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Portable and resilient infrastucture in Cloud Environment for ANSYS application

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With the growing trend of organizations transitioning to cloud computing, it has become crucial to adapt local batch solutions to cloud environments. In such respect, our activity has been focused on investigating alternatives environment solutions in order to run workflows designed by researchers from the Rizzoli Orthopedic Institute (IOR). The aims are to estimate the risk of a femur fracture occurring when specific loads from different angles are applied and to carry out studies on the wear of knee prosthesis, by simulating joint kinematics and loading conditions over time. ANSYS, the computer simulation modeling software used for the scope, is currently executed in a local batch system. To enhance the interoperability of this solution, it is useful to move to a microservices-based environment in INFN Cloud, using Kubernetes and Nextflow.

Kubernetes provides a scalable and flexible platform for deploying and managing containerized applications, making it an ideal choice for running even complex workloads in the Cloud. Likewise, Nextflow, a workflow management tool, has been choosen as it easily integrates various software packages and environment management systems. Moreover, it simplifies writing and deploying data-intensive computational pipelines.

As an added value, the adoption of object storage service has been considered to provide data persistence and sharing capabilities among applications as well as different research groups thanks to its HTTP-based RESTful API.

The present study aims to find advantages and possible improvements, by leveraging a cloud-enabled approach. Moreover, as we will manage personal data from patients, hence subject to GDPR, the workflow must be executed in a secure infrastructure. Since at CNAF we have already worked on projects that treat personal data, we have gained experience in security field, hardening tools (RKE2+CIS) and infrastructures (EPIC). Finally we aim to wrap those workflows in a microservices-based environment on a secure Cloud infrastructure and be able to easily replicate this recipe in future biomedical collaboration.

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