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CASE STUDY REPORT

Creating the simulation-based digital twin of a high-speed fan on an internet-of-things (IoT) platform

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Start & End Date	<i>30.07.2021 - 30.01.2022</i>
Approved by	<i>NCC Project Management Team – 09-06-2021</i>

***Company** accepts that the Case Study Report is shared with the EuroCC Project and the community through the EuroCC@Turkey awareness creation activities and platforms.



1. Problem Identification

The project involves creation of a simulation-based digital twin of a turbomachine (fan) used for multiple purposes in aircrafts. The system simulation for the digital twins will be acquired via running the relevant physics-based simulation software on TRUBA resources.

While the controlled and measured parameters from the in-service fans are used as inputs, parameters from simulation-based virtual sensors and parameters that need to be adjusted are outputs of the twins. For all fans and twins, this interaction and collection of data is to be performed on an internet-of-things (IoT) platform preferably with a big data analytics module. Originally, usage of a commercial software suite had been proposed, which is currently not possible due to financial aspects of implementing this solution.

The company undertaking the project, Numesys, must develop an ingenious solution for at least for the IoT side. High-level propositions for this should be defined by the end of July 2021 for the project schedule not to be affected negatively.

2. First Suggestion

The initial suggestions are based on utilizing an off-the-shelf cloud infrastructure for data gathering on the data historian. Big data analytics algorithms are to be developed by Numesys. Selection of the infrastructure, gateways, device control and connectivity protocols, implementation of the big data analytics module are still unclear.

The milestones and milestone numbers in the beginning of the project, (starting from the project start date) are:

- 1) after two (2) months: to be able to use the TRUBA infrastructure with Fluent, end of first trials, validation of the results
- 2) after four and a half (4.5) months: to finalize the reduced order models of the fan at different speeds, with Fluent

3. Solution Stage – I

In order to facilitate collection, storage and preprocessing of sensor data, two open source solutions are identified and suggested to Numesys. The initial response of Numesys was positive. They will investigate and evaluate these solutions further. Based on the evaluation results the intended IoT infrastructure may be based on the selected open source platform.

4. Solution Stage – II

The company did not respond to the suggestions provided as part of Solution Stage 1, and there was no further progress.



5. Results and Achievements

There was no satisfactory progress, since the company was not able to allocate enough resources. Accordingly, it was decided to finalize the case study.