

This work was supported in part by the Spanish Ministry of Economy and digital transformation under TestBUS (PID2019-105455GB-C32) and SEBASNet 2.0 (RED2018-102472-T).

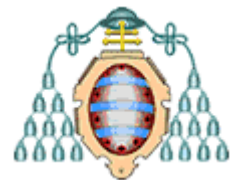
Resource Optimization for E2E Test Execution

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University of Oviedo
&
Istituto di Scienza e Tecnologie
dell'Informazione "A. Faedo"



Introduction

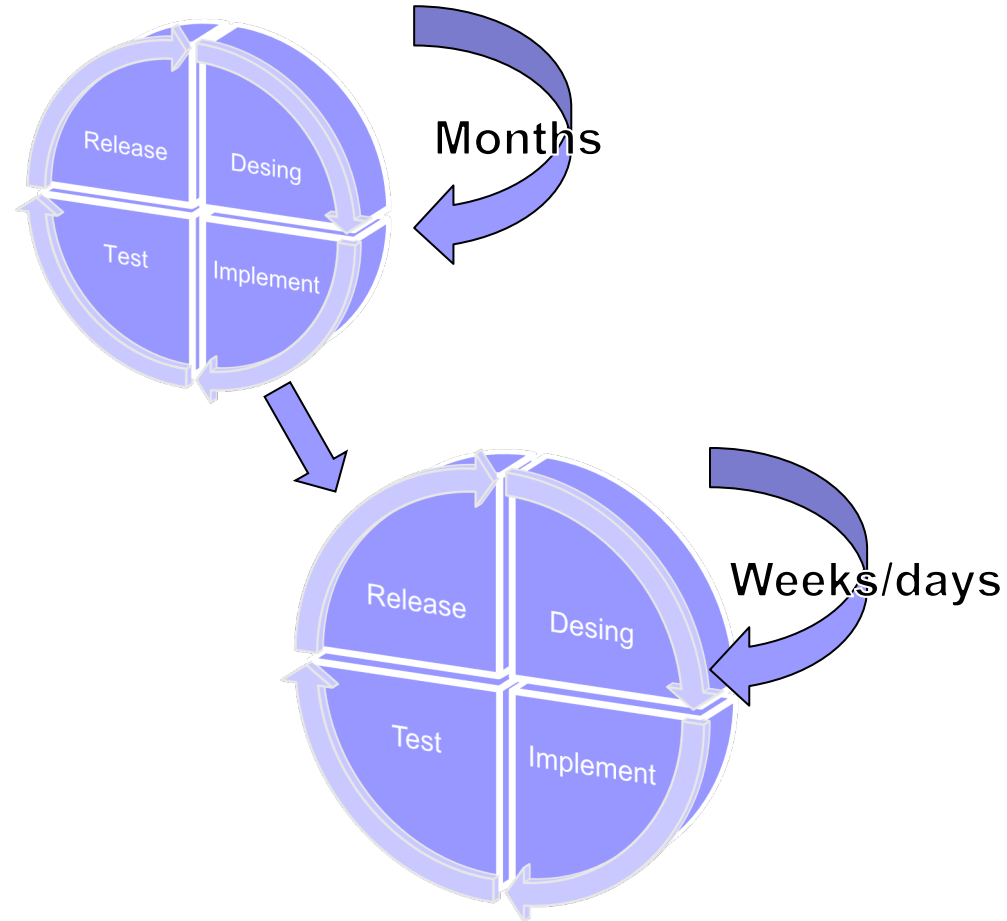
- **Shorter** development cycles than the past
- With this *increase of the release speed, tests suites become larger* and are executed more frequently

 Microsoft have huge test suites with 60k of tests, that take the better part of a day to run

