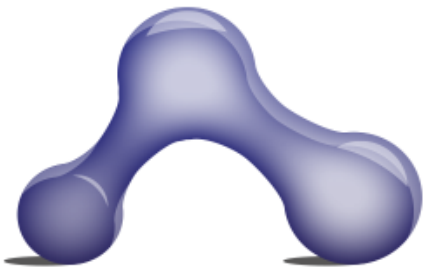


# Using TITAN in Life Sciences

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ismael@uma.es



**SWAT<sup>4</sup>HCLS**

**13th International SWAT4HCLS Conference**  
Semantic Web Applications and Tools for Health Care and Life Sciences



January 10-13, 2022  
Leiden, The Netherlands

# What is TITAN?

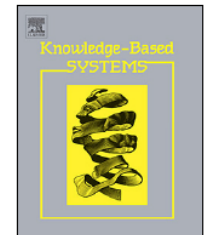
Knowledge-Based Systems 232 (2021) 107489



Contents lists available at [ScienceDirect](#)

## Knowledge-Based Systems

journal homepage: [www.elsevier.com/locate/knosys](http://www.elsevier.com/locate/knosys)

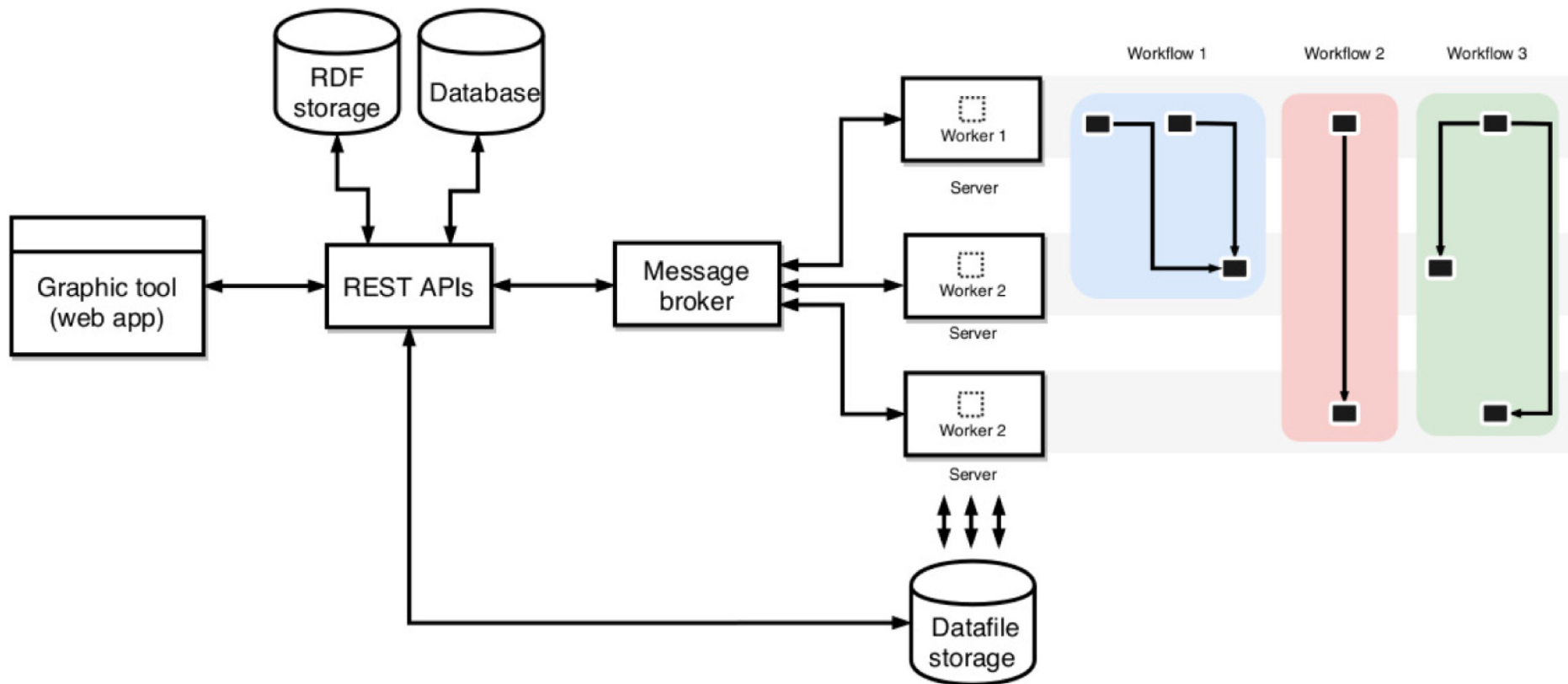


## TITAN: A knowledge-based platform for Big Data workflow management<sup>☆</sup>

Antonio Benítez-Hidalgo<sup>1</sup>, Cristóbal Barba-González, José García-Nieto, Pedro Gutiérrez-Moncayo, Manuel Paneque, Antonio J. Nebro, María del Mar Roldán-García, José F. Aldana-Montes, Ismael Navas-Delgado<sup>\*</sup>

*Dept. de Lenguajes y Ciencias de la Computación, ITIS Software, Universidad de Málaga, Málaga 29071, Spain*

