You have been hired by an international manufacturing company to design a MongoDB based system to collect and store information from their production monitoring system. The production facilities produce a variety of liquid products for retail distribution. Here are the specifications of the project.

* **There are three production facilities in the world**. Each are roughly the same size. They are located in Lyons **(France**), Brussels (**Belgium**), and Sioux Falls (**US**).
* At each production facility there are *several thousand flow monitoring devices*. Each device is **has an ID that is unique to the facility** ***but not necessarily*** unique between facilities. The devices collect information **about product flow rate and product temperature**.
* **Readings are take 20 times per minute** at each of the monitors. For a facility with ***1000 monitors*** that equates to **20,000 measurements a minute**. That is ***1.2 million measurement an hour*** and nearly ***29,000,000 measurements a day*** at each facility. Just FYI this equates to **3.15x1010 measurements a year** for the whole system being added to the database.
* At each production facility there is a quality assurance application that read data from the database **and shuts down the production line if it determines that parameters are out of spec**. ***If*** data cannot be written to the database or the application cannot access the database, the **production line will shut down**, causing the company to lose money. **This is a bad thing and must be avoided at all costs.**
* The headquarters of the company is in Atlanta (**US**) and they run dashboard applications that maintain a near realtime view of production. This system is based on data from all of the production facilities monitoring applications. This can be down or delayed if there are issues but they’d prefer it to be as resilient as possible.
* Each of the production facilities has a **“mini data center”** where their local systems run. Connectivity from the monitoring devices to this center should be considered highly reliable. *However* these are **not** **highly managed facilities** and they keep as little as possible at these centers.
* There is a large datacenter in **Paris (France)** that serves all of Europe. Each of the European production facilities has *a dedicated link to that data center*. **They are reasonably reliable links but they do go down periodically.**
* There is a large database in **Atlanta** at the headquarters. The link from **Sioux Falls to Atlanta** has **reliability** on par with the **links in Europe.**
* There is a link between **the data centers in Atlanta and Paris**, it is known to be *flakey* and bounces up and down with some frequency. **They know they need to upgrade it**, but that is another project. Your design must account for this.

As a skilled MongoDB big data consultant your job is to design a system to meet their requirements. Specifically you must address the following:

* **What is the design of the collections in the system**. (Specs.tex @ github)
* **What data goes in each document**. Make sure to discuss in your proposal how your system is **designed to optimally handle this time sequence data.** (i.e how to we handle data loading)
* **Will you be sharding your database?** If so what is your strategy for sharding?
  + If you opt to shard you need to explain why this more complex solution is required.
  + If you opt not to shard you need to explain why a simple implementation will be sufficient for these requirements. \*(Warning, research Sharding. Useful or not)
* **Where will you be placing servers and how will these be placed into replications sets.** (Specs.tex @ github)
  + Fortunately the customer has a big budget for hardware **so you can go crazy if you’d like.**

Finally, there are several scenarios that have occurred recently that the customer is concerned about handling properly. **You need to explain in detail what impact the following failures will have on your system.** Specifically address whether these failures will cause any of the production facilities to halt and what will happen to the **dashboards in Atlanta.**

* **The transcontinental link from Atlanta to Paris goes down for about 1 hour.**
* **The link from Lyon to Paris goes down.**

\*Lyons **(France**), Brussels (**Belgium**), and Sioux Falls (**US**).\*