**Defining A Standard**

When we were asked to define a standard for our cohort for this fortnight homework, we made 2 key decisions to split the task and pair it up with a different topic to define our standard. With the time limit that we were given (1 hour), we managed to create some standard together collaboratively through our discussion at the end. I think these decisions impacted the process of defining the standard quickly, and it's far from complete or perfect because we didn't have enough time to go through everything. I also think it's hard to define the standard when you don't even know the system that you’re creating the standard for.

I was paired up with Chloe, and we were given the task to define the **Operational Considerations**, and we came up with the following standard:

Purpose of System: To collect data from the PM2.5 Sensor and upload it to and retrieve it from the Data Logging Server.

Time period of data collection: 24 hours

Frequency of data collection: started with 30 minutes initially and then after the discussion feedback from cohort we updated to 10 minutes

Access frequency of server: 10 minutes (to reduce access events to the server at any one time)

Security Concerns:

Data privacy: use of a unique identifier can lead to personal identification through the ANU system.

Cyber-attack and hacking the sandbox network (wifi: Roboroo I'm a robot robot)

Possible data manipulation if accessed externally.

Chloe and I tested the code together because we want to see how the Sensor is working with the sample code and trying to apply the standard that we have around "uid", "student\_name", and "student\_ip". Thank you for the help from Matthew (tutor), who guided us to work out the code and test our standard. We then shared our finding and updated our cohort, and agreed on the standard naming convention that we'll use for our dictionary. Thanks to Erika, who updated our standard document to look more professional and confirm the required dictionary for our homework.

Also, through the testing process, we found that the sample code for time.sleep(1) if we were collecting data for 24 hours, it will create around 86,400 data points, and if we implement our standard, which is every 10 minutes, we will only get 144 data points. So, we informed the cohort and updated the standard to every 1-minute frequency of data collection (sensor reading), which will collect around 3,600 data points. While accessing the server can be done every 10 minutes or every 30 minutes or even at the end of the 24-hour collection period should be fine.

Reading through our standard document again, I realised that we have the "date" in our standard, but we didn't have that in our standard dictionary. So, I asked around the cohort we should include "date" into our dictionary code as part of our standard because I think the date is important to see when the data is collected. Thanks to Matthew (2021 cohort) for sharing the code for "date". I then tested the updated dictionary codes in the studio. However, due to the time limitation, I won't be able to test for a 24-hours duration period, so I changed my code to read every 1 second. The duration is only for 30 minutes, and I have around 1,800 data points which I thought should be sufficient enough data points for basic visualisation. I downloaded it in CSV format from the server and tried to visualise it using Tableau (attached in the supplementary documents folder).

Unfortunately, due to the time and location access limitation, I'm aware that some other cohort might not be able to implement this standard update for "date" given they have measured it on Wednesday when they're in the 3Ai studio with access to Roboroo wifi network. Also, we didn't have any class on Thursday, and on Friday some people dial into the session from home. In my supplementary documents, I provided the CSV file and the web browser file where I tested multiple reading from the first test with just uid and particle reading to the latest one, including the "date".

I had some challenges throughout the process, from understanding the instruction because it wasn’t cleared to me, the time challenges, the cable and network connection, the wifi, and server issue to the hardware malfunction (faulty air-quality Sensor). Thanks to Johan to help me troubleshoot and work on step-by-step to find out the broken pipe in my code. It turned out my code was OK; the wifi and server access also fine. Apparently, it's the air-quality sensor that was the broken one. I swapped with Chloe's old sensor because when we did the test the first time, she couldn't read anything, but she could read some data when I gave her my sensor. Then I tried to use her old sensor, and it was working for me so I’ve been using it. But then later on, unable to read again, so Johan thought it must be the faulty sensor then. Unfortunately, there's no other spare sensor available in the studio, so I used Sarah's cute puppy creature from last fortnight homework. Thanks so much, Sarah.

Another revision that I would suggest after implementing and testing the standard is the particle sample that we measure. For the homework submission, we only measured one type of particle ("particles 03um"). But ideally, we should be able to measure other particle sizes too (e.g. ["particles 05um"], ["particles 10um"], ["particles 25um"], ["particles 50um"] or ["particles 100um"]). Also, if we measured for a 24-hour period over multiple days, we need to add "time" and the "date". Unfortunately, we have "time" in our standard originally but didn't have enough time to implement it in our code. Also, Matt (2021 cohort) mentioned around automation of the data collection time by adding the code for the sensor to stop recording the data after certain period of time (e.g. 24-hour, 1 hour, 30 minutes, etc).

Compared with ACT Health Air Quality data, my data is very far from complete and definitely very different result. Also, the location difference, I measured the 3Ai studio air quality while the ACT health measure the outdoor air quality around Florey, Monash and Civic area. The ACT health measure over a more extended period of time for a different type of particle and gas while mine only 30 minutes with only one type of particle. So, a lot of improvement for sure to implement my system in the future.

I consider the role of standards in developing this NBE is crucial and needs to be done before we implement/create any CPS systems. People who should be involved in creating the standard should be the Subject Matter Expert (SME) in the diverse mix for all aspects of the CPS- system. Standard also should be tested first to make sure it's fit for the purpose and easy to understand before implementation. The standard should be kept up-to-date with the relevance over a period of time. Currently, our standard is still a living document, and we'll update it as we do more testing. Overall, I really enjoy this fortnight homework around data and network. It has made me think differently about standard. I know that standard is important, but I always thought standard is defined at a high level and by people with high power. Now I realise that I could also contribute and play an important role in shaping the standard for our future NBE by bringing diverse backgrounds and ways of thinking. Thank you again for this homework and for the opportunity to learn, grow and be part of something extraordinary for our future.