# PORTABLE AND RESILIENT INFRASTRUCTURE IN CLOUD ENVIRONMENT FOR ANSYS APPLICATION

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# DARE internal pilot: *disease progression and implant failure*
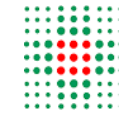
Within the **DARE PNRR project**, the Rizzoli Orthopedic Institute (**IOR**) developed this workflow in order to:

- **assess** the **risk of disease progression** and **support** clinical management of patient with early osteoarthritis;

- **predict** the **risk of implant failure** in patients with joint prostheses

The twin project needs to run digital twins on the INFN secure Cloud
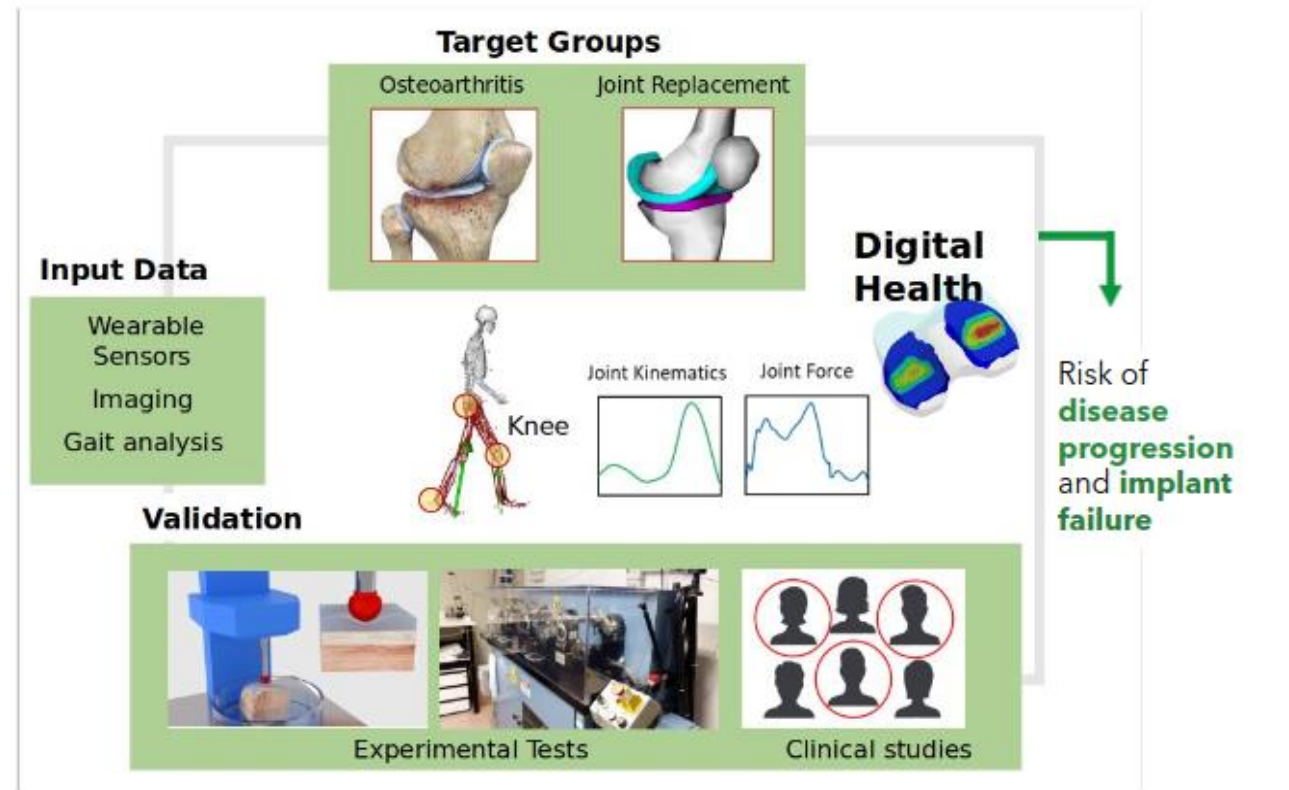
State of the art

Deployment:

- Cluster **Slurm Workload Manager**, local batch system

- It adopts a Network File System (**NFS**) to share the results in each node.

- **Conda** environment with Python packages

- **ANSYS** installation, the computer simulation modeling software with the support of **openmpi libraries**.


