Final steps – 02/06/2021

UE SAR INFO SI-SSG FISE A1 S2

Important: Update your simulator files (the entersim) from:
https://moodle.imt-atlantique.fr/mod/folder/view.php?id=40068

1. Reminder about previous "Requirements for 1st step"

(You should have already completed this part, but it is provided here with a few more hints to help you complete it)

1.1 Initialize simulation

Perform a `POST` request to `/control/poll/create_from_example/{sim_id}` where `{sim_id}` is one of `"sim1", "sim2", "sim3"`.

IMPORTANT: The following plots need to work with ALL of "sim1", "sim2",and "sim3".

1.2 Advance time

Manually ask for the advancement of time of the simulator: to move ahead in time by simulating one hour make a `POST` request to `/control/poll/run_one_step`.

1.3 Create two types of plots

1.3.1 Plots that evolve with time

Use the example provided that does real-time updating of the plots creating an "animation". You will plot the following values, as they change as time passes, hour by hour.

Evolution with time plots of the following values:

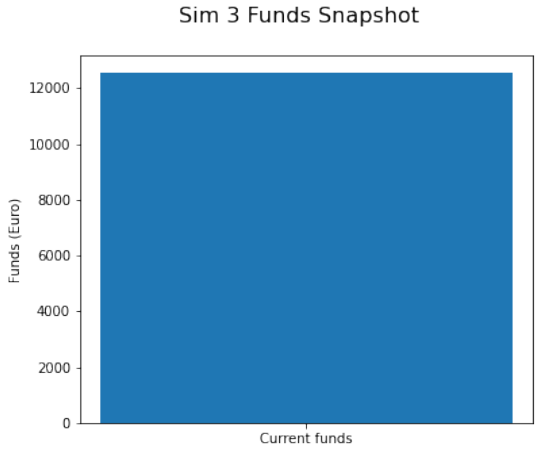
- Budget / Funds
  - See `GET /enterprise/poll/inventory` → `"funds_in_eur"`. Example:

- Status of every machine
  - See `GET /enterprise/poll/machine` → `"nominal_output_rate_items_per_hour"`
- Health / Sickness of every employee
  - See `GET /enterprise/poll/employee` → `"remaining_sickness_in_hours_worked"`, if it is >0 (positive) then the employee is sick, otherwise they are working.
- Contents of inventory per type of item
  - See `GET /enterprise/poll/inventory` → `"item_quantities"` and inside that the `"item"`→ `"name"` and `"quantity"` fields
- Total profit from start of simulation (Without initial funds)
  - Use the Budget / Funds from before but subtracting the initial funds available at the start of the simulation
- Total profit from start of simulation (Without initial funds) per hour worked per employee
  - More complicated - Combine:
    - The previous *"Total profit from start of simulation"*
    - The previous *"Health / Sickness of every employee"* (working vs sick)
    - The total profit per hour worked per employee = *"Total profit from start of simulation"* / Total hours worked by each employee from the start of the simulation.
    - Results: One curve in the plot per employee

1.3.2 Time snapshot plots

Plots that only show the current state of values of the simulation.

- Budget / Funds
  - See `GET /enterprise/poll/inventory` → `"funds_in_eur"`. Example:



- Number of employees healthy / total number of employees
  - See `GET /enterprise/poll/employee` → `"remaining_sickness_in_hours_worked"`, if it is >0 (positive) then the employee is sick, otherwise they are working.
  - Calculate the number of healthy (and therefore working) employees as a percentage of the total number of employees.

2. Composite plots and analytical accounting

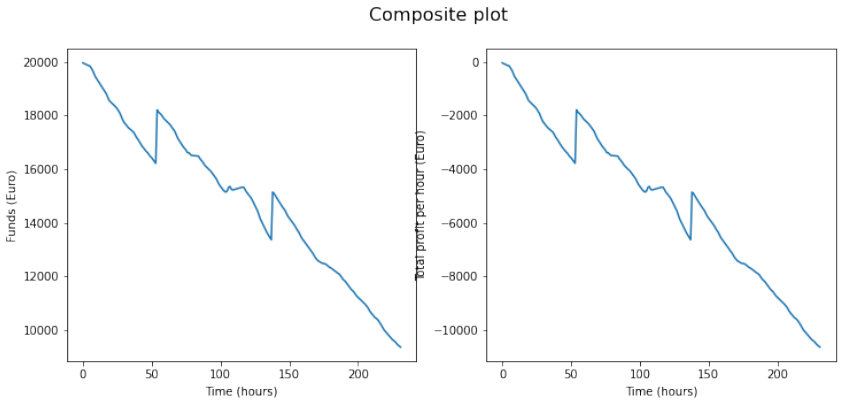
2.1 Real-time plot of two values

IMPORTANT: This plot needs to work with ALL of "sim1", "sim2",and "sim3".

Create a composite plot that evolves with time in the "animation" style (updates in real-time) which combines two different sub-plots from part 1. You are free to choose any two plots, but as an example you can create a composite plot showing:

- On the left side the *"Budget / funds"*, and
- On the right the *"Total profit from start of simulation (Without initial funds)"*

Example:



2.2 Analytical accounting

Important Reminder: Update your simulator files (the entersim) from: https://moodle.imt-atlantique.fr/mod/folder/view.php?id=40068

This task will be slightly different in terms of results for each team.

