HELIX

Hellenic
Data
Service

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Data
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Spiros Athanasiou
IMSI/Athena RC


ATHENA
Research & Innovation
Information Technologies

Athena RC

Why us?

- Our **scientific focus** is on cross-disciplinary, transformative **data-intensive** research (Big, Open, Linked data)
- We champion **Data Economy**, **Big Data** and **Data Science** for national economic growth
- We lead **EU/national policies** and **technical interventions** on **Open Access**/**Data** (scientific infrastructures, data catalogues)
- Our collective insights and knowledge shaped the vision, implementation, an governance of HELIX grounding it on **real-world challenges and considerations**

Motivation

Motivation

Converging Policy landscape

- **Data Economy** – a strategic priority for EU's sustainable future growth integrating policy, technology, and innovation actions
- **Public Sector Information** – open up and create value from public-sector and publicly-funded Data (open data, INSPIRE, H2020, OGP, …)
- **Industrial Data Platforms** – emerging organization & technical instrument to facilitate data sharing and valorization within EU industrial value chains
- **Research**
  - **Open Access** – de jure policy for sharing EU-funded scientific output
  - **Data Management Plans** – formalize data handling on project/organization-level
  - **FAIR data** – de facto international policy for scientific data

Motivation

The Big Picture

Economic growth, scientific progress, and societal prosperity are about **searching, sharing, using, experimenting, building, and valorizing**

(*frictionless)

Data

* = simple, fast, inclusive,

Motivation

Archiving-focused Data Platforms

- **Research Data Platforms** heavily focused by the priorities and workflows of **Digital Libraries (i.e., serve archiving and provenance)**
  - Introducing **artificial barriers** for researchers
  - **Narrowing real-world** relevance
    - Most useful data are not linked with publications
    - Make it easier to publish data, why the strict rules?
    - Help me use and experiment with data

I am not a librarian

Motivation

Challenging the status quo

- We need flexible, low-cost, open, collaborative services for simplifying **sharing**, **discovery**, **use**, **analysis**, and **visualization** of scientific data
- **Let’s change**: the explicit **assumption** is that RDPs must serve **scientists**

I am a scientist

Motivation

Why is this needed?

- Key lessons learned from **Open Data** are highly relevant for Research Data Platforms
  - Lower the **entry barrier**, making it **easy, simple, and fast** to publish and find data
  - No **walled gardens**; **all data**, from **any field** are welcomed, at **any point** of their lifecycle
  - Make data **useful** to **more people**, **most of the time** (80/20) through visualization and services
  - Ensure **sustainability**

Motivation

Sustainability

- A Research Data Platform must be **diachronic**, ensuring data are always accessible, and **evolving**, addressing the **ever-growing data-intensive** needs of scientists
  - Relatively low CAPEX (setup), **higher and fluctuating OPEX** (operation, growth)
  - Public funding may not **suffice** or be timely **available**
  - **Devaluation** is (only) a few steps away (stale/missing data, no QA/SLA)
  - Need to introduce additional **revenue streams**, but from where?
- Industry-relevance (another lesson from Open Data)
  - **Industry** amongst the first and leading users of Open Data, generating **value** from new/improved services
  - Sharing and using **industrial data** in commercial **value chains** remains a challenge

Motivation

Industrial Data Platforms

- Data Platforms for securely **sharing, discovering, licensing, using**, and ensuring fair **reimbursement** of industrial data
  - Concept follows the **paradigm** of open data (simplicity, fit for purpose, benefits, fast, low cost)
  - Same technical **foundations** with key differences (confidentiality, contract management, IPR protection)
- **We can inherently serve these needs, provide a parallel industrial data platform by-design, and tap into the additional revenue streams**
  - **USPs**: scalable production-grade **data processing/analysis services**, **unified** proprietary & open data, **data science** as-a-service (DataSaaS)

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Hellenic Data Service

- **Scientific eInfrastructure for data-intensive research**
  - Supports the full lifecycle of scientific **data management, processing, sharing, and reuse**
  - Inherently **scalable**, **cloud-based**
  - Nation-wide, **horizontal**, **cross-domain**
  - **Low-cost**, economies of scale, network effects, maximize ROI
  - **Multiple roles**: Open Access, FAIR Data, Public Data, Industrial Data Platform