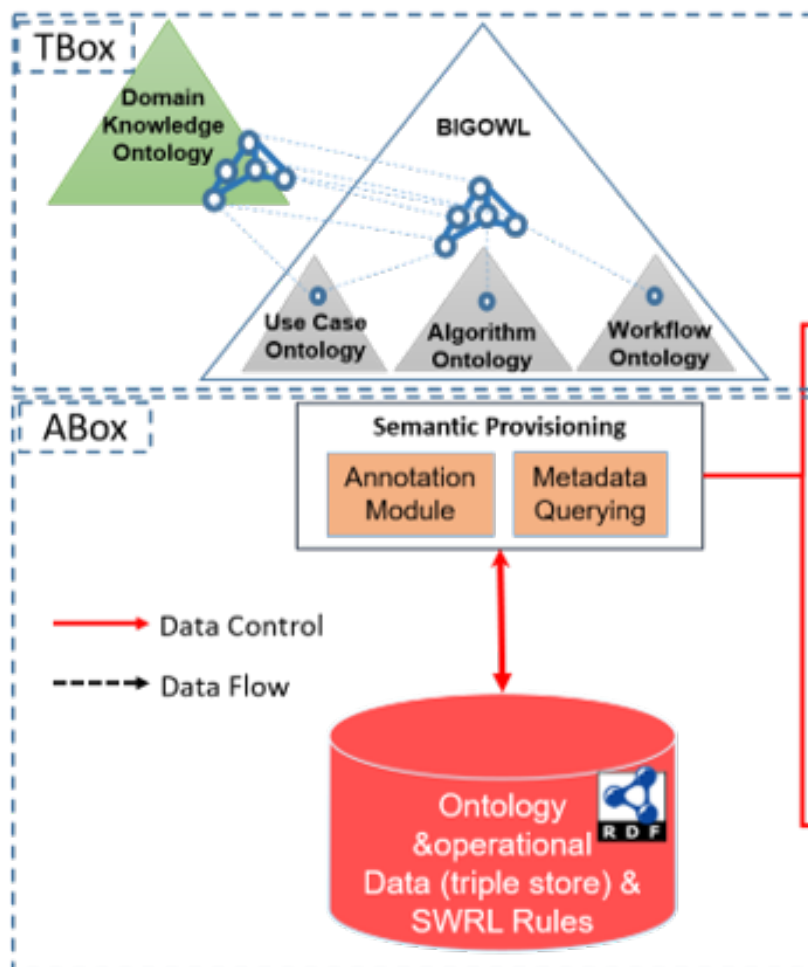




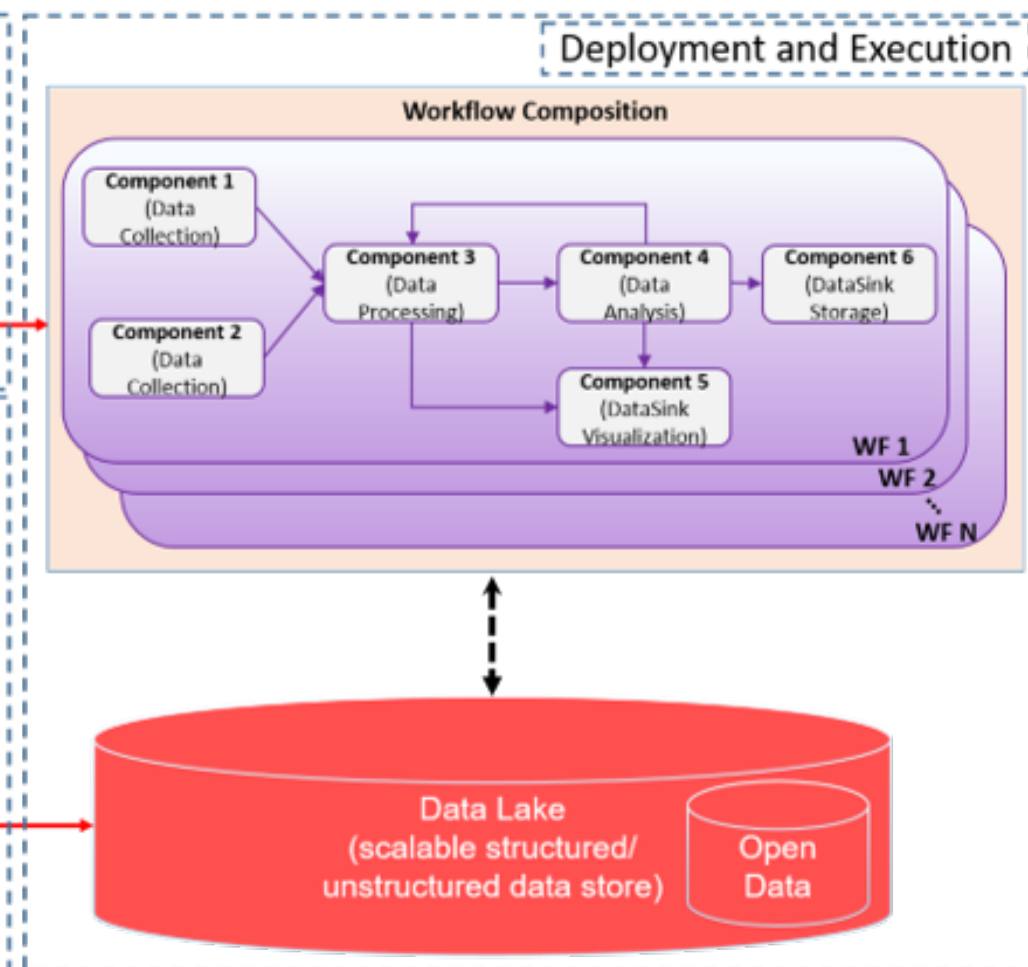
## What is TITAN?

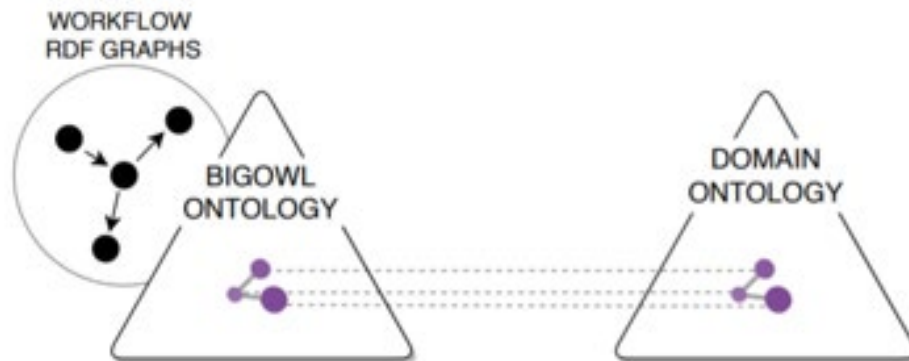
A software platform for managing all the life cycle of science workflows from deployment to execution in the context of Big Data applications

## Semantic Model



## Operational Model





Split Shuffle — <http://www.ontologies.khaos.uma.es/titan/ComponentSplitShuffle>

Annotations Usage

Annotations: Split Shuffle

Annotations +

- `rdfs:label` [type: xsd:string]  
Split Shuffle
- `rdfs:comment` [type: xsd:string]  
Horizontal tabular dataset split shuffle.

