

# Enabling a data-informed public sector:

## *From hype to action using the **Big Data Test Infrastructure (BDTI)***

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**Business Owner:**  
**DG CNECT**

Directorate-General for Communications Networks, Content and Technology

**Service Provider:**  
**DG DIGIT**

Directorate-General for Digital Services



# Road Map

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1

## BDTI in a nutshell

- Its context and why use it

2

## BDTI in practice

- Access and overview of the BDTI portal
- Concrete application of the BDTI

3

## BDTI's community

- Developing the BDTI community and how can you help us



# 1

## BDTI in a nutshell

- Its context and why use it

# What is the Big Data Test Infrastructure (BDTI) ?



Not only for big data, for public sector in general (open data)



Six months free of charge service  
for EU public administrations \*



Ready-to-use  
data analytics stack and support



Cloud platform based on  
open-source tools



To help the public sector **to derive insights from data**  
and accelerate transition towards **data-informed decision making**.

\* The cost of the pilot project must fit within the funding boundaries of the BDTI pilot budget

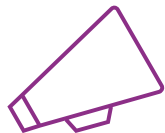
## Who is the Big Data Test Infrastructure (BDTI) for?



European Public Administrations  
All European Public Administrations at **local, regional and national level** can independently apply for a BDTI pilot project



Ecosystem with **academia** and **private sector**  
Academia, spin-off, startups can apply for pilot projects as long as there is a **clear collaboration** with a Public Administration which will be the main point of contact for the project (Master/PhD, GovTech startups)



**We need YOUR support in promoting BDTI  
between your public administrations**

Contact us:

[EC-BDTI-PILOTS@ec.europa.eu](mailto:EC-BDTI-PILOTS@ec.europa.eu)



# Big Data Test Infrastructure Objectives



## Objectives

- Increase the easy accessibility, interoperability, quality and usability of public sector information in compliance with the requirement of the **Open Data Directive**
- Boost the **re-use and combination of open public data** across the EU for the development of information products and services, including AI applications
- Testing **Business-to-Government (B2G)** data sharing collaborations for the **public good**
- **Data Space Support Centre: explore and experiment with your data\***
  - BDTI provides a safe **testing environment to run big data experiments** for data space customers

\* <https://joinup.ec.europa.eu/collection/semic-support-centre/data-spaces>

## Why use the BDTI ?



**Benefit of six months free of charge** service, including **advisory and technical** support for the duration of the pilot



**Experiment with data analytics** using high **performance infrastructure** that leverages the power of the **elastic cloud**



**Receive guidance** to move from a pilot to a **production-ready** process – **EXIT package**

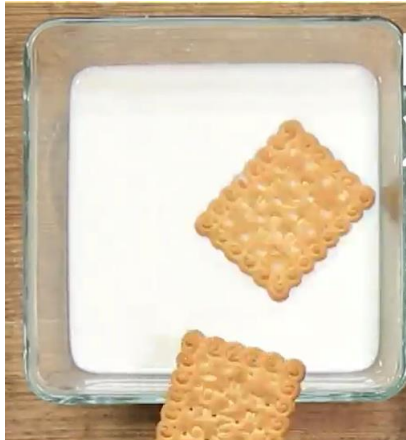


**Test your idea → Extract value → Create knowledge**

## Why use the BDTI ?



Data → Information → Presentation → Knowledge

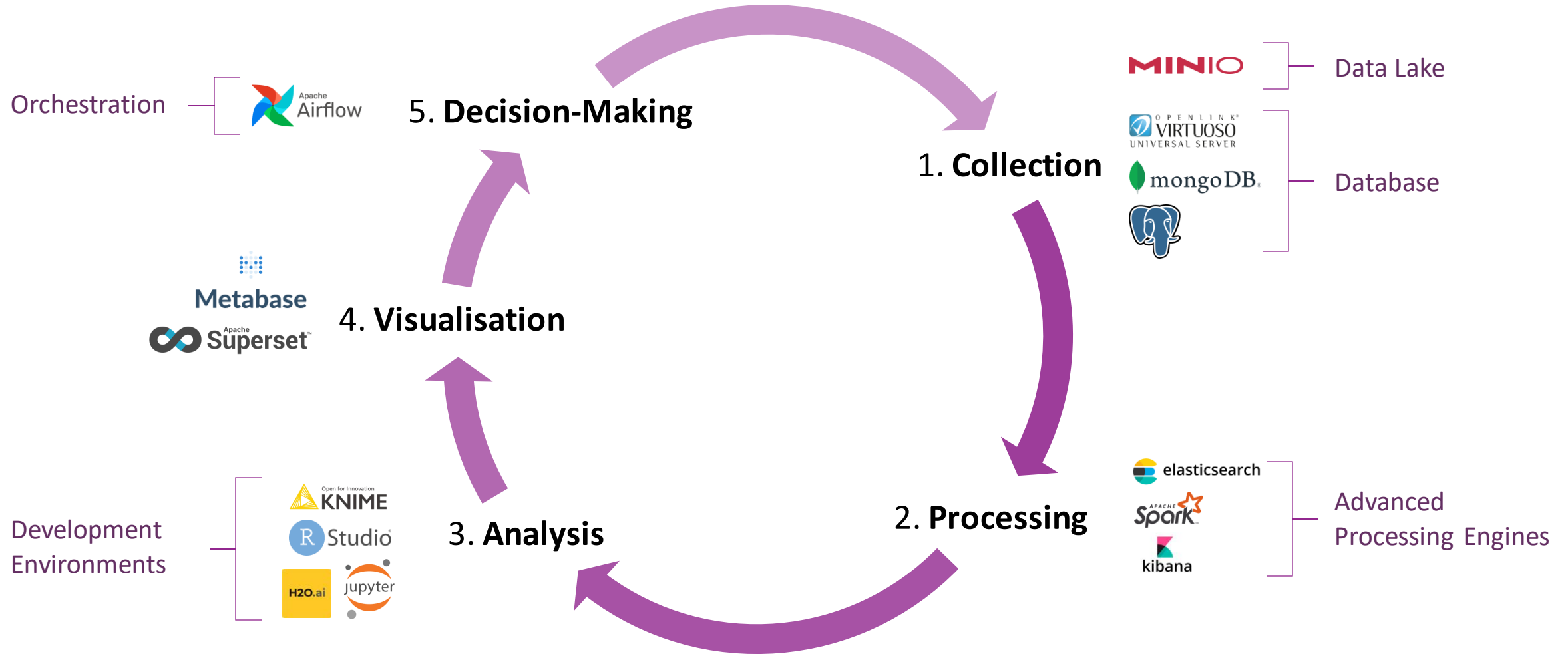


You have the key ingredients (datasets),  
we equip you with the best open source tool  
to generate amazing recipes.