Data first

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The 3 pillars of HELIX

- **Publications**
  - Nation-wide, cross-domain discovery of **publications**
  - Adapt and localize **OA OpenAIRE CRIS** services
- **Data**
  - Data **catalogue** and **repository** for **FAIR scientific** and **industrial data**
  - Discover, collect, evaluate, download, and use
- **Labs**
  - **Generic-purpose** and **domain-specific** services and APIs for **data analysis**, **processing**, and **experimentation**

Data alone is not enough

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Target groups

- Scientists: data sharing, OA publishing, data experimentation
  - All scientific fields, including **citizen scientists**
- Organizations: institution-wide services augmenting, exposing, or replacing existing publication & data catalogues/repositories
  - Academia, Research, Public Administrations (PSI), special-interest groups
- Scientific Infrastructures: building block; scalable data processing services for very large, heterogeneous scientific data
  - Upcoming: ELIXIR (bio), APOLLONIS (linguistic)
- Industry & innovators: value-added services; ad hoc analysis services
  - Industrial Data Platform: low-cost data processing infrastructures; Data Science as a Service, training data for ML

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Core Concepts 1/2

- **Data-first:** make it simple, easy, and fast to share data (<10 secs); this is what is truly missing; build critical mass (data & users)
- **Scientists first:** serve the scientists, not librarians or standardization bodies; all too often this is lost, raising the entry barrier and thus failing (see open data)
- **Just another tool:** ensure inclusiveness and downplay our potential impact on the scientific process – be useful and in the background (just another hammer)
- **Love ALL data:** any data used during research (not only in pubs); we do not know what/how/where data will be useful; no data is too little, no data is too small

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Core Concepts 2/2

- **Cross-disciplinary:** actively avoid walled-gardens and domain silos; facilitate data-driven cross-disciplinary research (introduce data & problems, facilitate networking); ‘scientist’ role is fluid
- **Bundle data with services:** software, tools, and knowhow on how to use data is the 2nd greatest bottleneck behind data availability; think equally big (e.g., Spark) and small (e.g., fast visualization);
- **Openness as a principle:** open software, open standards, open services (learn from others, give back)
- **Agility:** flexibility and reusability across all provided services and sub-systems; also during design and development of the system itself
- **All Scientists are Data Scientists:** data management, processing and analysis skills are integral in modern scientific practice

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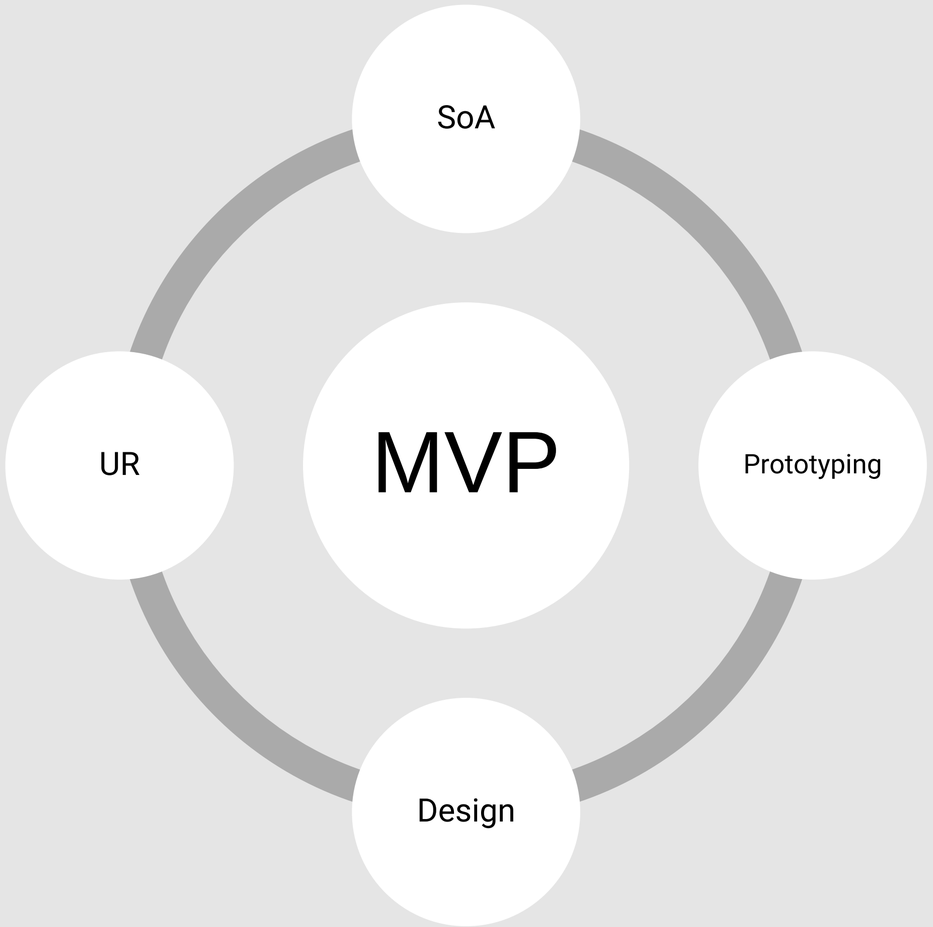
Development Roadmap

