Theoretical tasks

1*. Scenario: You have to design a system to be able to handle heavy read-write operations of high frequency time data (1s resolution). The data has to be available to be served to ML training pipelines and on front-end request (web app). Which type of database would you choose and why?*

Firstly, I would consider the type of data that will be stored. For industrial systems such as wind turbines, I think there would be raw data collected from various sensors on each turbine. The raw data could be recorded in a time series and may consist of timestamps and datapoints stored in key-value pairs. For this type of simple structured data, I think a NoSQL database would be suitable. NoSQL databases can handle fast read/write operations as they don't require the additional overhead to maintain schemas and tables (like relational databases do). Additionally, NoSQL databases are generally designed to be distributed which means they are highly scalable and can therefore handle large amounts of data.

2. How many servers does Turbit have?

I do not have a definitive answer for this question but I first would ask - what do we consider a 'server'? A server could be a physical machine hosting one or more services. A server could also be software, like a virtual machine or a container. If we include containers in this definition, then I would ask how the container instances are configured as they could be configured to autoscale up or down depending on load.

I would then think about how many wind turbines exist and what metrics are being collected for each of them. From a quick Google search, I gathered there was approximately 60,000 in Germany in 2023. From Turbit's website under the FAQ section, I can see Turbit uses ideally 24 months' of data from asset management systems. This information gives me an idea of the scale of Turbit's operation.

Following that, I would consider the systems and services (or microservices) that support Turbit's applications as well as the software development tooling used, not ot mention the internal IT systems.

3. Imagine you are a wind turbine. What would annoy you the most and why?

If I was a wind turbine, I would find it annoying that in order for me to operate, there is no way to completely prevent wildlife fatalities. Knowing that the purpose of my existence, which is to help solve one problem by providing a renewable source of energy, but it creates another problem for birds and bats would be very frustrating.