2.2.1 Initialize the simulation

There is a new simulation named **`"sim4"`** which cannot be created with the previous `POST` to `/control/poll/create_from_example/{sim_id}`. This sim must be created with a `POST` to the "special" `/control/poll/create_from_example_sim4/{team}` route with `{team}` being the name corresponding to your team. One of: `"T1"`, `"T2"`, `"T3"`, `"T4"`, `"T5"`, `"T6"`, `"T7"`, `"T8"`, `"T9"`, `"T10"`, `"T11"`, `"T12"`.

2.2.2 Advance time

Execute the simulation for 29 days of 8 hours: Total of 29*8 = **232 hours** / steps. **Not more** (because you will run out of inventory and crash).

In this simulation the analytical cost calculation has been **already implemented** and is available via `GET` to `/enterprise/poll/analytical_accounting_sim4`.
This route will return the **break-even cost** of the two produced and sold items in sim4: **`"ProcMat1"`** and **`"ProcMat2"`**.

2.2.3 Composite plot

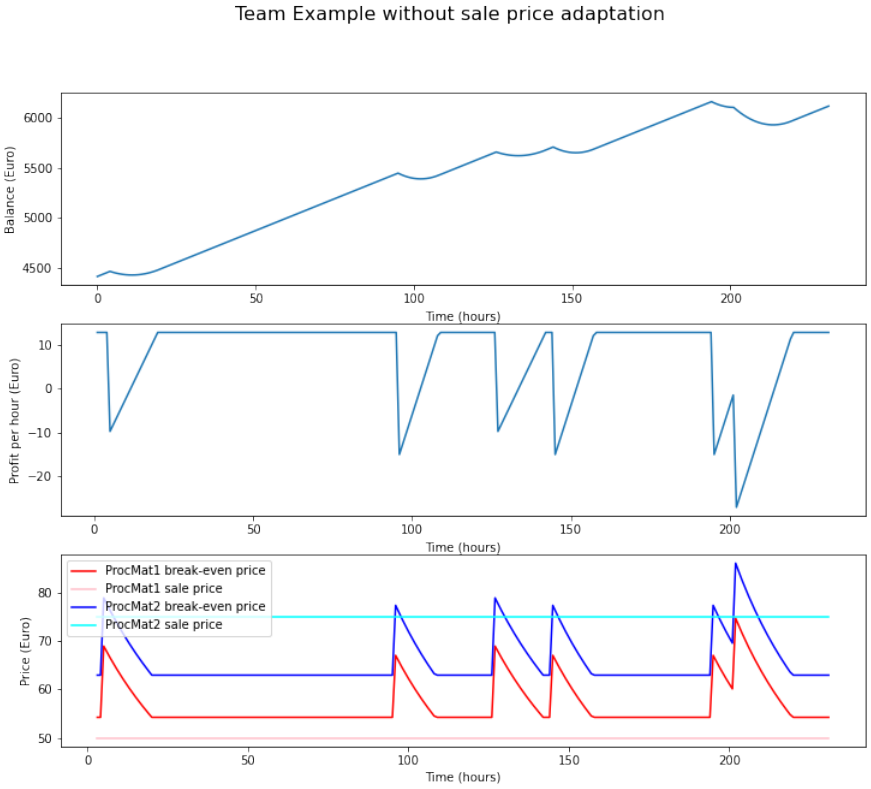
Produce a composite plot ***not necessarily*** in the "animation" style (meaning you can get all the values and plot everything at the end once).
The plot will have the following three sub-plots:

1. The Budget / Funds as a function of time
   - As before, see `GET /enterprise/poll/inventory` → `"funds_in_eur"`.
2. The Profit per hour as a function of time

- The difference of funds between consecutive hours. It indicates if we are making or losing money at a specific hour. Example:
  - If the funds at hours `[2, 3, 4, 5]` are `[100, 110, 105, 100]` then the profit per hour will be `[110-100, 105-110, 100-105]` → `[10, -5, -5]`.

3. The actual sale price of each item and the break-even cost of each item as a function of time.
   - Since there are two items and two values for each, four curves will be produces in the same plot.
   - The actual sale price of each item
     - See `GET /enterprise/poll/market_price` and look for `"ProcMat1"` and `"ProcMat2"` in `"item"`→ `"name"` and get the corresponding `"unit_price"`.
   - The break-even cost of each item
     - See `GET /enterprise/poll/analytical_accounting_sim4`

Example plot:



2.2.4 Critical question

In sim4 the workers are never unhealthy (always working), the machines and all departments are always staffed and for the period of execution there is enough initial inventory that no purchases are required.
The only aspect which affects the profit is that machines get randomly damaged and need to be slowly repaired by support employees. However, in no case does a machine completely break down (0% production).
Given that the falls in profit are due only to machines which are damaged and are not working at 100% output capacity, please explain what would happen if the price of sale of both items sold was changed after every hour to match the break-even cost.

2.2.5 Bonus Task

This is optional, but will be considered for extra points.
Implement the change in price to the break-even cost after every hour and evaluate the advantages and disadvantages of this approach.

See the `POST /enterprise/poll/set_market_sell_price_sim4` route to set the new prices of both `"ProcMat1"` and `"ProcMat2"` after each hour / step.
Plot the previous composite plot (see 2.2.3) again with this adaptation performed and evaluate the results.