Description: Split Shuffle

Types +

- SplitShuffle

Same Individual As +

Different Individuals +

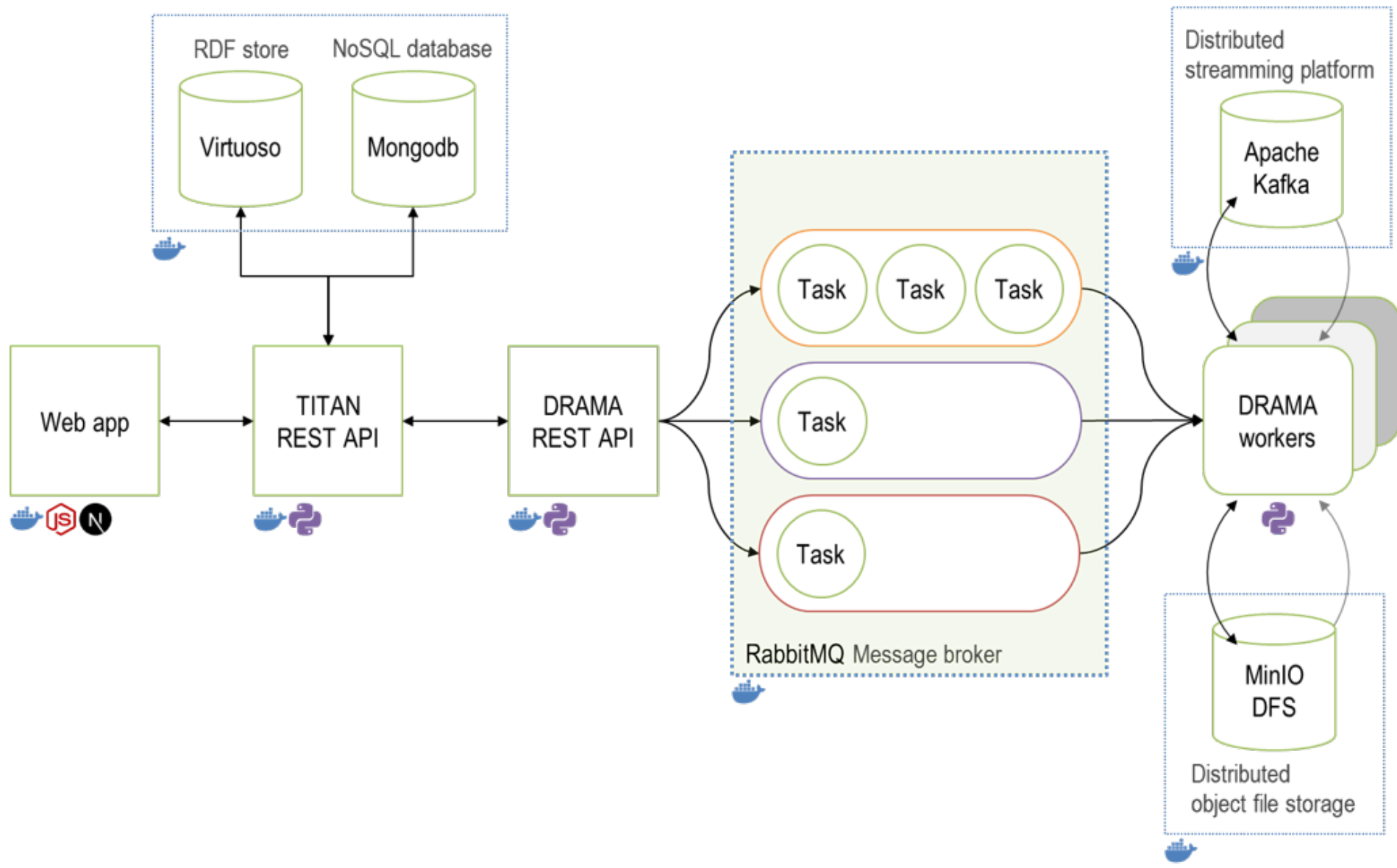
Property assertions: Split Shuffle

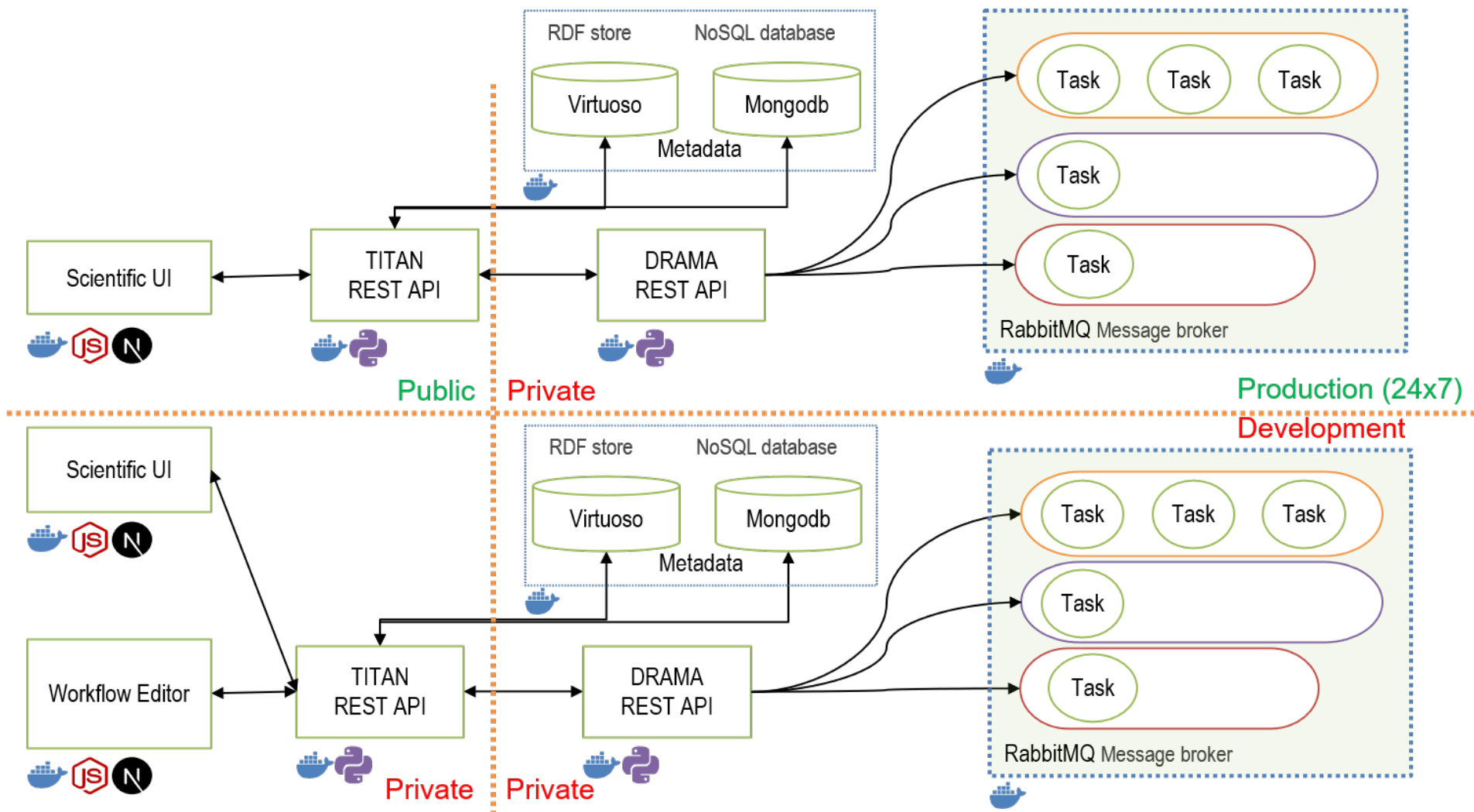
Object property assertions +

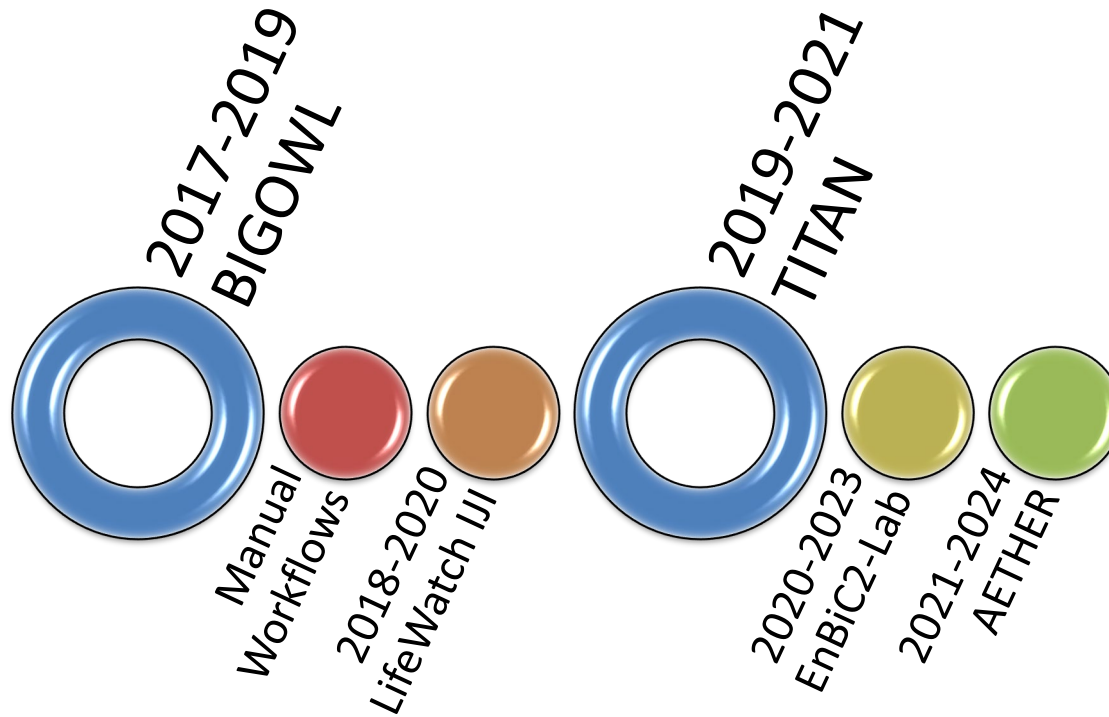
- `specifiesOutputClass` STDatasetTest
- `hasImplementation` 'Split Shuffle in Python'
- `hasParameter` proportion
- `specifiesInputClass` TabularDataset
- `hasAlgorithm` 'Split Shuffle'
- `specifiesOutputClass` STDatasetTrain

Data property assertions +