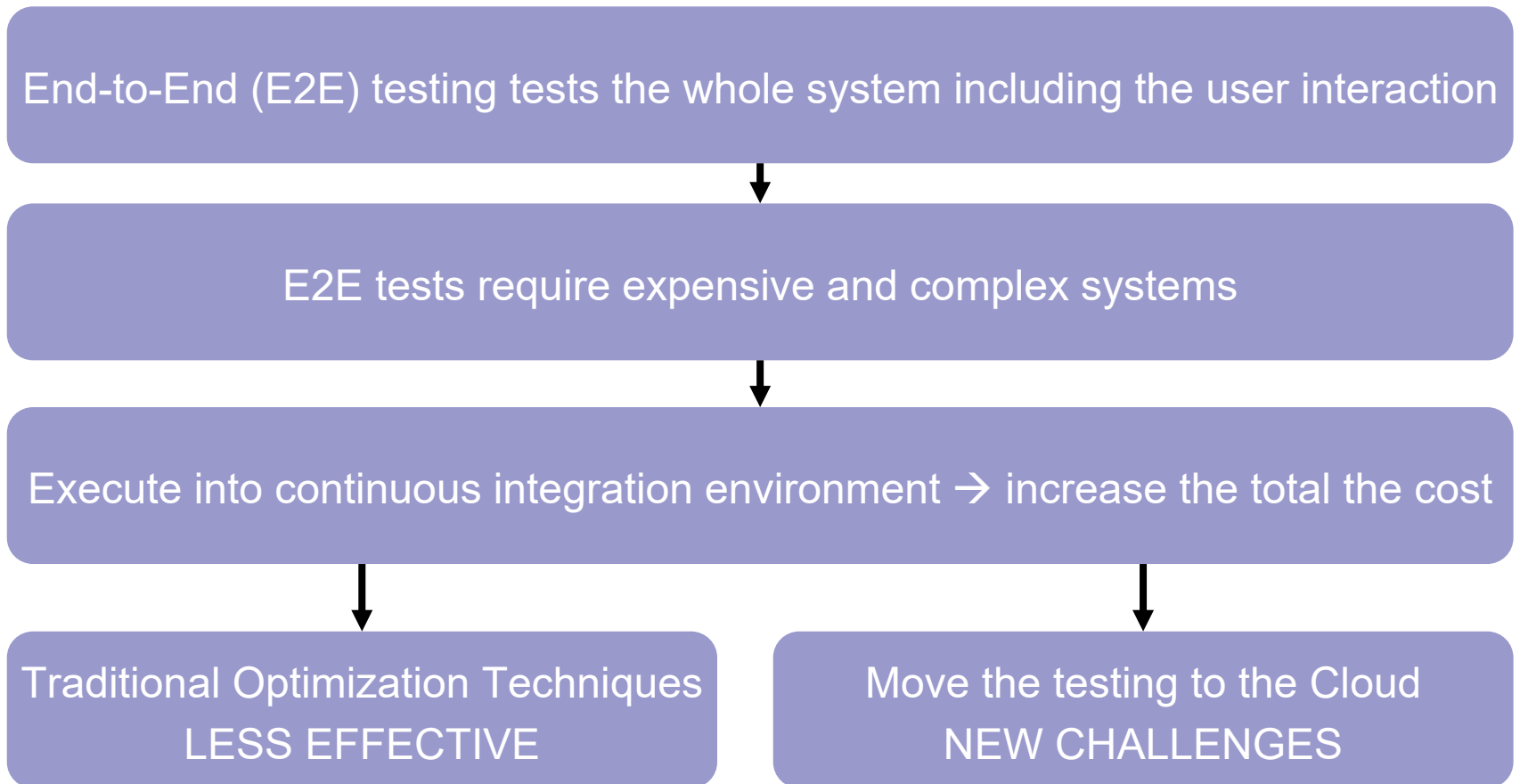
 *Google Test Automation Platform (TAP)* executes daily more than 150 Million test runs

¹How we approach testing VSTS to enable continuous delivery | Brian Harry's Blog. (n.d.). Retrieved September 8, 2019, from <https://devblogs.microsoft.com/bharry/testing-in-a-cloud-delivery-cadence/>

²Memon, A., Zebao Gao, Bao Nguyen, Dhanda, S., Nickell, E., Siemborski, R., & Micco, J. (2017). Taming Google-scale continuous testing. *2017 IEEE/ACM 39th International Conference on Software Engineering: Software Engineering in Practice Track (ICSE-SEIP)*, 233–242. <https://doi.org/10.1109/ICSE-SEIP.2017.16>



Introduction



Key Concept: Resource

“Physical, logical or computational entity that is required during the execution of a E2E test suite”