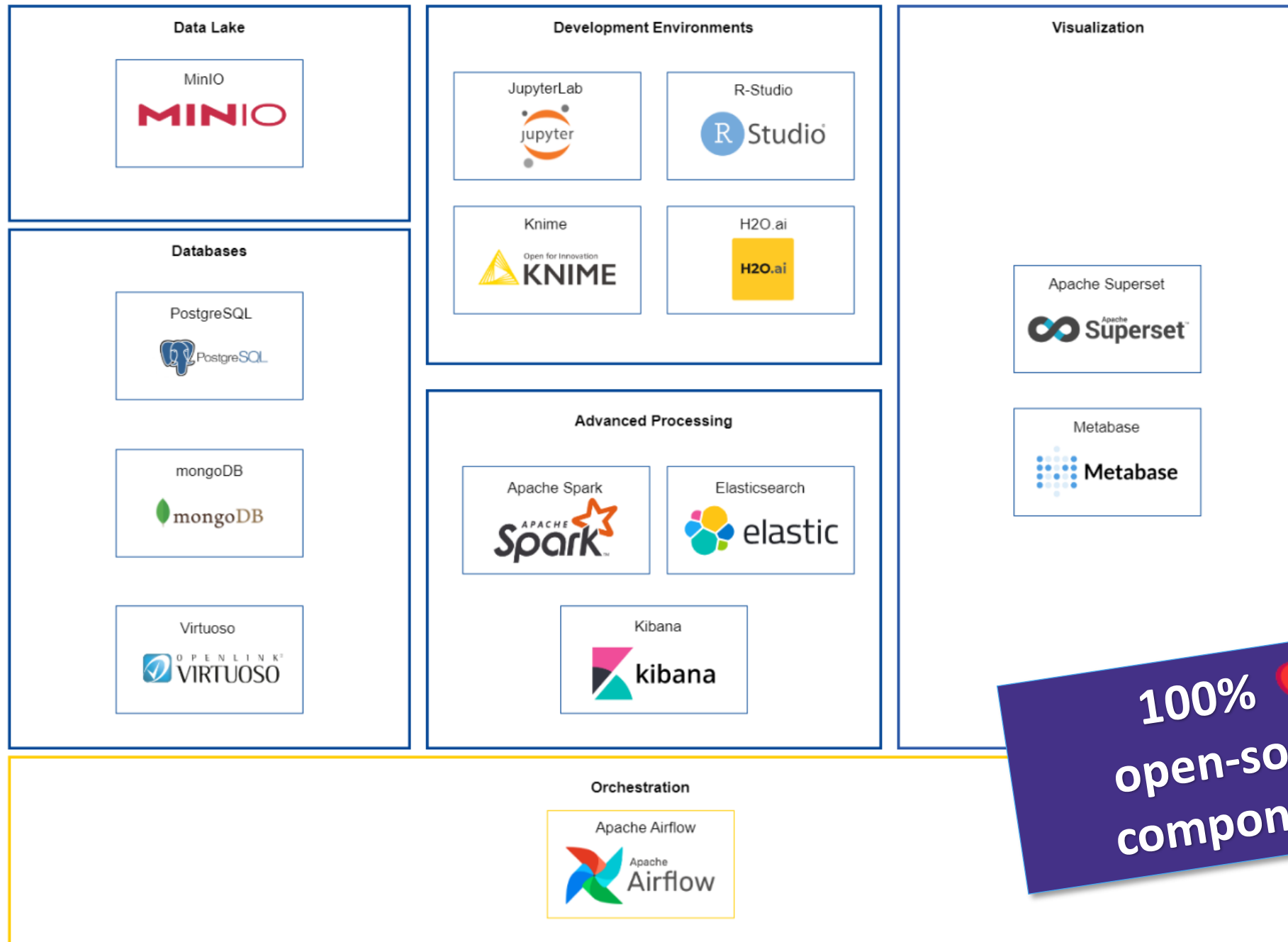
2

# With its open-source tools, BDTI supports you throughout your data journey



# BDTI's Data Analytics Stack

2



100% ❤️ open-source components

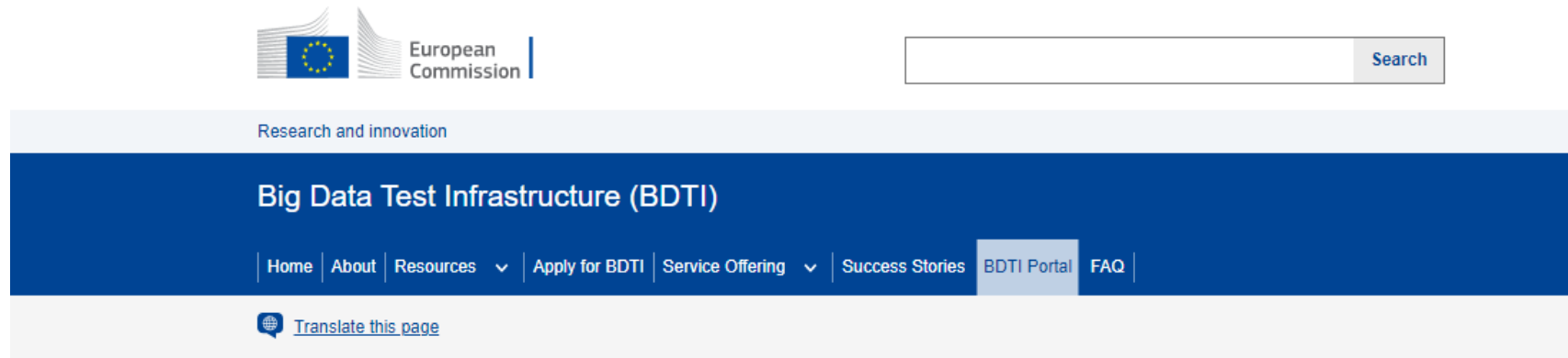


# 3

## BDTI in practice

- Access and overview of the BDTI portal
- Concrete application of the BDTI

# Access to BDTI portal directly from your browser (EU Login integration)



Home > BDTI Portal

## BDTI Portal

The BDTI portal is a web application which allows users to easily deploy and manage containerized data science workloads. In this section, you can access the portal and find documentation about the portal.

## Access the BDTI Portal

Disclaimer: The BDTI portal is only available to users who have a BDTI pilot.

The user documentation for the BDTI portal can be found [here](#).