- `numberOfInputs` "1"^^xsd:int
- `numberOfOutputs` "2"^^xsd:int





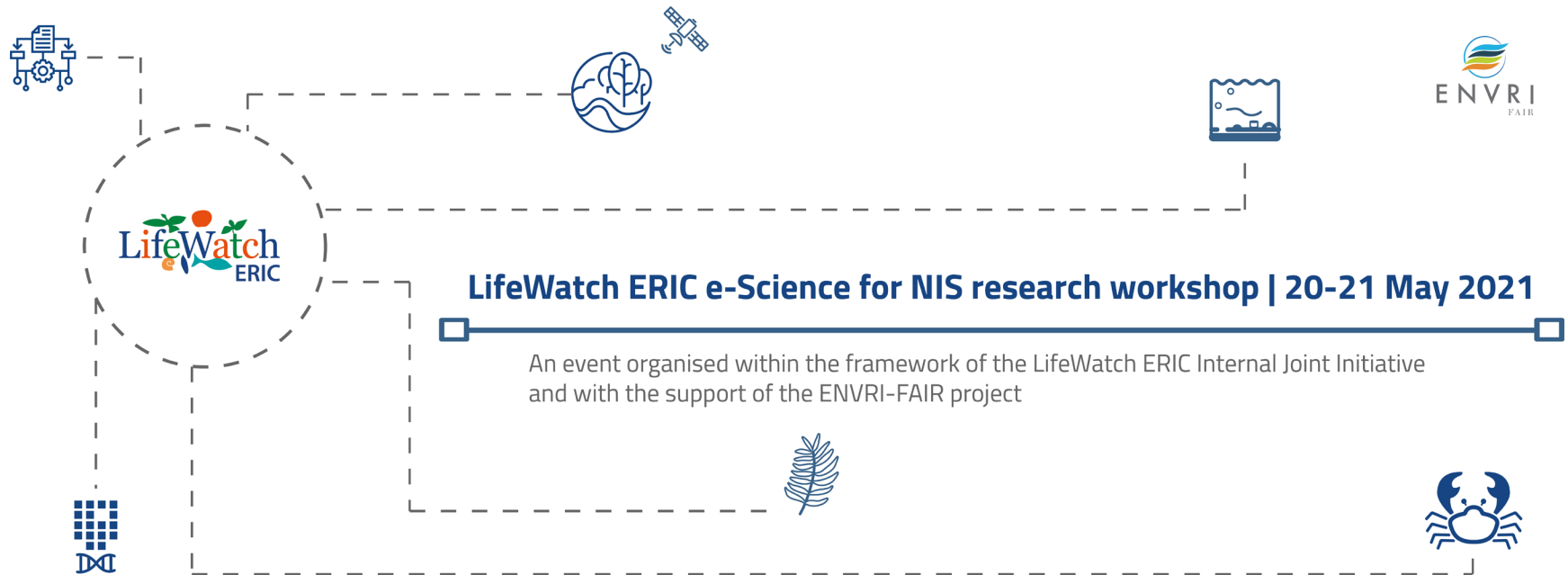


## What is TITAN?

A software platform for managing all the life cycle of science workflows from deployment to execution in the context of Big Data applications



# Where is TITAN being used?



**LifeWatch ERIC** is a [European Research Infrastructure](#) Consortium providing e-Science research facilities to scientists investigating biodiversity and ecosystem functions and services in order to support society in addressing key planetary challenges.