ACCESS MODE

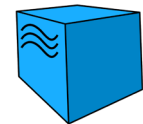
How the test case access the resource

ATTRIBUTES

Extra information about how can be used



redis





Msc. PROJECT

1st PhD YEAR

2nd PhD YEAR

3rd PhD YEAR

4th & UP

2020_{Q3}

2021

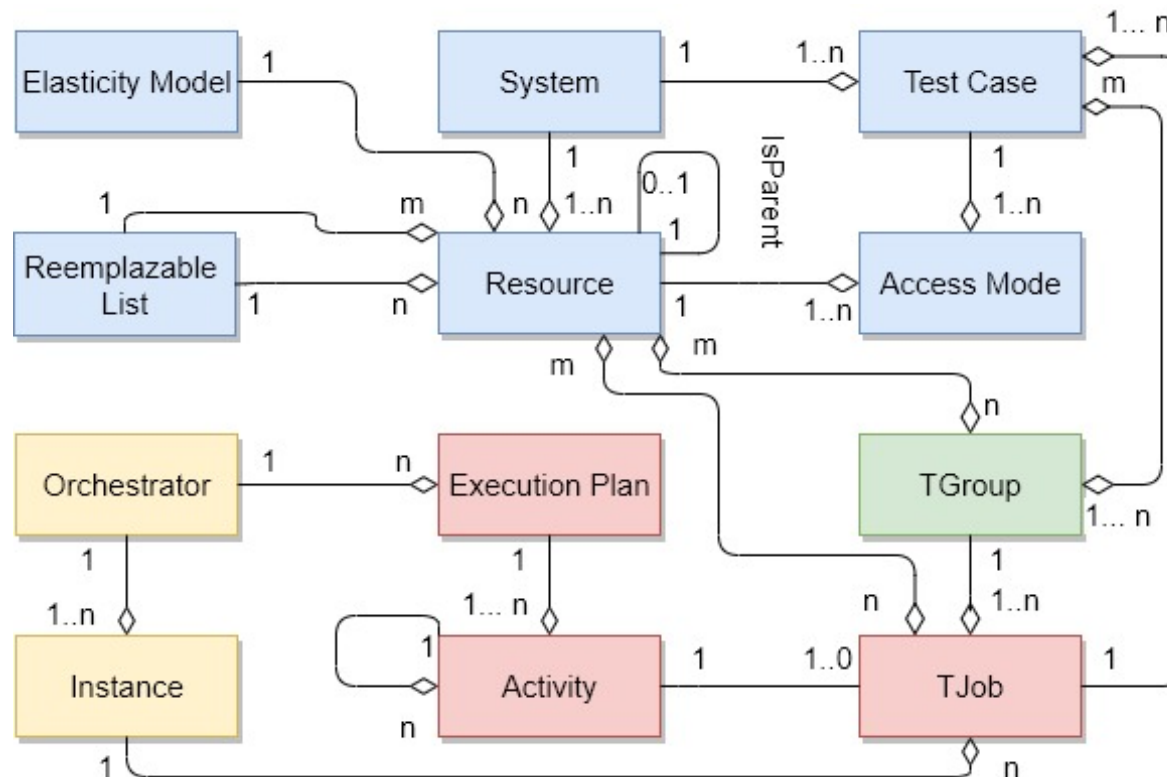
2022

2023

2024...

First Stages

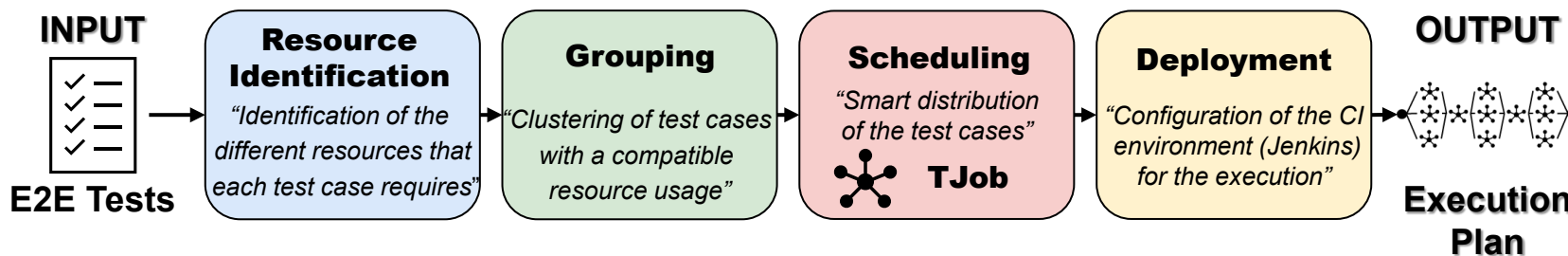
Characterization of the resources employed on E2E testing





Resource aware End-to-end Test ORCHestration Framework

“Optimize the E2E test case execution, through a resource characterization, grouping and scheduling of compatible test cases while reducing resource deployments and execution time.”