Access the BDTI Portal

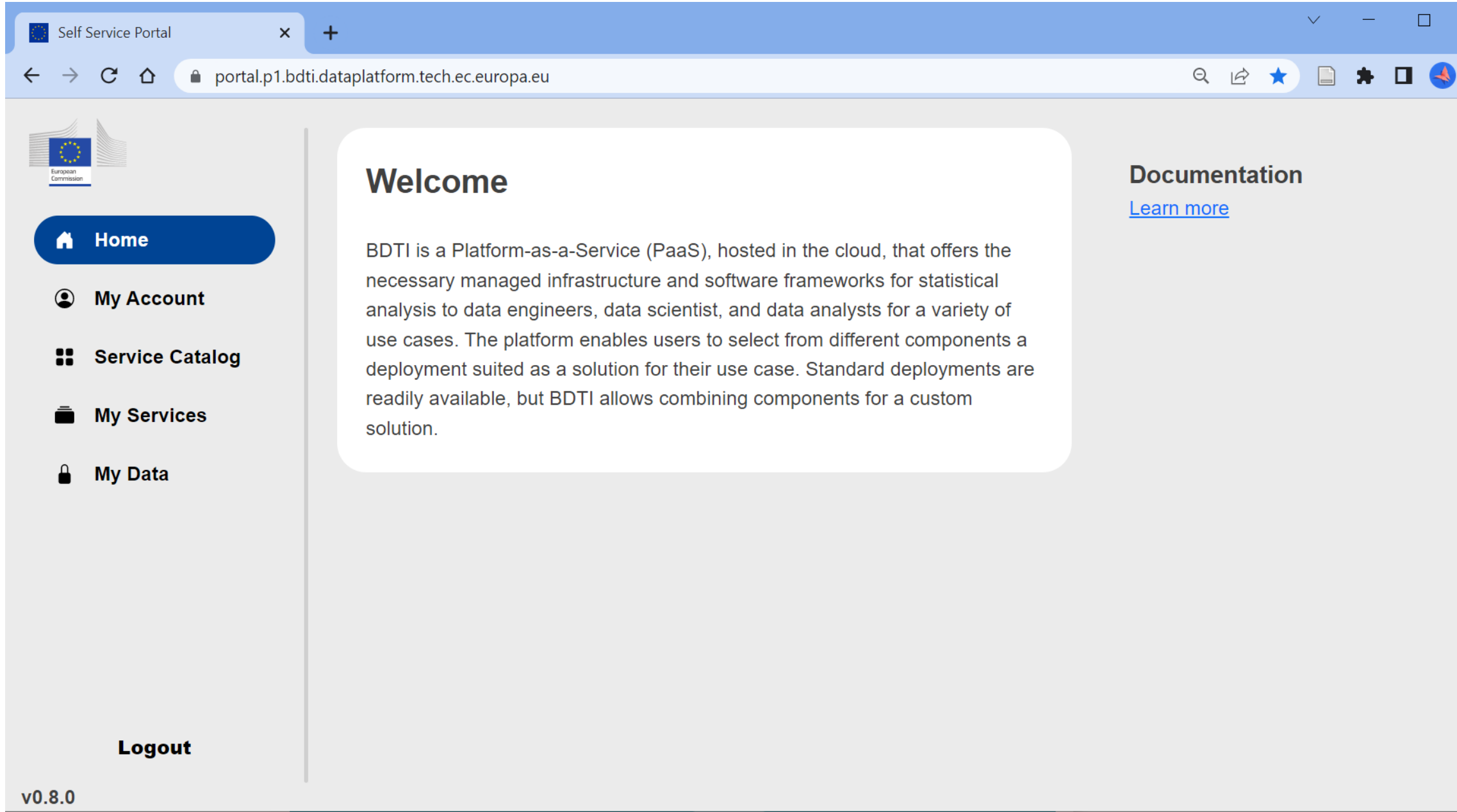


For teams part of BDTI pilots

**EU Login**  
One account, many EU services



# The BDTI portal



The screenshot shows a web browser window with the following elements:

- Browser Tab:** Self Service Portal
- Address Bar:** portal.p1.bdti.dataplatform.tech.ec.europa.eu
- Header:** European Commission logo
- Navigation Menu (Left):**
  - Home (highlighted with a blue background)
  - My Account
  - Service Catalog
  - My Services
  - My Data
- Main Content Area:**

## Welcome

BDTI is a Platform-as-a-Service (PaaS), hosted in the cloud, that offers the necessary managed infrastructure and software frameworks for statistical analysis to data engineers, data scientist, and data analysts for a variety of use cases. The platform enables users to select from different components a deployment suited as a solution for their use case. Standard deployments are readily available, but BDTI allows combining components for a custom solution.
- Right Sidebar:**

### Documentation

[Learn more](#)
- Footer (Left):** Logout
- Footer (Bottom Left):** v0.8.0

# The BDTI portal: service catalogue

← → ↻ 🏠 🔒 portal.p1.bdti.dataplatfom.tech.ec.europa.eu/service-catalog 🔍 📄 ☆ 📑 🛡️ ⚙️ 🗑️ 👤 ⋮

Home

My Account

**Service Catalog**

My Services

My Data

**Logout**

## Service Catalog

**Airflow - v2.3.0**

**Description**  
Airflow is a platform created by the community to programmatically author, schedule and monitor workflows.

[Launch](#)

**Apache Superset - v1.0**

**Description**  
Apache Superset is a modern data exploration and visualization platform. It is fast, lightweight, intuitive, and loaded with options that make it easy for users of all skill sets to explore and visualize their data, from simple line charts to highly detailed geospatial charts.

[Launch](#)

**Apache Superset v2.1**

**Description**  
Apache Superset is a modern data exploration and visualization platform. It is fast, lightweight, intuitive, and loaded with options that make it easy for users of all skill sets to explore and visualize their data, from simple line charts to highly detailed geospatial charts.

[Launch](#)

**ElasticSearch - v7.17.3**

**Description**  
Elasticsearch is the distributed, RESTful search and analytics engine at the heart of the Elastic Stack.

[Launch](#)

**H2o-3 - v36.1.1**

**Description**  
H2O is an in-memory platform for distributed, scalable machine learning. H2O uses familiar interfaces like R, Python, Scala, Java, JSON and the Flow notebook/web interface, and works seamlessly with big data technologies like Hadoop and Spark.

[Launch](#)

**Jupyterlab - lab-3.2.8 - datascience-notebook**

**Description**  
The Jupyter Notebook is a web application for creating and sharing documents that contain code, visualizations, and text. It can be used for data science, statistical modeling, machine learning, and much more.

[Launch](#)

**Jupyterlab - lab-3.4.2 - all-spark-notebook**

**Description**  
The Jupyter Notebook is a web application for creating and sharing documents that contain code, visualizations, and text. It can be used for data science, statistical modeling, machine learning, and much more. Used for spark.

[Launch](#)

**Jupyterlab - lab-4.0.4 - all-spark-notebook**

**Description**  
The Jupyter Notebook is a web application for creating and sharing documents that contain code, visualizations, and text. It can be used for data science, statistical modeling, machine learning, and much more. Used for spark.

[Launch](#)

**Jupyterlab - lab-4.0.4 - datascience-notebook**

**Description**  
The Jupyter Notebook is a web application for creating and sharing documents that contain code, visualizations, and text. It can be used for data science, statistical modeling, machine learning, and much more.