# Where is TITAN being used?

## Technology

- Platform
- Big Data
- IoT
- Supercomputing

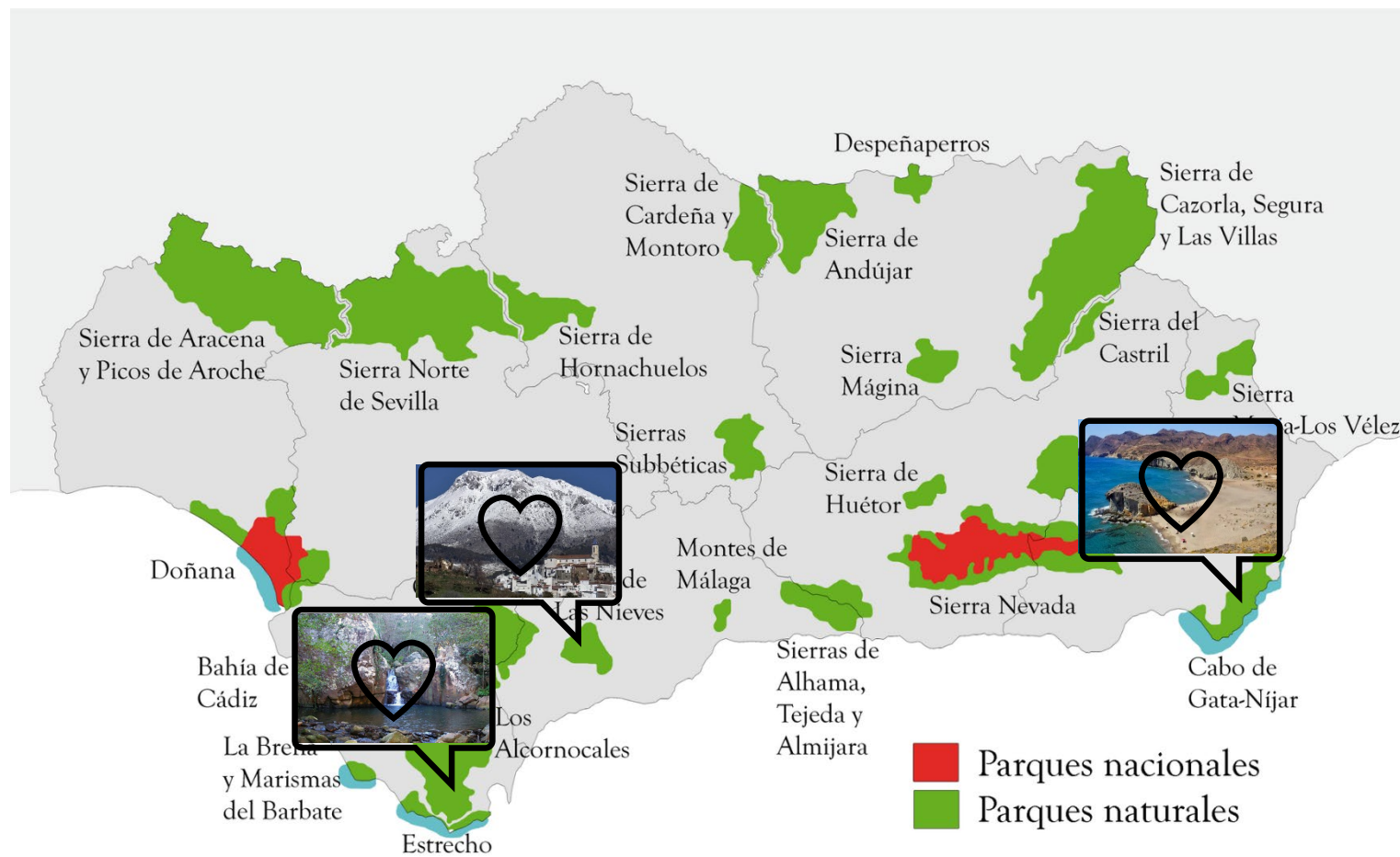
## Components & Workflows

- Soil
- Flora
- Air
- Water
- Fauna

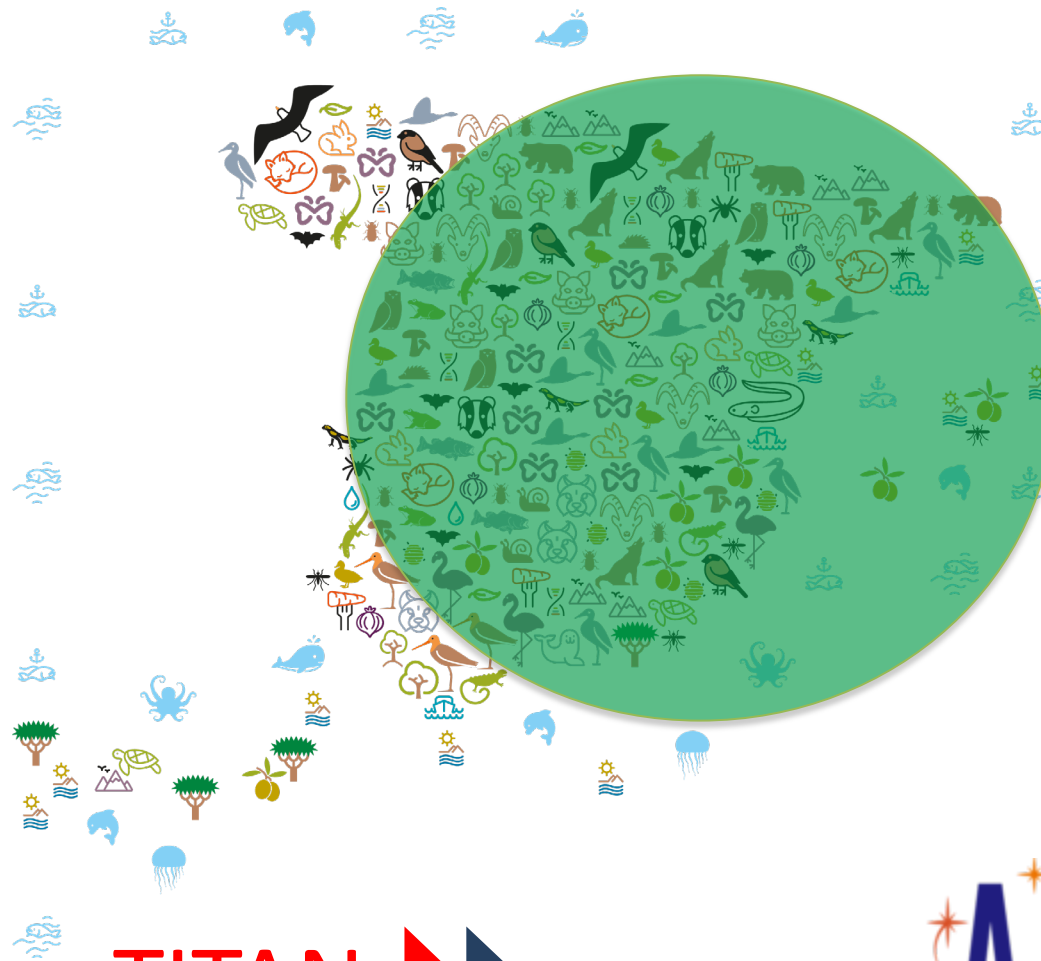


<https://enbic2lab.uma.es/>

**EnBiC2-Lab**



# Where is TITAN being used?



## Functionality

- Data Quality
- Cybersecurity
- BPMs
- KPIs
- Semantics

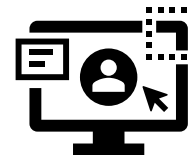
**TITAN**



<https://aether.es/>

**AETHER**

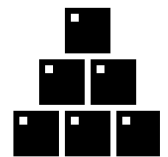
# How can it be used?



Dedicated  
End-user  
interfaces



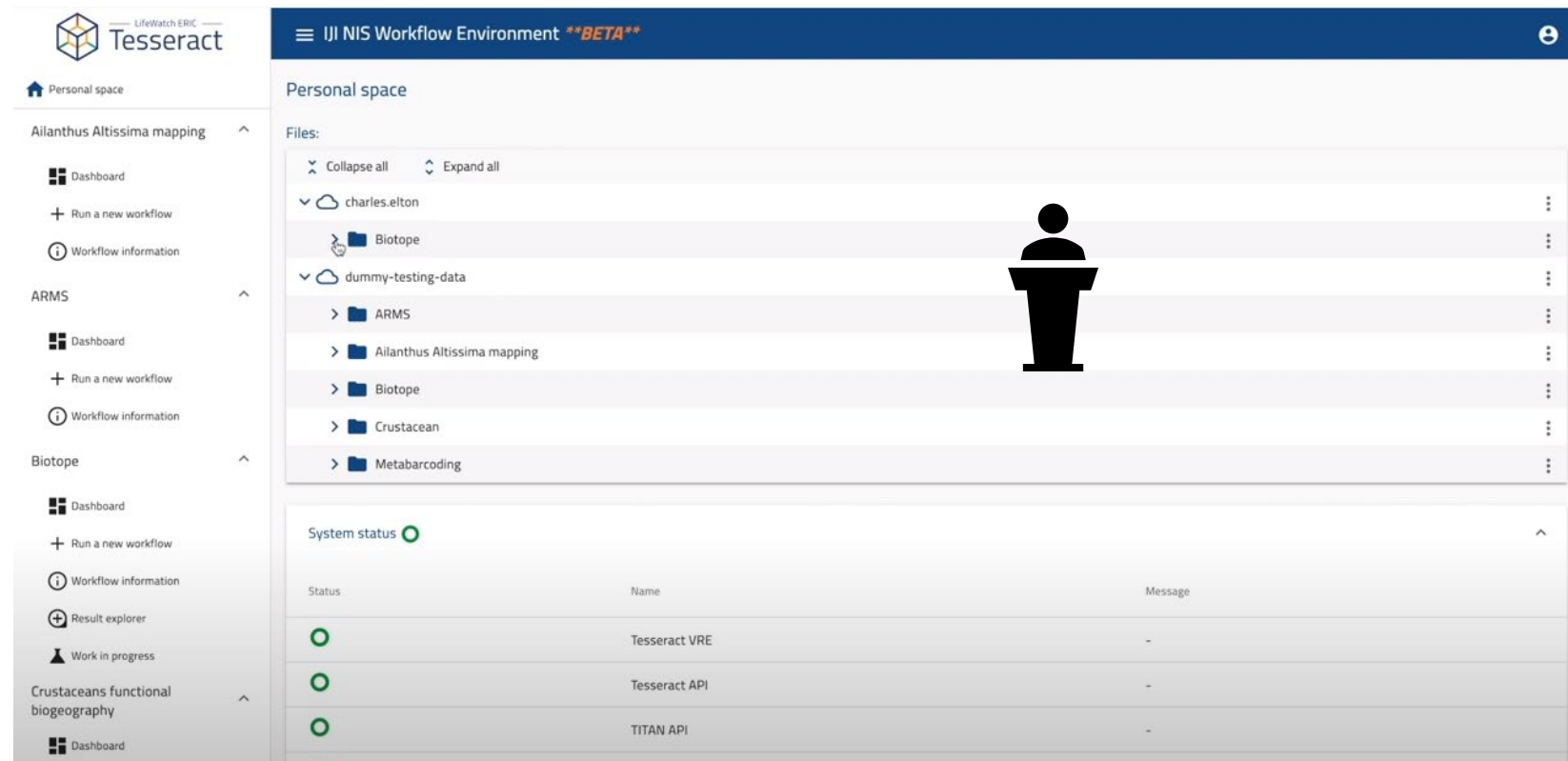
Workflow  
design  
interfaces



Component  
development

# How can it be used?

- You have pre-defined workflows
- Ad-Hoc user interface developed for users to run these workflows



Personal space

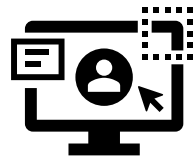
Files:

☐ Collapse all    ☐ Expand all

- charles.elton
  - Biotope
- dummy-testing-data
  - ARMS
  - Ailanthus Altissima mapping
  - Biotope
  - Crustacean
  - Metabarcoding

System status ●

Status	Name	Message
<span style="color: green;">●</span>	Tesseract VRE	-
<span style="color: green;">●</span>	Tesseract API	-
<span style="color: green;">●</span>	TITAN API	-



Dedicated  
End-user  
interfaces

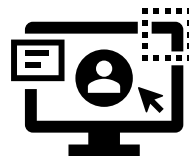
<https://www.youtube.com/watch?v=AJfNzj0OGol>

# How can it be used?

- You have pre-defined workflows
- Ad-Hoc user interface developed for users to run these workflows

The screenshot shows the Tesseract workflow environment interface. The sidebar on the left contains navigation links for 'Personal space', 'Ailanthus Altissima mapping', 'ARMS', 'Biotope', 'Crustaceans functional biogeography', and 'Dashboard'. The main content area is titled 'Personal space' and shows a 'Files:' section with a tree view of folders: 'charles.elton', 'dummy-testing-data', 'ARMS', 'Ailanthus Altissima mapping', 'Biotope', 'Crustacean', and 'Metabarcoding'. A large red prohibition sign is overlaid on the file tree. Below the file tree is a 'System status' section with a table showing the status of 'Tesseract VRE', 'Tesseract API', and 'TITAN API'.