It contains a list of 28 different combination of force applied and angle of application
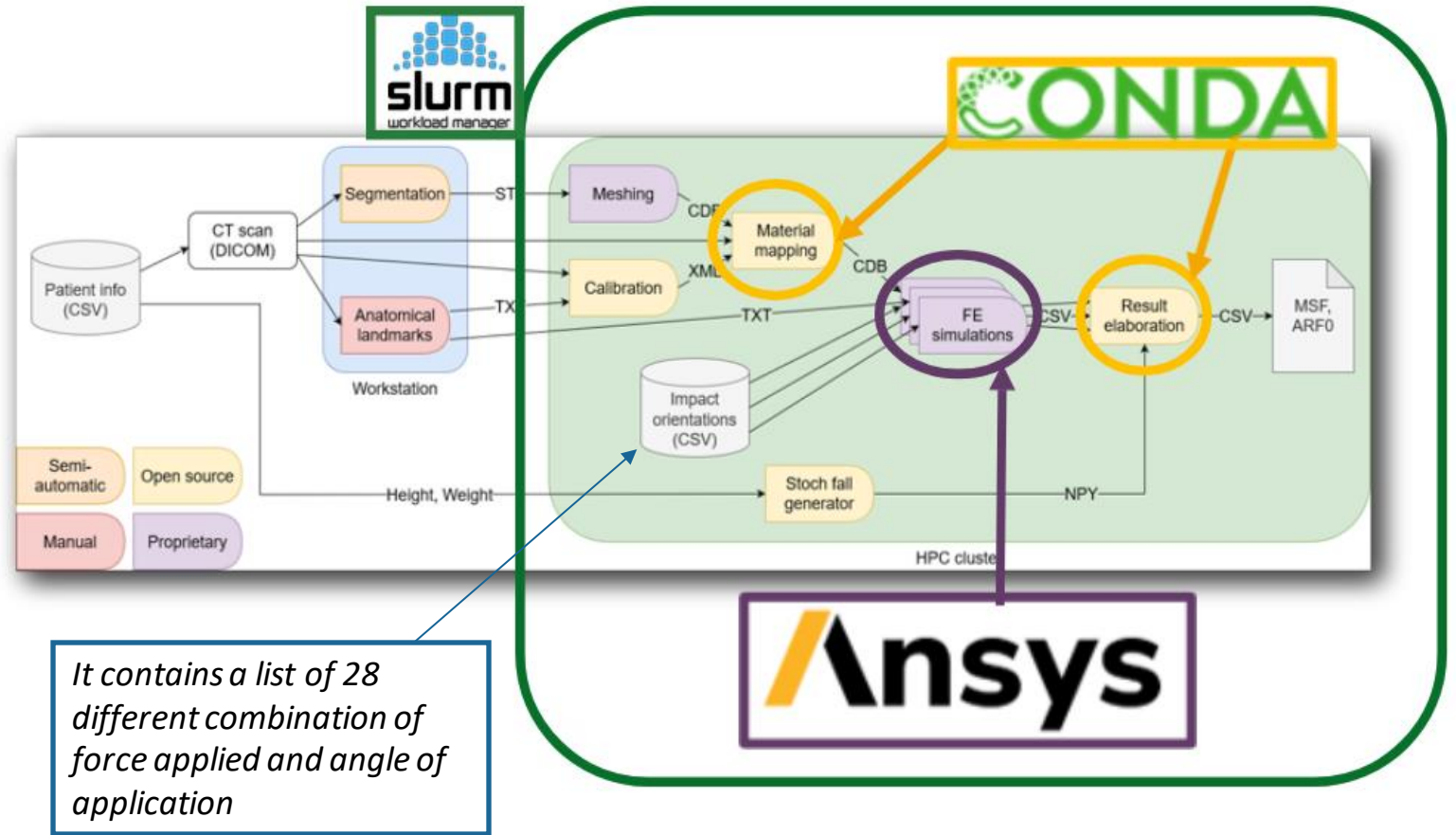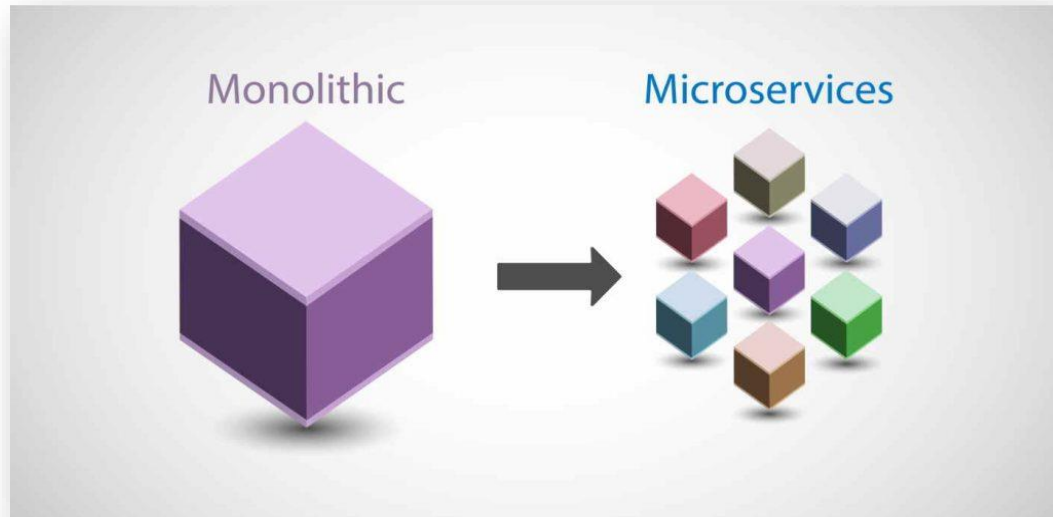
The Cloud-oriented approach