[Launch](#)

**Kibana - v7.17.3**

**Description**  
Kibana is your window into the Elastic Stack. Specifically, it is a browser-based analytics and search dashboard for Elasticsearch.

[Launch](#)

**Knime - v4.5.3**

**Description**  
KNIME Analytics Platform is the open source software for creating data science. Intuitive, open, and continuously integrating new developments, KNIME makes understanding data and designing data science workflows and reusable components accessible to everyone.

[Launch](#)

**Knime - v5.1.0**

**Description**  
KNIME Analytics Platform is the open source software for creating data science. Intuitive, open, and continuously integrating new developments, KNIME makes understanding data and designing data science workflows and reusable components accessible to everyone.

[Launch](#)

**Metabase - v0.43.3**

**Description**  
Metabase sets up in five minutes, connecting to your database, and bringing its data to life in beautiful visualizations. An intuitive interface makes data exploration feel like second nature—opening data up for everyone, not just analysts and developers.

[Launch](#)

**MinIO - RELEASE.2022-06-20T23-13-45Z**

**Description**  
MinIO offers high-performance, S3 compatible object storage. Native to Kubernetes, MinIO is the only object storage suite available on every public cloud, every Kubernetes distribution, the private cloud and the edge. MinIO is software-defined and is 100% open source under GNU AGPL v3.

[Launch](#)

**MongoDB - v4.4.13**

**Description**  
MongoDB® is a relational open source NoSQL database. Easy to use, it stores data in JSON-like documents. Automated scalability and high-performance. Ideal for developing cloud native applications.

[Launch](#)

**PgAdmin4 - v6.8**

**Description**  
PgAdmin is the most popular and feature rich Open Source administration and development platform for PostgreSQL, the most advanced Open Source database in the world.

[Launch](#)

**Postgresql - v14.2.0**

**Description**  
PostgreSQL is a powerful, open source object-relational database system with over 30 years of active development that has earned it a strong reputation for reliability, feature robustness, and performance.

[Launch](#)

**RStudio - v4.1.2**

**Description**  
An integrated development environment for R and Python, with a console, syntax-highlighting editor that supports direct code execution, and tools for plotting, history, debugging and workspace management.

[Launch](#)

**Spark - v3.2.1**

**Description**  
Apache Spark is an open-source unified analytics engine for large-scale data processing. Spark provides an interface for programming clusters with implicit data parallelism and fault tolerance.

[Launch](#)

**Virtuoso - v7.2.7**

**Description**  
OpenLink Virtuoso is a next-generation Universal Server that facilitates the development and deployment of a new generation of Enterprise-wide, Internet, Intranet, and Extranet-based solutions, transcending prevalent enterprise challenge areas such as Disparate Databases and Data Sources, Web Service Composition, and Business Process Management.

[Launch](#)

# BDTI Demonstrator: Towards Data-Informed Government Spending



## Goal:

Show how the BDTI can be used by different users (at different levels of complexity) to derive insights from government spendings to take data-informed actions



## A user-centered approach:

- Elena and Daniel, public servants
- Low data literacy skills
- **Problem:** high government spending in public lighting
- **Solution:** how to optimise public lighting to reduce government spending

# 3

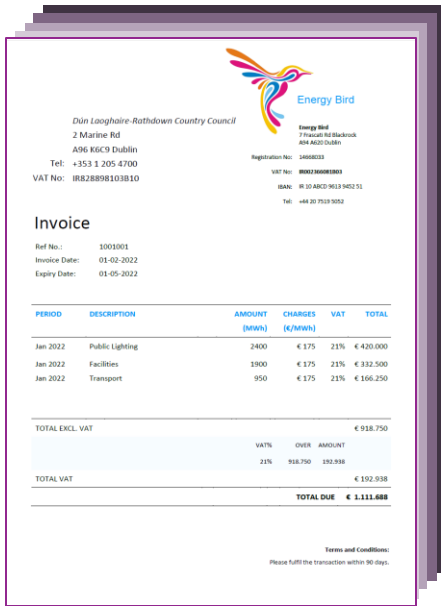
# Data Ingestion: Automating Invoice Extraction



ETL - Data extraction from non-machine readable PDF files



Storage & structuring of collected data



Row ID	Ref No	Invoice...	Public ...	Total ...	Iteration
Value#0	1001001	01-02-2022	420.000	1.111.688	0
Value#1	1001010	01-11-2022	350.000	847.000	1
Value#2	1001011	01-12-2022	437.500	1.132.863	2
Value#3	1001012	01-01-2023	463.750	1.185.800	3
Value#4	1001002	01-03-2022	385.000	1.016.400	4
Value#5	1001003	01-04-2022	350.000	931.700	5
Value#6	1001004	01-05-2022	367.500	942.288	6
Value#7	1001005	01-06-2022	332.500	815.238	7
Value#8	1001006	01-07-2022	315.000	794.063	8
Value#9	1001007	01-08-2022	280.000	667.013	9
Value#10	1001008	01-09-2022	280.000	645.838	10
Value#11	1001009	01-10-2022	315.000	762.300	11

