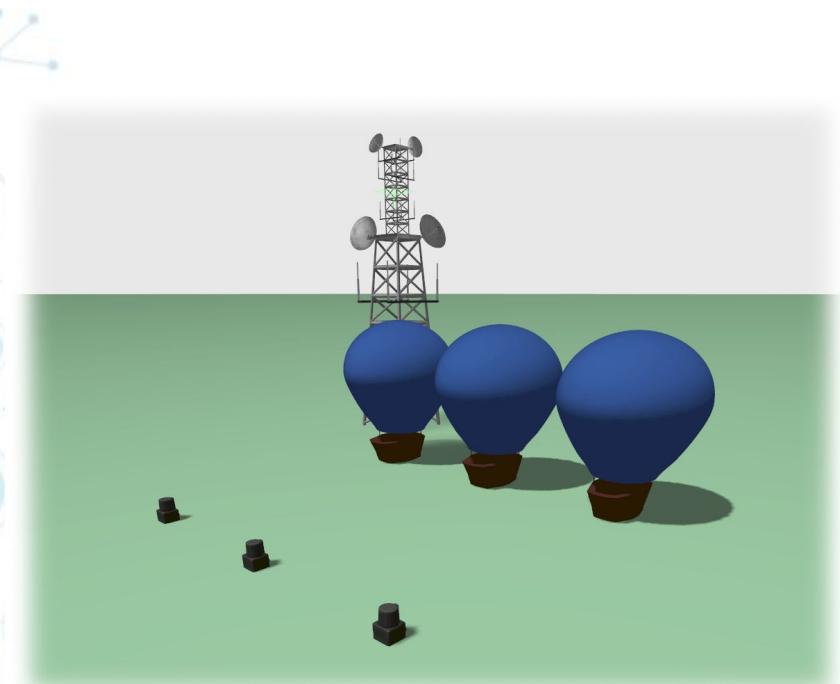
Scenarios

A: Offloading with Coverage Constraint

- Unlimited storage capability for the moving balloons and guaranteed connectivity between the balloons and the base.
- Sensors' communication range is limited.
- Balloons cannot cover the whole set of sensor devices on the field from a unique position.
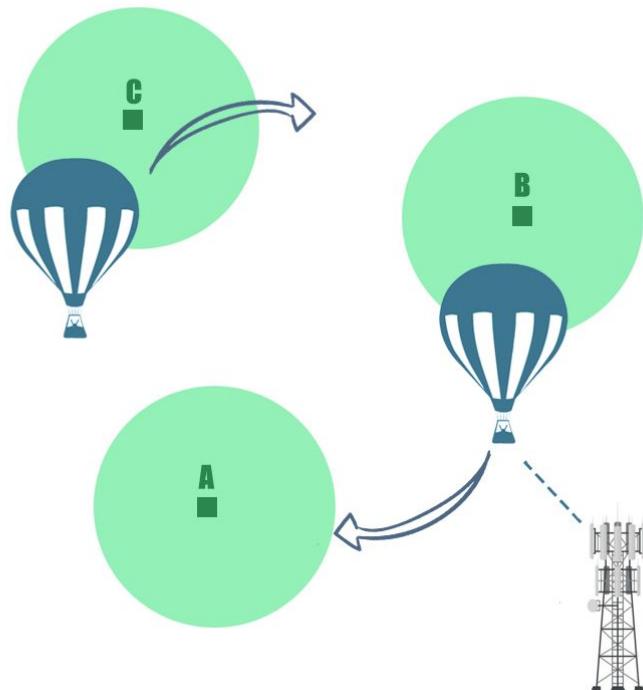
B: Offloading with Distance Constraint