- **Phase 0 (incubation)**: 2012-2017
  - Original concept & funding proposal; core technology developed in other R&D projects; National Research Infrastructures Roadmap
- **Phase 1 (MVP):** 2018-2019
  - MVP for technical/policy foundations; core services & lighthouse apps/communities; prepare follow-up
- **Phase 2 (Beta):** 2020-2024
  - Scale services and expand reach to more scientific communities; integration in 3rd infrastructures; first industrial clients; governance structure; industrial data platform
- **Phase 3 (Production):** 2025-
  - Sustainable diachronic operation

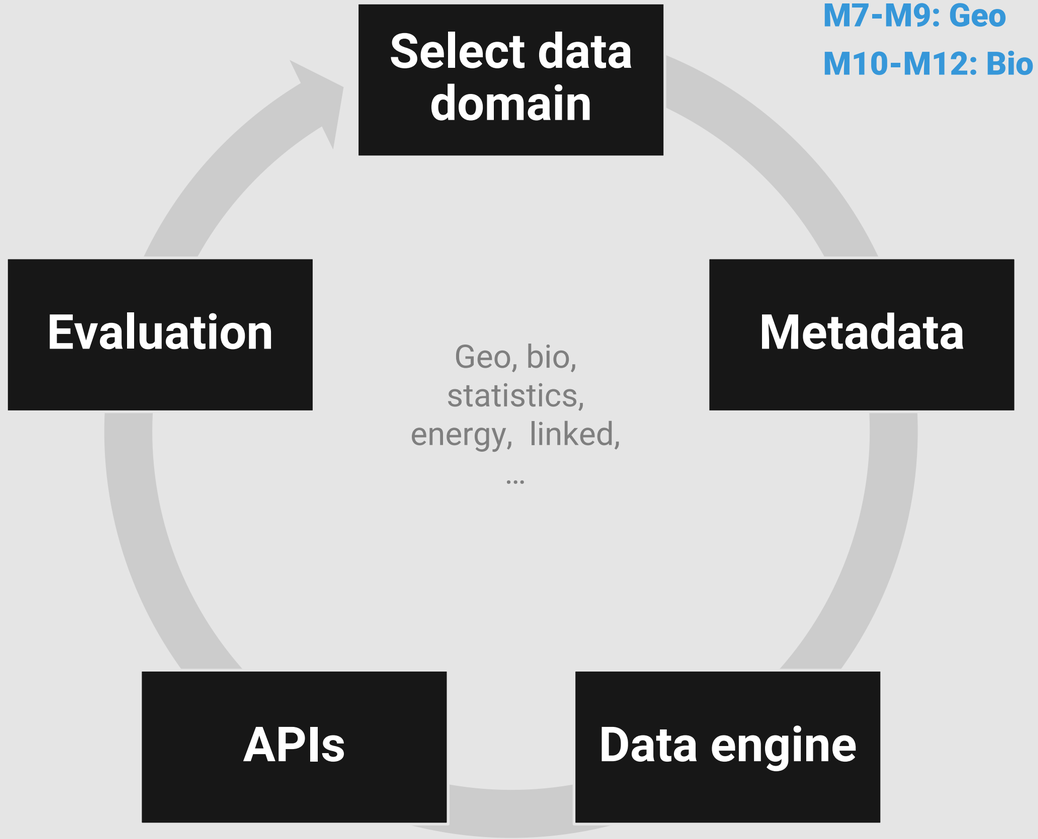
HELIX Architecture

Data-drive & Agile development

M1 – M6



M7 – M24



M7-M9: Geo
M10-M12: Bio

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HELIX Architecture

HELIX Architecture

Three pillars

hellenic**data**service**.gr** || **helix.gov.gr**

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pubs.hellenicdataservice.gr

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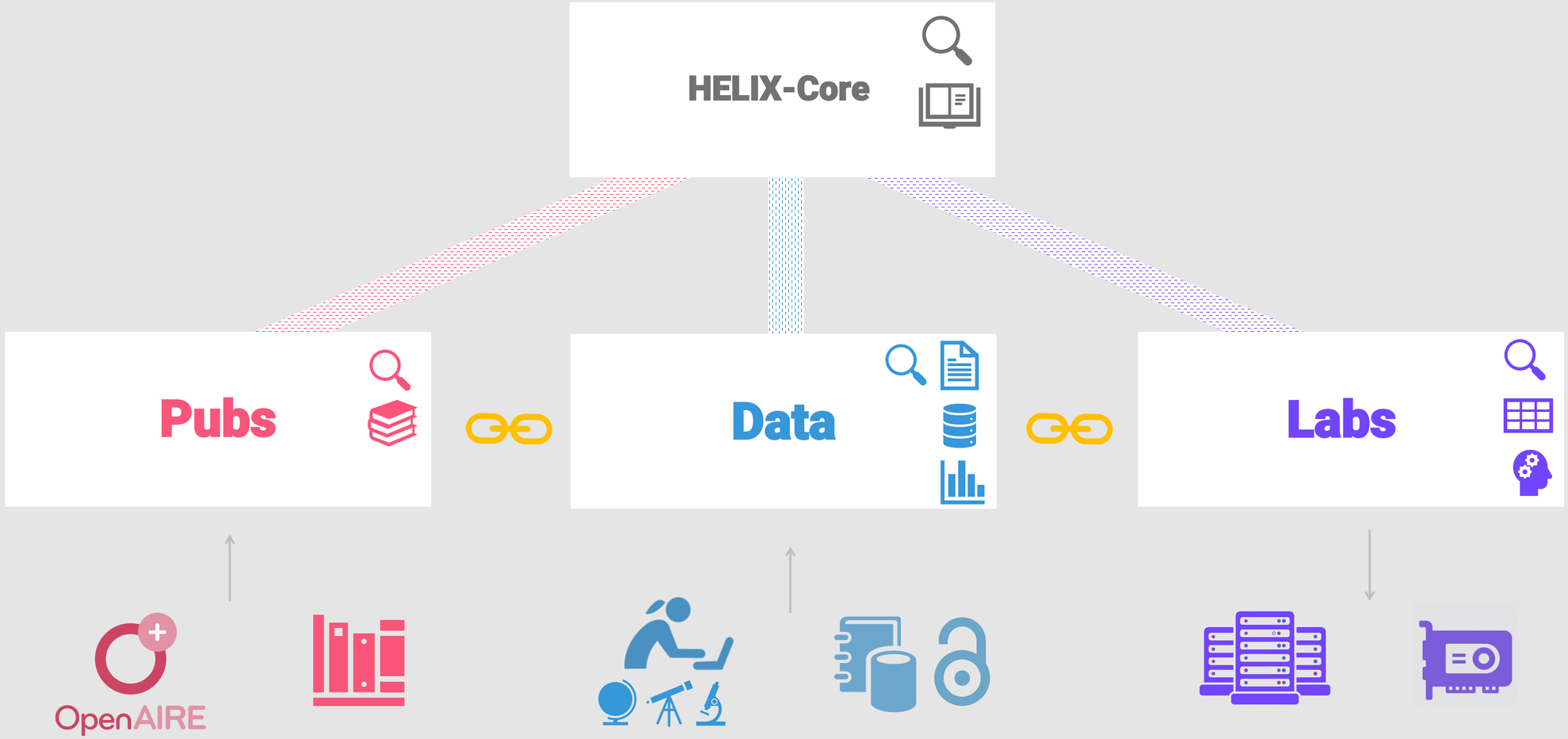
Birds-eye view