RETORCH

Results



Msc. PROJECT

2020_{Q3}



1st PhD YEAR

2021



2nd PhD YEAR

2022



3rd PhD YEAR

2023



4th & UP

2024...

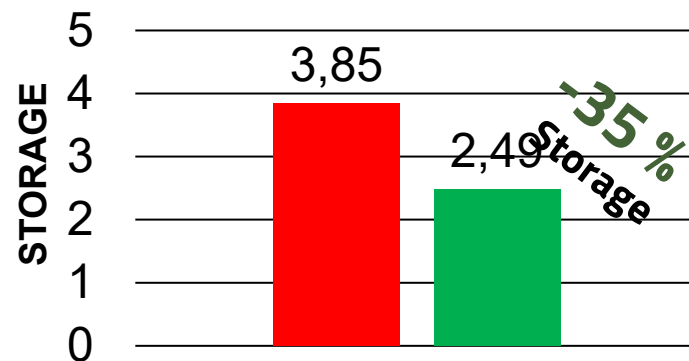
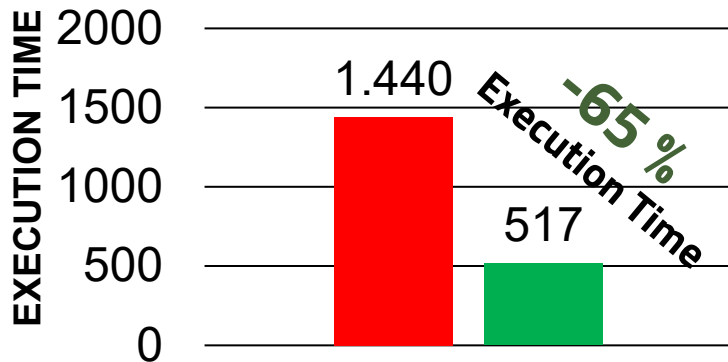
Full Teaching

Educational web application to support on-line classes.

21 E2E test cases

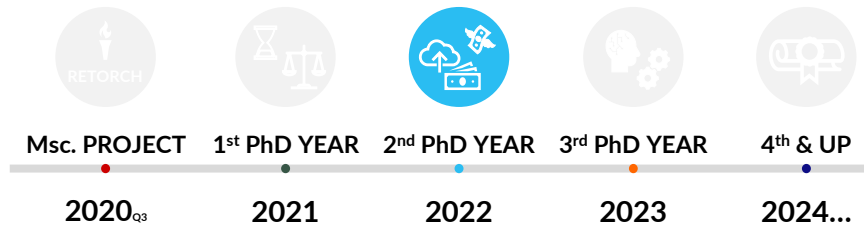
10 resources.

Several access modes



- [1] C. Augusto, J. Morán, A. Bertolino, C. de la Riva, and J. Tuya, 'RETORCH: Resource-Aware End-to-End Test Orchestration', *QUATIC*, 2019
- [2] C. Augusto, J. Morán, A. Bertolino, C. de la Riva, and J. Tuya, 'RETORCH: An Approach for Resource-Aware Orchestration of End-to-End Test Cases', *Soft. Quality Journal*, 2020
- [3] C. Augusto, 'Efficient test execution in End-to-End testing', ICSE20
- [4] C. Augusto and C. de la Riva, "Optimización de Recursos en Pruebas de Sistema," 5th edition of the SISTEDES-Everis Award