- Collection
- Processing
- Analysis
- Visualisation
- Decision-making



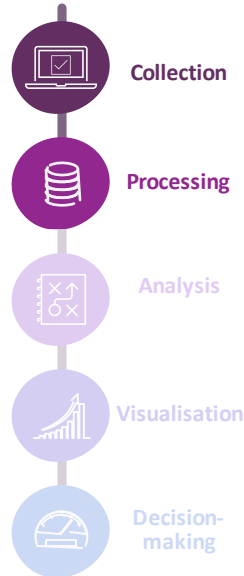
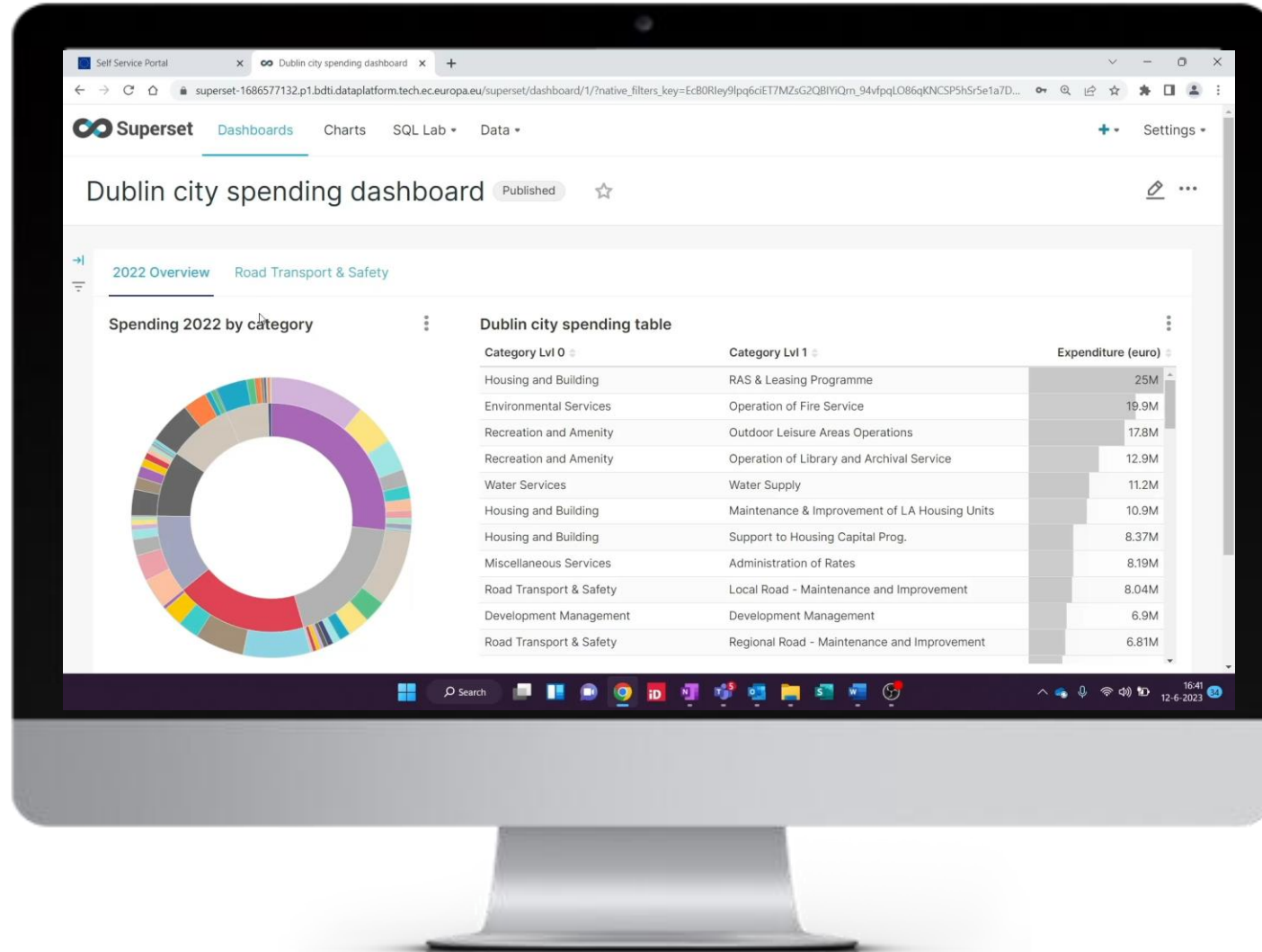
# 3

## Data visualisation and analysis



Interactive overview of expenditures per category.

Ability to benchmark against different data sets.



3

# Dublin's Data-Driven Energy Expenditure Reduction

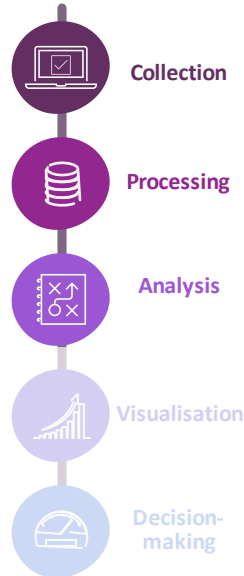
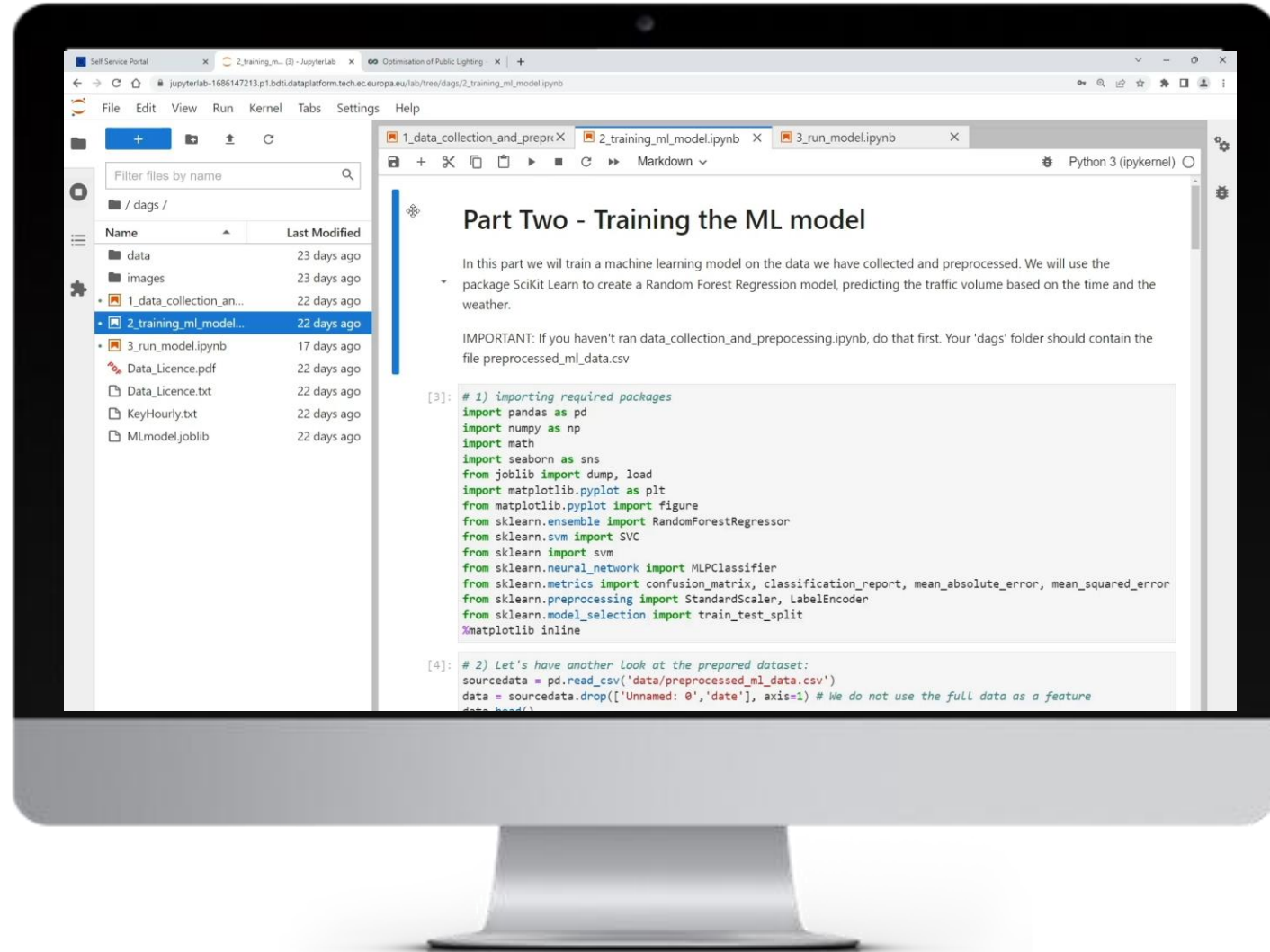