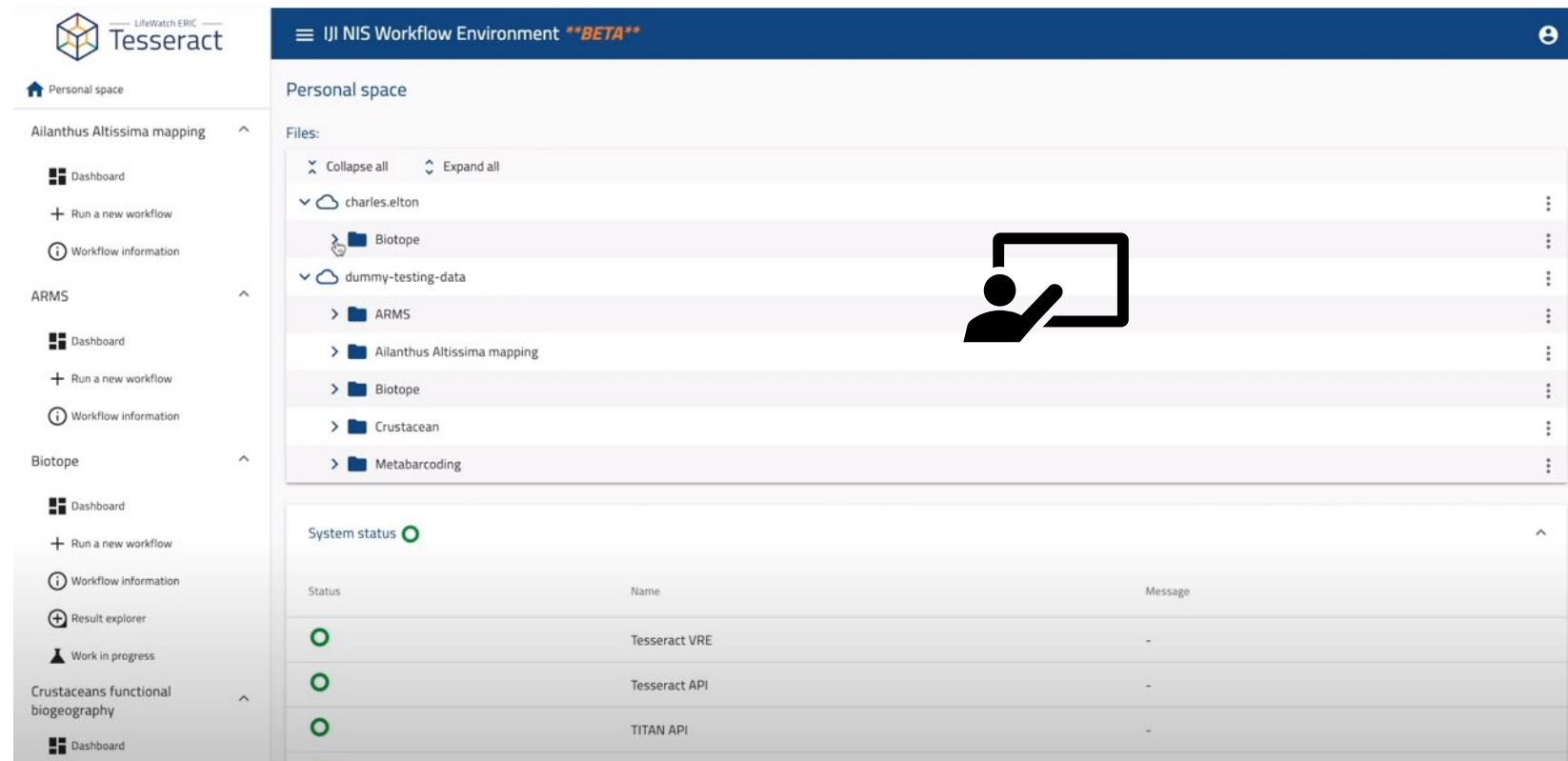
Status	Name	Message
○	Tesseract VRE	-
○	Tesseract API	-
○	TITAN API	-



Dedicated  
End-user  
interfaces

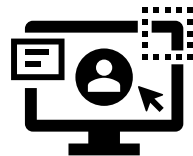
# How can it be used?

- You have pre-defined workflows
- Ad-Hoc user interface developed for users to run these workflows



The screenshot shows the Tesseract workflow environment interface. The top navigation bar includes the Tesseract logo, the text "LifeWatch ERIC Tesseract", and a user profile icon. The main content area is titled "Personal space" and displays a list of files and folders under the heading "Files:". The files list includes "charles.elton" (expanded to show "Biotope"), "dummy-testing-data" (expanded to show "ARMS", "Ailanthus Altissima mapping", "Biotope", "Crustacean", and "Metabarcoding"), and "System status". A large icon of a person at a computer is overlaid on the files list. The "System status" section at the bottom shows a table with columns "Status", "Name", and "Message". The table lists three components: "Tesseract VRE", "Tesseract API", and "TITAN API", all with a green status indicator and a dash in the message column.

Status	Name	Message
●	Tesseract VRE	-
●	Tesseract API	-
●	TITAN API	-



Dedicated  
End-user  
interfaces









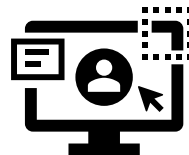
# How can it be used?