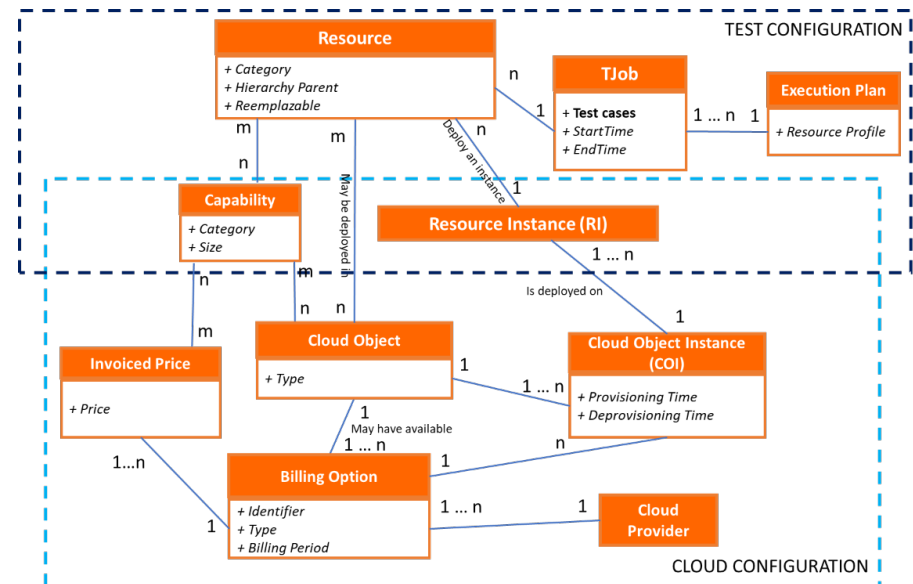
RETORCH Cloud Cost Model



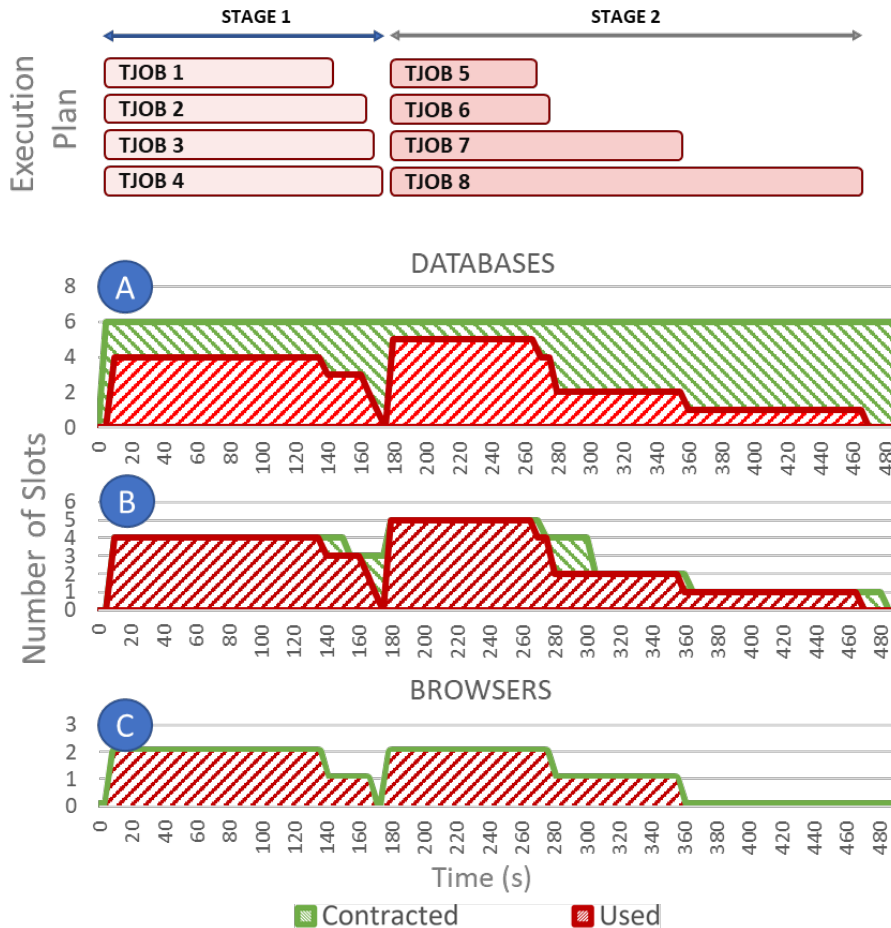
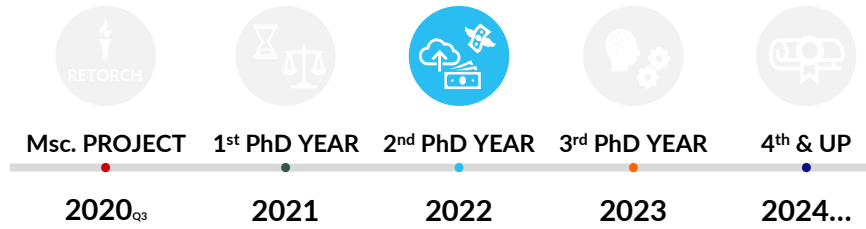
“Optimize the Cloud Infrastructure selected to deploy the E2E test suite in the Cloud”

Represents all different possible configurations for executing the test suite in a **Cloud** infrastructure:

- **Test configuration:** represents the scheduled test suite given by RETORCH
- **Cloud configuration:** represents the configuration of the Cloud Infrastructure