To train Machine Learning (ML) models to analyse big (or small) amount of data



PostgreSQL

Stores the newly analysed data



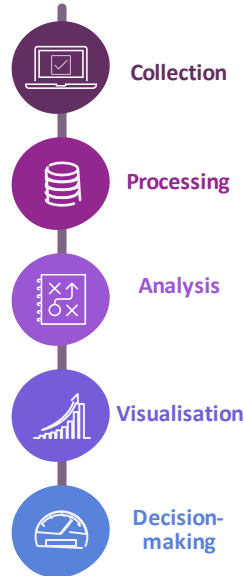
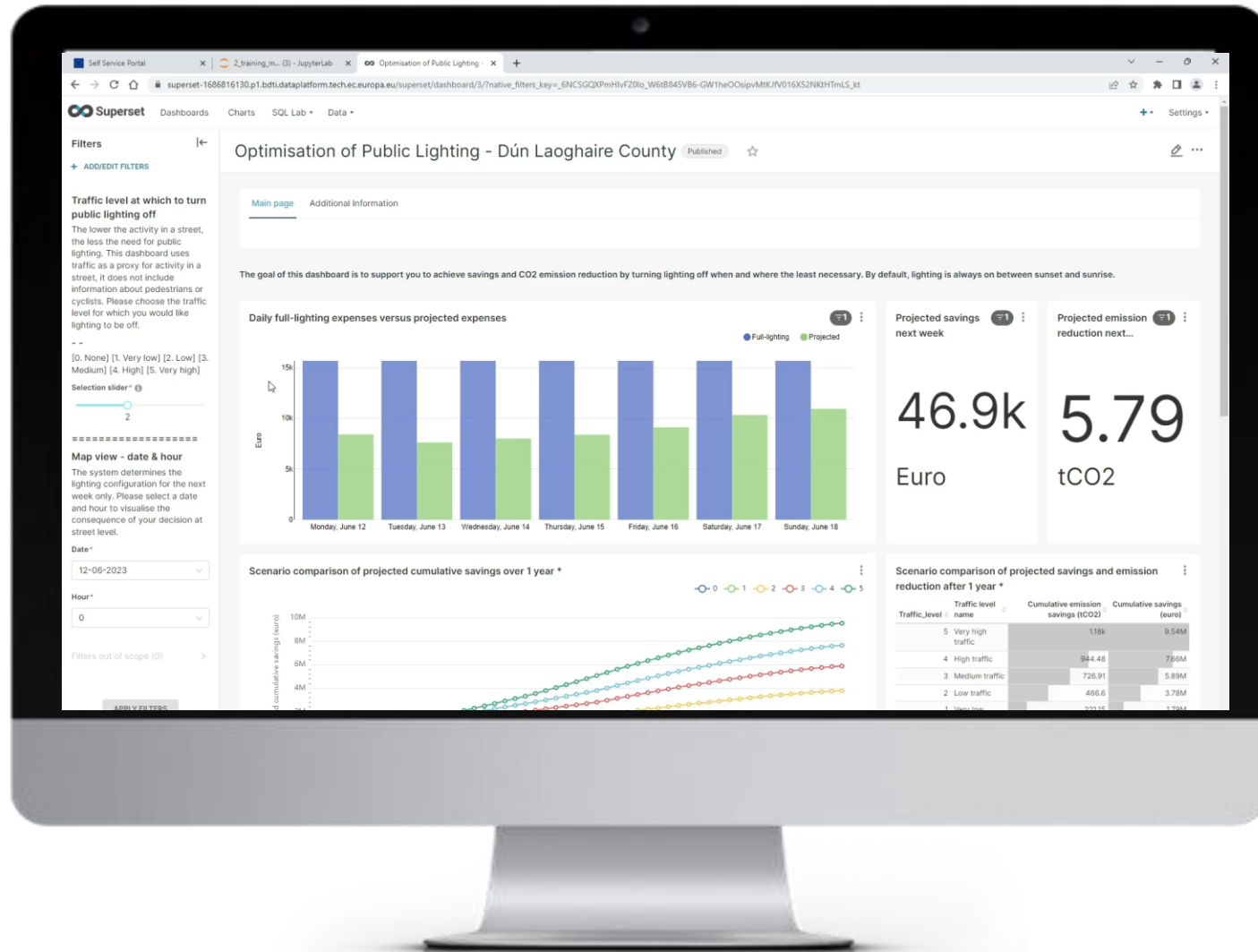
# 3

## Communication and implementation



Can display the created data through an interactive dashboard.

Thanks to the ML trained model, it is possible to create different simulations and visualise the outcome through different graphics



3

# OPEN SOURCE CODE: <https://code.europa.eu/bdti/bdti-demonstrator>

The screenshot shows a GitLab repository page for 'BDTI Demonstrator'. The browser address bar shows the URL 'code.europa.eu/bdti/bdti-demonstrator'. The page header includes the GitLab logo and a search bar. The left sidebar contains navigation options: Project information, Repository, Issues (0), Merge requests (0), CI/CD, Deployments, Packages and registries, Monitor, Analytics, Wiki, and Snippets. The main content area displays a table of repository files and folders, followed by the content of the 'README.md' file.

Name	Last commit	Last update
BDTI - Data-informed Government Spend...	Update 4 files	4 months ago
.gitlab-ci.yml	modify pipeline - gitleaks implementation	2 months ago
BDTI_Banner_generic.png	Upload BDTI banner	3 months ago
Data-informed Government Spending - Ge...	Update Data-informed Government Spending - General i...	9 months ago
Licence_BSD-3-Clause	fix license name	2 months ago
Licence_CC-BY-4.0	License	2 months ago
Notice.txt	add notice.txt	2 months ago
README.md	License	2 months ago

**README.md**

Copyright 2023 European Union

Documentation in this repository is licensed under the Creative Commons Attribution 4.0 License, and code samples are licensed under the BSD 3-Clause licence.

The banner features the European Commission logo on the left. The main text reads: "From hype to action: Enabling a data-informed public sector using the Big Data Test Infrastructure (BDTI)". On the right, there is an illustration of people working with data, with the text "DIGITAL EUROPE PROGRAMME" and various icons representing digital technology and data.