Deployment:

- A **Kubernetes** cluster has been deployed with **RKE2**. It was chosen to exploits **CIS** (Center of Internet Security), the **hardening profile** to secure the infrastructure.

- **Nextflow** adopted to enable **scalable** and **reproducible** scientific workflows using software containers.

- **ANSYS software** has been **deeply lightened** and **containerized**, with the support of **openmpi libraries**.

- Finally, the workflow ends by running two **Python** scripts, both containerized.

- A private **Harbor registry** has been exploited to cache the docker images

- A **persistent volume claim provided by Ceph-FS** and distributed among the different nodes and pods.

Nextflow directed acyclic graph

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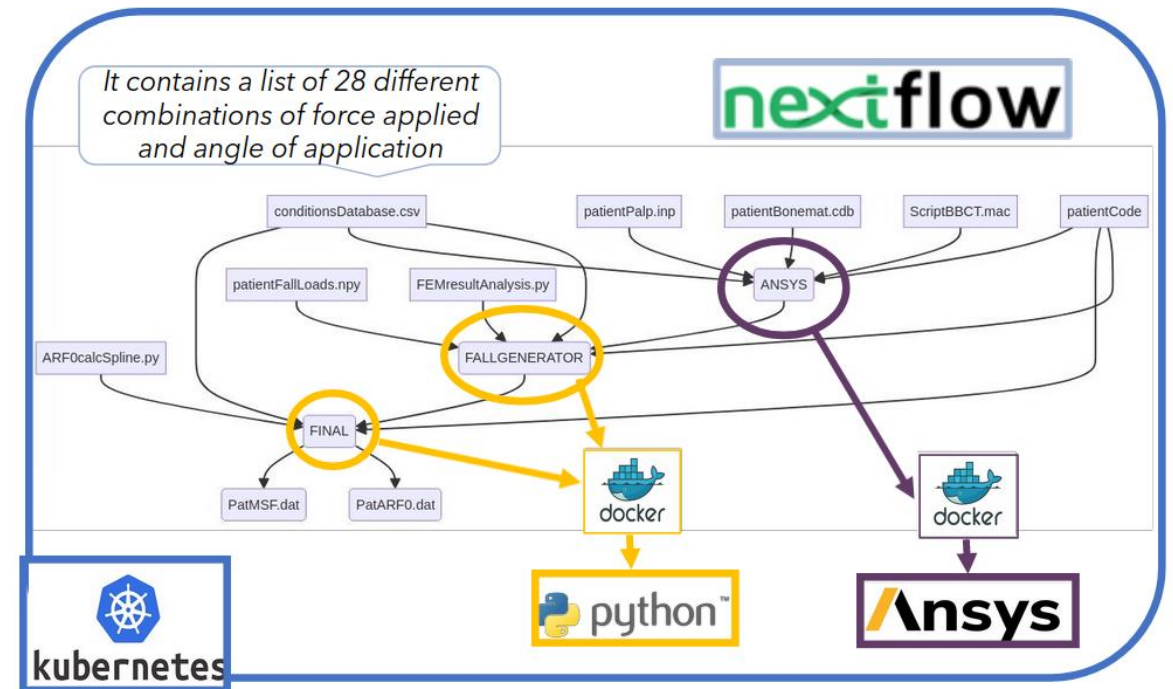
Conclusions

- This activity demonstrates how a classic batch-oriented workflow model can be **ported to a cloud-oriented environment**.

- Features provided by the adopted technologies enables to **integrate the different solutions** and to define a cloud-enabled platform that can provides resources **elasticity as well as service provisioning**.

- As an added value, the **CIS approach** enables to deploy workflows in a **secure environment**, and this is mandatory when handling data subject to GDPR regulations.

For any question or further information come to see my poster!

Thank You!

Digital
Lifelong
Prevention

DARE