RETORCH Cloud Cost Model



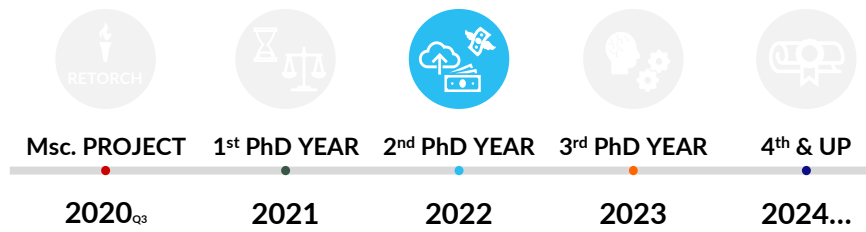
Execution Plan

“TJobs scheduled in sequential or parallel to reduce time/resources”

Resource Profile

“Shows how the different resources use the contracted Cloud Infrastructure”

RETORCH Cloud Cost Model



Infrastructure Cost

“Cost of the infrastructure contracted”

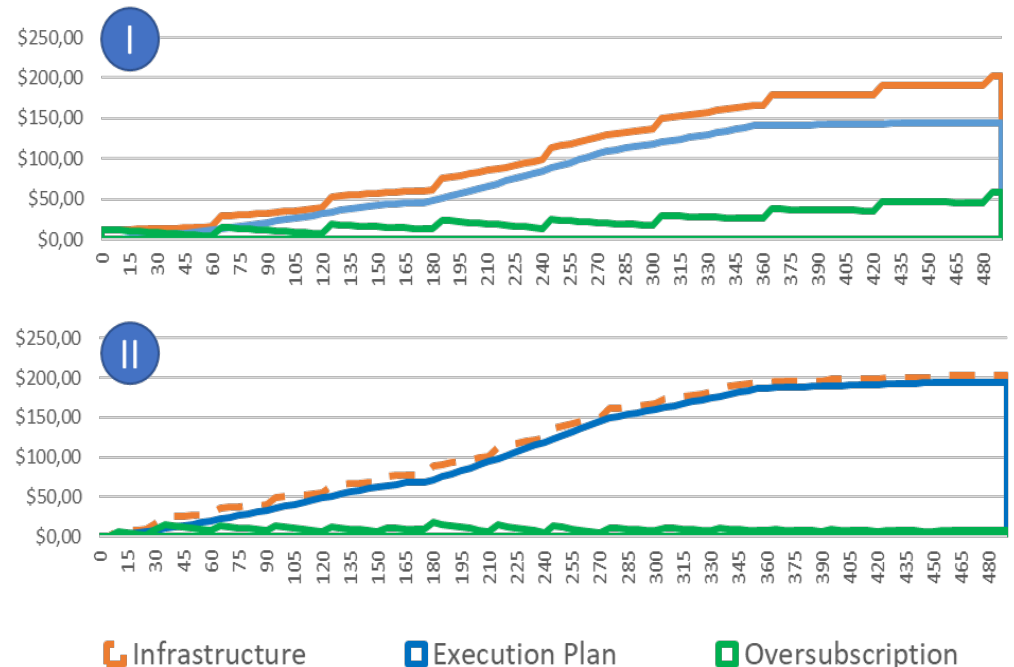
Execution Plan Cost

“Cost invested in execute the test suite”

Oversubscription Cost

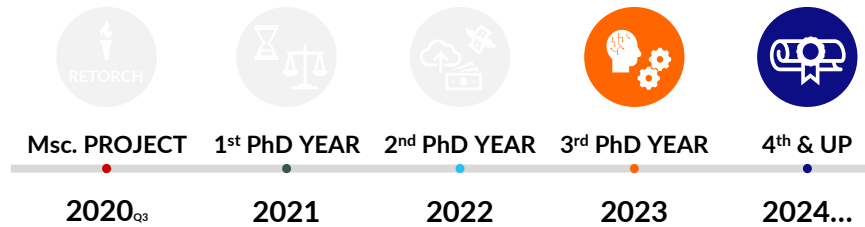
“Cost invested in Cloud infrastructure not used”

Total Costs



[1] C. Augusto, J. Morán, A. Bertolino, C. de la Riva, and J. Tuya, “Modelo de costes para el despliegue de pruebas E2E” JISBD22.

Conclusions and Future Work



- We have developed a framework to optimize resources/time and a cost model to optimize the infrastructure selected
- Integrate the cost model into a smart advisor-engine
- Automate the resource identification process
- Validate **RETORCH** in real world E2E Test suites

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Any Question?

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