- Number of almost static balloons deployed in key points of the area, from which they can easily communicate with the base station.
- The sensors' radio range is not sufficient for all of them to reach the closest balloon.
- We deploy a set of drones that act as data ferries facilitating data delivery from the sensors to the balloons.
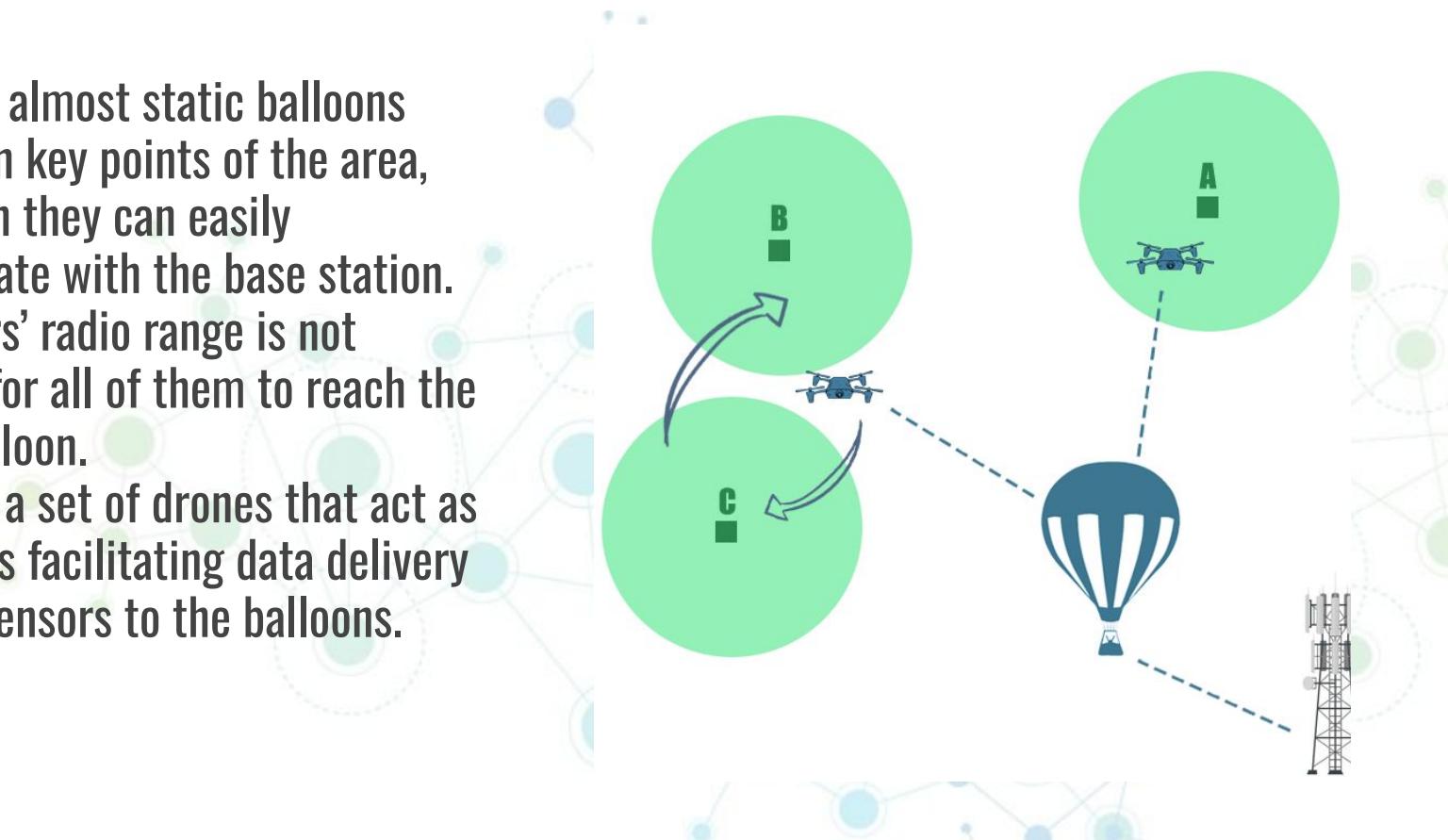
C: Offloading with Storage Constraint

- Balloons are always connected to the base station.
- The balloons are deployed so that they can collectively guarantee radio coverage to the entire set of mobile sensors.
- The balloons have limited storage capability that they use to provide a proxy caching service to the base station.
- The base station makes application specific requests on the data produced by the sensors.
- Sensors may move and balloons have to act accordingly.

C

B

1	C(4)
2	B(4)
3	B(3)

D

1	A(4)
2	A(3)
3	D(2)

A

D(4)?
MISS!

At time t=4
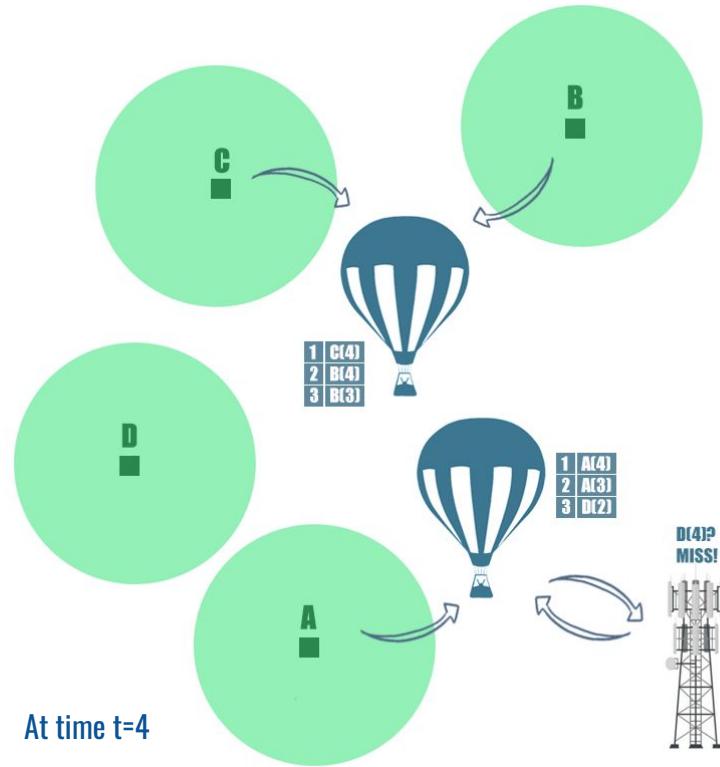
Evaluation

Evaluation

- You can work in teams of up to three students.

- The project challenges are presented in increasing order of difficulty, each with optional optimizations.

- You are asked to provide:
  - Your solution's code
  - Text report
  - 3-minute video presentation of the project

- Both the grade of the written test and of the project are scored in the range between 18 and 30+.

Different case studies difficulties and evaluation

- **Project A:** requires passing also the written test to pass the exam. The final grade will be the average between the project grade and the written test.

- **Project B:** if the delivered project does not meet exceptional standards, you will be required to pass the written test. Therefore, prepare for the written test if you choose this option. You can expect a better grade than with Project A for the project part of the exam, provided that you demonstrate a reasonable degree of novelty.

- **Project C:** allows you to pass the exam without the written test. If you are dissatisfied with the grade, you can try to improve it by either interacting with the professors to enhance your project solution or by taking the written test to increase the average of the project and written test scores.

Good Luck!