- You have pre-defined workflows
- Ad-Hoc user interface developed for users to run these workflows


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swat4ls  
swat4ls

 <p>Services to contribute to the knowledge and sustainable management of the Andalusian aquifers based on hydrological and hydrogeological information...</p> <p>Water</p>	 <p>Services to determine soil quality indicators properties and determine soil degradation/desertification processes: to determine...</p> <p>Soil</p>	 <p>Services to establish an aerobiological surveillance network to detect changes in the flowering phenology of different species through...</p> <p>Air</p>
 <p>Services to provide reliable and up-to-date datasets about the recent increase in distribution of African species that are currently reaching...</p> <p>Fauna: <i>In progress</i></p>	 <p>Services for habitat monitoring (species and plant community level) in suitable fragile environments such as endemic fir woods, high mountain...</p> <p>Flora</p>	 <p>Integrated services and innovative tools based on new technologies such as supercomputing and Big Data, that integrate the Water, Soil, Air, Fauna and Flora databases...</p> <p>Big Data</p>



Dedicated  
End-user  
interfaces

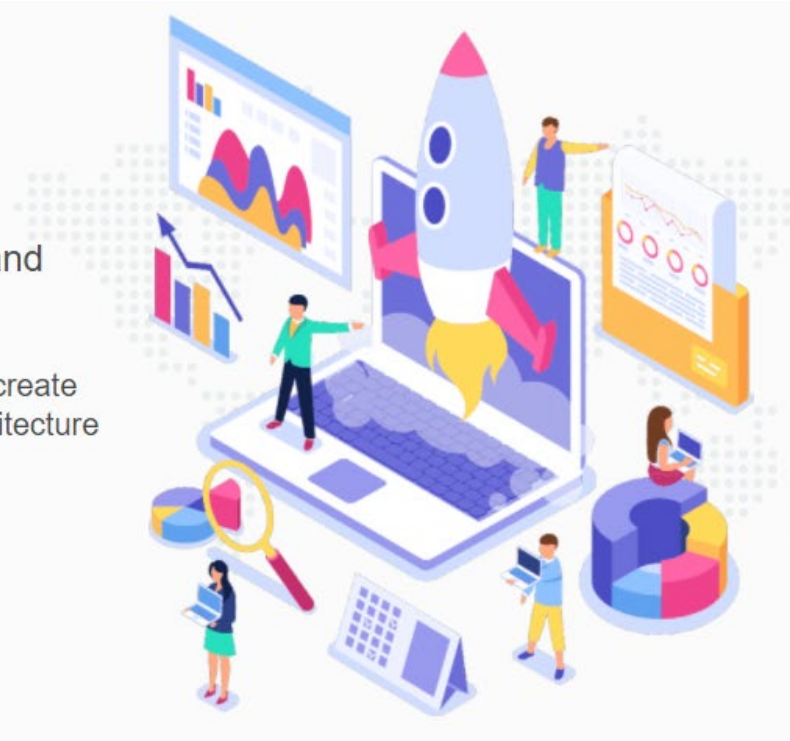
# How can it be used?

## Welcome to the Titan platform

Titan is an innovating project for the design and creation of Big Data Workflows.

Take advantage of the domain semantic capabilities, create Workflows and execute them under a distributed architecture powered by Apache Kafka and Apache Avro.

About Titan



swat4ls  
swat4ls

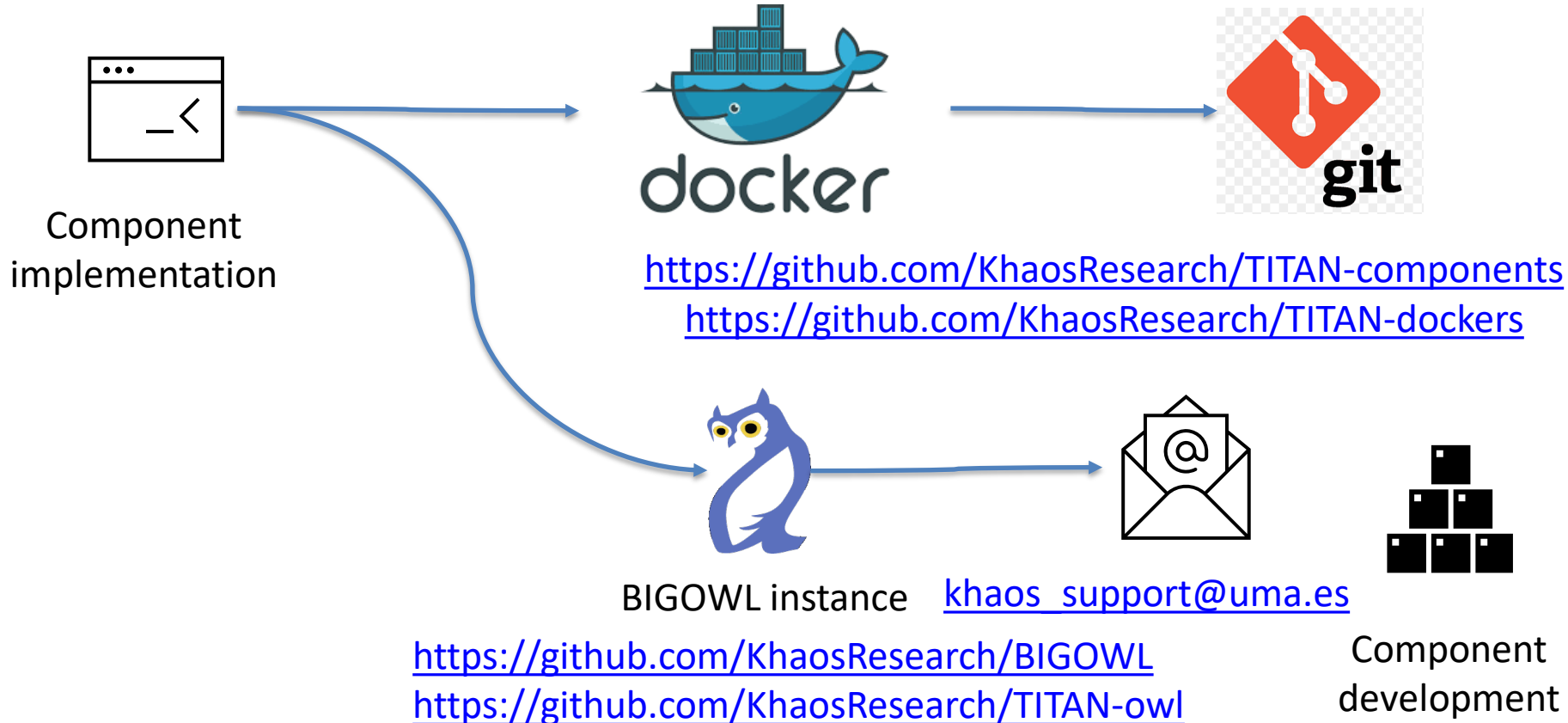
minio://testdata/enbic2lab/soil-workflow/ExampleData.sav



Workflow  
design  
interfaces

<https://titan.khaos.uma.es/>

# How can it be used?

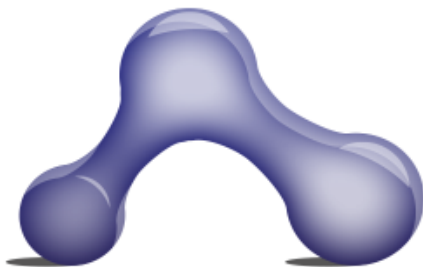


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<https://github.com/KhaosResearch>



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