Lab: Software Architecture

Congratulations! Desmond Inc. has decided to go with your company for their contract to automate Desmond's manufacturing chain. Sales and their CTO have agreed on the following user stories that should be addressed in the first version of the software.

- As *a floor employee* I can *get a notification once a machine is finished* so that *I can start the next step without interruption.*
- As a *floor employee* I can *get a digital overview of each of the steps that has been carried out on a individual product as well as the next steps (and their estimated timings)* so that *I have an overview of the steps and time still required*
- As a *on-call engineer* I can *remotely view all the dial readings and a live stream of the machine* so that *I can diagnose if a machine is actually malfunctioning or has a false alert.*
- As a *management executive* I can *check, for each floor employee, how much time it took to start the next step in the pipeline* so that *I can evaluate their individual performance.*
- As a *management executive* I can *check, for each floor employee, how many steps the individual employee has carried out* so that *I can evaluate their individual performance.*

The management also has some additional requirements

- Under no circumstances can the data collection for the bonus system interrupt the production
- Interactions with the system should only be possible for a subset of authorized users.
- Users should not be able to interact with parts of the machinery they are not trained on
- It should be easy to add new users and manufacturing chains

For your reference here is the initial case description again

Desmond Inc., an industry leader in high capacity water pump development is redesigning their production chain. The chain consists of up to 50 different steps that are carried out manually, semi-automatic or automatic.
Previously the different parts where put in a plastic bin and a piece of paper was attached to each bin describing which steps had been carried out. Each action is

encoded by a 5-digit action code (i.e. A-00004 starts the inner milling on the CNC machine). To start a new process the next code in the process needs to be input into the machine. This also meant that all automated processes had to be started by a human. Actions can take between 5 and 60 minutes. In between the different actions the floor employees usually retreat to a break room and miss the exact time the machine is finished.
When something went wrong with a machine, the machine would turn on a siren and the nearest employee would check what is wrong and call the responsible on-call engineer. Recently the machines where updated and now offer an API that allows the machine to (automatically) run a piece of code when they are starting, finished or an error has occurred. Furthermore, the API allows for machines to automatically start an action. Error detection on the machine is buggy so there is a 40% false alarm rate resulting in the fact that most on-call engineers don't want to always walk to the machine. Most of the false alarms can be diagnosed by looking at an image of the machine as a whole.

With the recent rise in Big Data the company owners would also like to leverage data and a bonus system to incentivize the employees to work more.

The new IT manager would like to automate both the production as well as the notification process. He has defined the following actors

- *Floor employees handling the different machines*
- *On-call engineers*
- *Floor managers determining bonuses and work load*