

Operational Data Software Engineer Technical Evaluation

Introduction

Do not worry about not understanding any term, we wrote the test with a realistic flavour, but we don't expect you to be an ace in the aerospace domain just yet. Check the attached glossary at the end for the meaning of some of them, or in doubt a quick web search should be enough.

During each flight, a rocket is subject to different heat loads. To measure these loads and their effects, a set of thermocouples are distributed across the vehicle. Example sets of this temperature data have been provided in *FLightAcL.csv* and *FLightBcL.csv*.

After each flight, domain experts will want a report, generated from this data, to ensure that the flight was nominal.

The Operational Data team creates systems to efficiently process and draw insight from this type of operational data. On this task we want you to provide a backend service for analysing and presenting results.

Tasks

1. Let's suppose that the operations team can provide the data in csv files, as the provided examples. Implement a backend service, providing a *REST* API with the following endpoints:
 - *PUT /data/{flight-id}*
 - Used to upload the CSV with the flight data.
 - User provides the flight-id at their discretion; it can be any valid url-encoded string (feel free to add any length limit that makes sense).
 - Overwrites existing data if the flight-id already exists.
 - *GET /report/{flight-id}*
 - Returns the report for that flight-id.
 - If a report is not yet ready, it should be treated the same as a non-existing report.
 - *GET /report*
 - Returns a list of available reports.
2. The main logic should, for each flight:
 - Ingest and clean the Flight's data. Cleaning the data includes:
 - Remove duplicate datapoints, if any.
 - Handle missing datapoints, if any.
 - There's a variety of ways to handle these. Whatever you do, document your reasoning in the *README* or via code comments.
 - Using the cleaned data, generate a report for the Flight:
 - An overall summary of the Flight (e.g. charts with all channels)

- Any channel with a rate of change higher than 5 °C/s and the time period(s) (in `missionTime`) where this exceedance occurs should be identified.
 - You can choose any report format or presentation that makes sense, providing that it can be obtained via the service endpoints.
2. We expect you to provide a zip file, via email, with:
- A copy of the code (written in Python). The code should include:
 - A test to confirm the rate of change of temperature computation works as expected. Any other tests as considered appropriate.
 - Usage of *Pandas* is not required but it is encouraged. You can use any common python framework to implement the *REST* service. Don't use any proprietary or not readily available dependencies, we must be able to legally run your code without any extra license.
 - `README.md` file with instructions on how to setup, run and test your code. Include documentation where required, insight into the trade-offs made, as well as possible ways to improve or expand the solution provided more time were available.

Supplementary Information

There is two datasets, that represent completely independent flights:

- `FlightAcl.csv`
- `FlightBcl.csv`

A dataset contains one `missionTime` channel and several Temperature channels. Because this data resembles real vehicle telemetry, there can be duplicates and missing values for a variety of reasons.

The `missionTime` channel is zeroed at liftoff and is used to sync all channels under the same timeline. Because the time of liftoff is zero, times before lift-off are negative, and times after liftoff are positive.

Useful glossary:

- Nominal: <https://space.stackexchange.com/a/37397>
- Thermocouple: [Thermocouple - Wikipedia](#)
- Telemetry: [Telemetry - Wikipedia](#)
- Liftoff, countdown: [Countdown - Wikipedia](#)

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