# 4

## BDTI's community

- Developing the BDTI community and how can you help us

# 4

## Who used it already?



### CONSELLERIA DE SANITAT (CS) - Text Mining

Conselleria de Sanitat, the Health Public Administration of the Comunidad Valenciana Regional Government, needed a tool capable of analysing and extracting knowledge from the huge quantity of scientific clinical articles coming from different sources (i.e. PubMed.gov, Covid-19 related clinical articles).



Advanced **data visualisation** and **text mining** tools to help **extract knowledge contained in the documents**, supporting clinicians and managers in their clinical practices and day-to-day work.

### EU CONVALESCENT PLASMA DATABASE – Data sharing

The European Blood Alliance is working together with the European Commission (DG SANTE) to create and manage an **EU-wide open-access platform** that collects data to support a study on **Covid-19 convalescent plasma therapy**. The aim of the study is to assess in which conditions the convalescent plasma treatment is most effective, in order to take data-driven decisions on the therapy and focus the efforts of the research in the most promising directions.



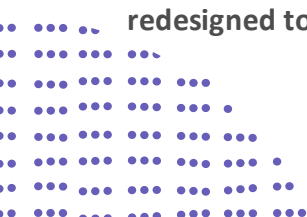
A ready-to-use, virtual environment in which **data collected through a custom-built website** is ingested and anonymised, to be then analysed with advanced data visualisation and analytical tools. Initially, only donation data was processed, then the scope was increased to capture the **end-to-end of blood plasma, from donation to patient/clinical trial**.

### CITY OF FLORENCE – Mobility data

The main goal of the Municipality is to perform a **cross correlation between the multiple datasets** available within the city to understand how people were and are moving between the different districts, to then derive precious insights about mobility and about **how services can be redesigned to foster cultural activities and events**.



Predictive, descriptive and time-series analysis on multiple datasets collected **before, during and after the Covid-19 pandemic** such as: public Wi-Fi sensors, parking and geo-referenced data of people movements (i.e. tourists).








# Who used it already?

## Semantic Knowledge Graphs for Distributed Data Spaces



### The Public Procurement Pilot Experience

#### Semantic Knowledge Graphs for Distributed Data Spaces: The Public Procurement Pilot Experience

Cecile Guasch<sup>1</sup> , Giorgia Lodi<sup>2</sup> , and Sander Van Dooren<sup>1</sup> 

<sup>1</sup> European Commission, DG DIGIT, Brussels, Belgium  
{cecile.guasch,Sander.VAN-DOOREN}@ext.ec.europa.eu

<sup>2</sup> Institute of Cognitive Sciences and Technologies of the Italian National Research Council (ISTC-CNR), Rome, Italy  
giorgia.lodi@cnr.it

**Abstract.** This paper presents the experience gained in the context of a European pilot project funded by the ISA2 programme. It aims at constructing a semantic knowledge graph that establishes a distributed data space for public procurement. We describe the results obtained, the follow up actions and the main lessons learnt from the construction of the knowledge graph. This latter requires to support different data governance scenarios: some partners control, with their own tools, the building process of their portion of the knowledge graph. Other partners participate in the pilot by providing only their open CSV/XML/JSON datasets, in which case transformations are required. These are performed on the infrastructure made available by the European Big Data Test Infrastructure (BDTI). The paper introduces the design and implementation of the knowledge graph construction process within such a BDTI infrastructure. By instantiating an OWL ontology created for this purpose, we are able to provide a declarative description of the whole workflow required to transform input data into RDF output data, which form the knowledge graph. The declarative description is therefore used to provide instructions to a workflow engine we use (Apache Airflow) for knowledge graph construction purposes.

Guasch, C., Lodi, G., & Dooren, S. V. (2022, October). Semantic Knowledge Graphs for Distributed Data Spaces: The Public Procurement Pilot Experience. In *The Semantic Web—ISWC 2022: 21st International Semantic Web Conference, Virtual Event, October 23–27, 2022, Proceedings* (pp. 753-769). Cham: Springer International Publishing. <https://iswc2022.semanticweb.org/index.php/accepted-papers/>

# How to apply:



Get familiar with the [BDTI service on our website](#)



Brainstorm your data analytics project using our [BDTI Canva](#) and then fill in the [BDTI template request form](#)



Submit your pilot request (template) by email: [EC-BDTI-PILOTS@ec.europa.eu](mailto:EC-BDTI-PILOTS@ec.europa.eu)



Meet with us to elaborate on your use case



Pilot Project is approved if:

- Brings value
- Can be completed in 6 months
- Sufficient resources available (skills, team, data)



Your test environment is set up



You can start piloting and create value!





## The BDTI Canva

by the BDTI Team

The BDTI Canva aims to help you build a strong data use case through a series of questions.

For more information, visit the [BDTI website](#)

Contact us by email: [EC-BDTI-PILOTS@ec.europa.eu](mailto:EC-BDTI-PILOTS@ec.europa.eu)

### Context:

Who are you? Who are your stakeholders?



### Objective(s):

What is the problem you are trying to address?  
What is your timeframe?



### Data's added value:

Which information helps you address the problem? From which sector and or domain?

### Data's availability:

Does the data you need exist? If it doesn't exist, can you collect it? From whom can you get the data you need? Can you reuse the data? What license applies to the data you'd like to use? How is the quality of the data you'd like to use? Are the different datasets interoperable? Do you know how to connect the dots?

### Data's risk(s):

What could go wrong when using data to address this objective? Are there legal and ethical considerations to make? Are you dealing with personal data?

### Data's processing:

What do you need to gather, process and analyze the data (i.e., tools, software, computing power, ...)? Do you already have them? If you do not, where can you get them (e.g., applying to the BDTI)?

### Data skills:

What data literacy and skills do you need (i.e., data engineering, data analysis, data science, data visualization)? Do you already have these available within your team/organization?


### Your solution

Combine what you've learned from the elements above into a statement describing your solution



# Register now to the BDTI Essentials Course


## February 2, 2024



**DIGITAL EUROPE PROGRAMME**

**Unlocking the Potential of Open-Source Analytics: Introduction to BDTI Essentials**

A series of five e-learning courses to discover the Big Data Test Infrastructure's set of open-source tools.

 **Starts February 2, 2024. Register now!**

### Become familiar with the BDTI open-source data analytics tools

- ✓ A **free course** helping public administrations explore BDTI delivered through a **practical use case**:

Analysing H2020 funding allocated for research and innovation to universities across EU nations with high carbon emissions

- ✓ **Use open-data sources for public sector innovation:** Learning how to harness open data sources to address a real-world application by leveraging the resources offered by [data.europa.eu](https://data.europa.eu)
- ✓ **Prepare to build your own data use case:** After this course, you will be ready to apply for BDTI and build a public sector data use case using the platform.

[https://big-data-test-infrastructure.ec.europa.eu/resources/courses-and-training/bdti-essentials-course\\_en](https://big-data-test-infrastructure.ec.europa.eu/resources/courses-and-training/bdti-essentials-course_en)

# The BDTI Kitchen: Baking data



Read the online version | 2811-7794

## The BDTI Kitchen: Baking Data



The newsletter to follow the latest BDTI news, learn about good practices and opportunities for data analytics in the public sector.



### In this issue

- o Welcome note
- o Upcoming events
- o Data literacy corner
- o BDTI latest news
- o Spotlight on public sector initiatives

### Welcome to the December edition of The BDTI Kitchen.

This month, we're discussing our upcoming free online course on how to use open-source tools, and we're sharing an example of how a local council in Ireland can put data to use for powerful outcomes.

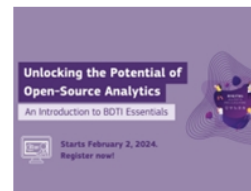
We'll also talk a bit about data ownership and data visualisation.

We hope you find it engaging and useful, and we'd welcome your feedback and comments. Simply reply to this email to share thoughts or ask questions.

### BDTI latest news

#### Register for BDTI's free online course: introduction to BDTI Essentials

In our first online course, we're championing the re-use of data and with open-source tools. Utilising data from the Horizon 2020-21 Programme, the BDTIs Essentials will help you become familiar with a set of open-source tools and get you ready to start your own data-informed journey.



 permalink | [Main URL](#)



### Upcoming events

#### BDTI Team Gears Up for a Return to OASC Conference 2024

The Big Data Test Infrastructure (BDTI) team is again heading to the OASC Conference on January 16. Building on the success of our previous attendance, we are excited to reconnect with the Open & Agile Smart Cities (OASC) community and showcase the latest advancements in our open-source infrastructure.

 date | 16/01/2024 - 17/01/2024



### Spotlight on public sector initiatives

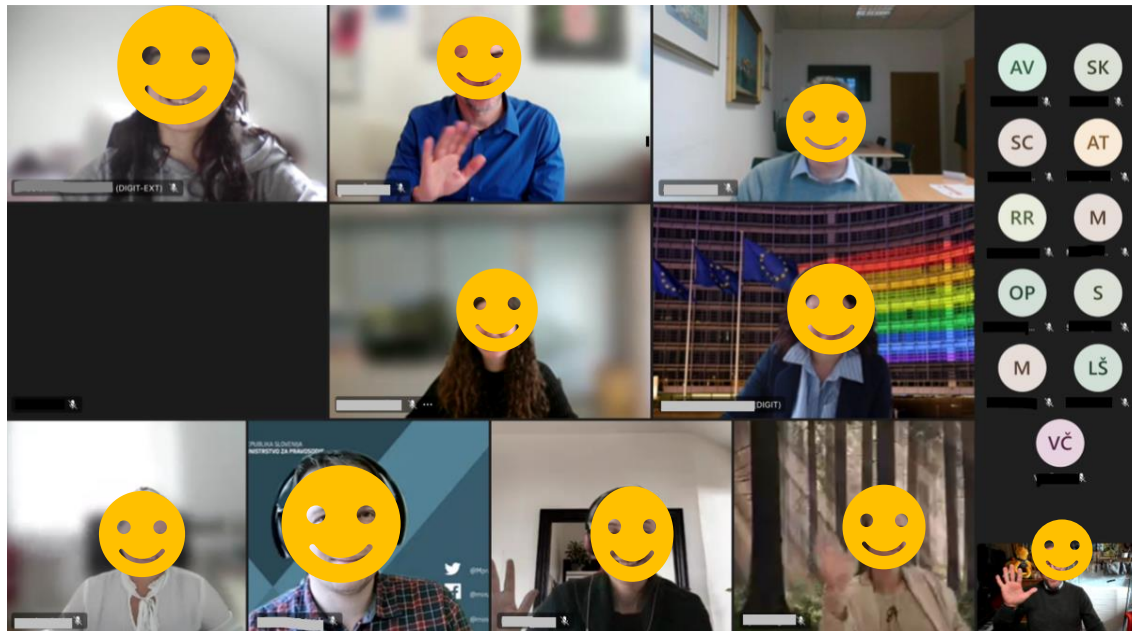
#### Digital literacy in the EU: A roadmap

Approximately 32% of Europeans still lack basic digital skills needed for 90% of jobs. To address the digital skills gap, the EU has implemented a variety of policies and initiatives, such as the European skills agenda, the digital education action plan and the Digital Skills and Jobs Coalition.

# BDTI National Information Sessions



**Goal:** introduce BDTI, learn about data analytics projects, develop your data analytics community!



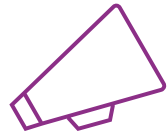
BDTI Information Session in Slovenia in collaboration with the Slovenian Ministry of Digital Transformation

National information centre/Nacionalno informacijsko središče

<b>Context</b> Slovenska turistična organizacija projekt izvaja v okviru reforme NDO v želji pomagati deležnikom pri podatkovno podpirani odločitvi.		<b>Objective</b> Cilj projekta je vzpostavitev Nacionalnega informacijskega središča, ki bo merilo učinke turizma na različnih ravneh ter pomagal pri geografski razprtosti in usmerjanju turističnih tokov. Cilj oblikovanja središča je tudi pospeševanje zelenega in digitalnega prehoda ter nadgradnje Zelene sheme slovenskega turizma.							
<b>Data's added value</b> Podatkovni viri so ključ do uspeha projekta. Ključno bo sodelovanje z neacionalnimi viri podatkov (SURS, AJPES, MOPE, NCUP, BS, ...). Trenutno je na voljo že kar nekaj podatkov, ki pa se v večini zbirajo na mesečni ali letni ravni.		<b>Data's availability</b> Izziv je frekvenca in raven podatkov, ki so trenutno na voljo. Cilj je pridobivanje dnevnih podatkov, ki v večji meri niso na voljo.		<b>Risks and issues with relation to data</b> Določeni podatki niso na voljo, zato bo potreben zbiranje alternativnih podatkovnih virov. Alternativni podatkovni viri so običajno zelo dragi, hkrati pa ne dajejo vedno najboljših informacij oziroma niso najbolj točni.		<b>Data's processing</b> V prvi fazi je potrebna identifikacija primerov uporabe, ki bodo na voljo v središču. Po identifikaciji teh, bo potrebne tudi izbere ustreznega orodja, ki bo na enem mestu omogočelo tako preproste prikaze kot tudi napredne analize.		<b>Data skills</b> Za izvedbo projekta je bil izbran zunanji izvajalec, saj naprednih znanj znotraj organizacije nimamo.	
DODATNI PREDLOGI?		PRILOŽNOSTI?		PRILOŽNOSTI?		PREDLOGI / IZZIVI?		PREDLOGI / IZZIVI?	
<b>Solution</b> Combine what you've learned from the elements above into a statement describing your solution.									
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BDTI Canva used in Mural during the BDTI Information Session in Slovenia

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