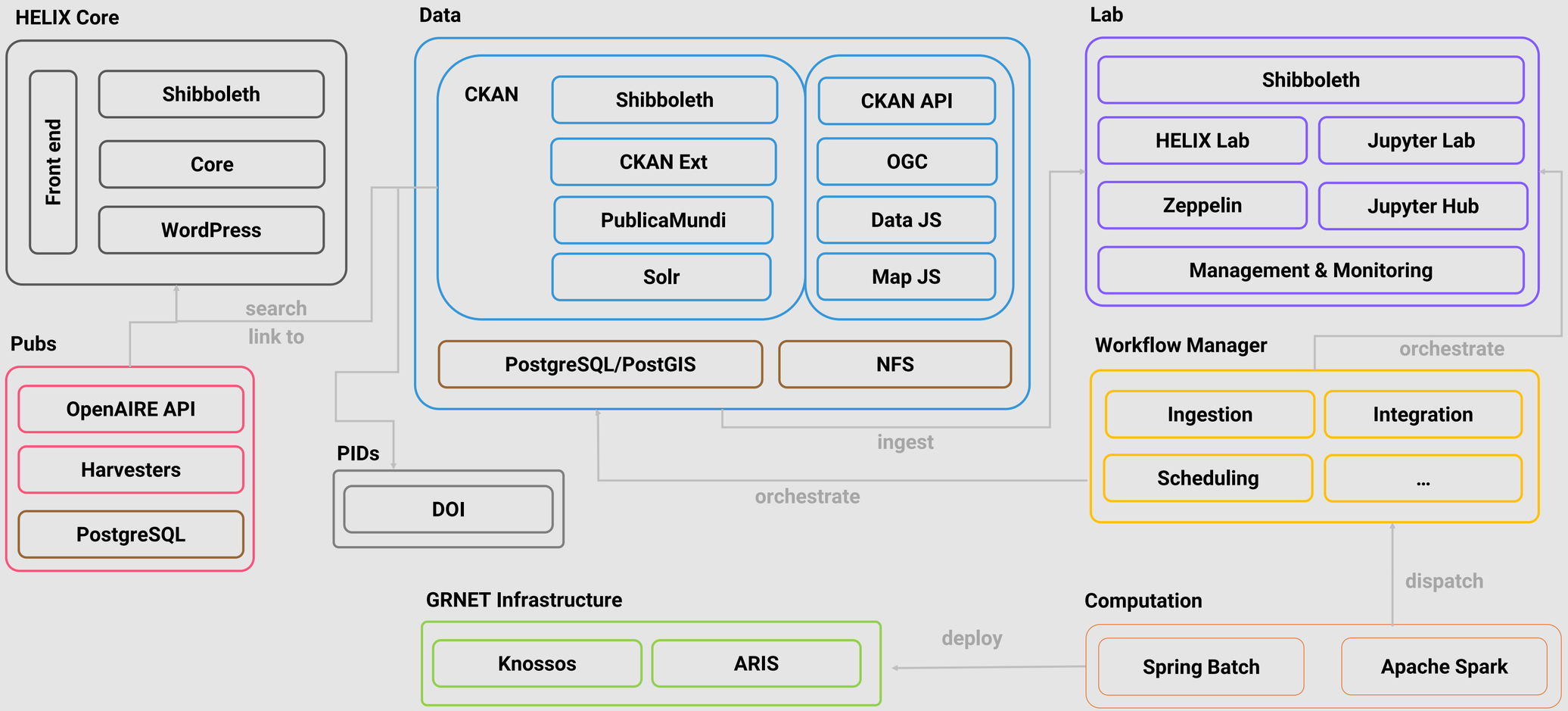
HELIX Architecture

Core Principles

- Not a single monolithic system, but an assembly of loosely coupled, highly-scalable independent components
  - Repurpose/extend software/APIs, flexible prototyping & experimentation, asynchronous parallel development tracks
  - Independently scale as/when/where needed, no single-point of failure
  - Workflow orchestration, management & monitoring via in-house Spring Boot sub-system
- Cloud-based
  - Leverage and valorize GRNET's IaaS cloud (knossos-okeanos) & HPC (ARIS)
  - Docker-based, ported to Kubernetes
- Open Source/Open Standards
  - Exclusively open: build on existing great software, give back to the community, help others
  - Majority of software originally developed in the context of EU/national R&D projects, powering world-scale systems
- Shibboleth-based federated authentication for members of the Greek scientific community
  - Authorization handled individually by each applications by custom roles (SSO not advisable)

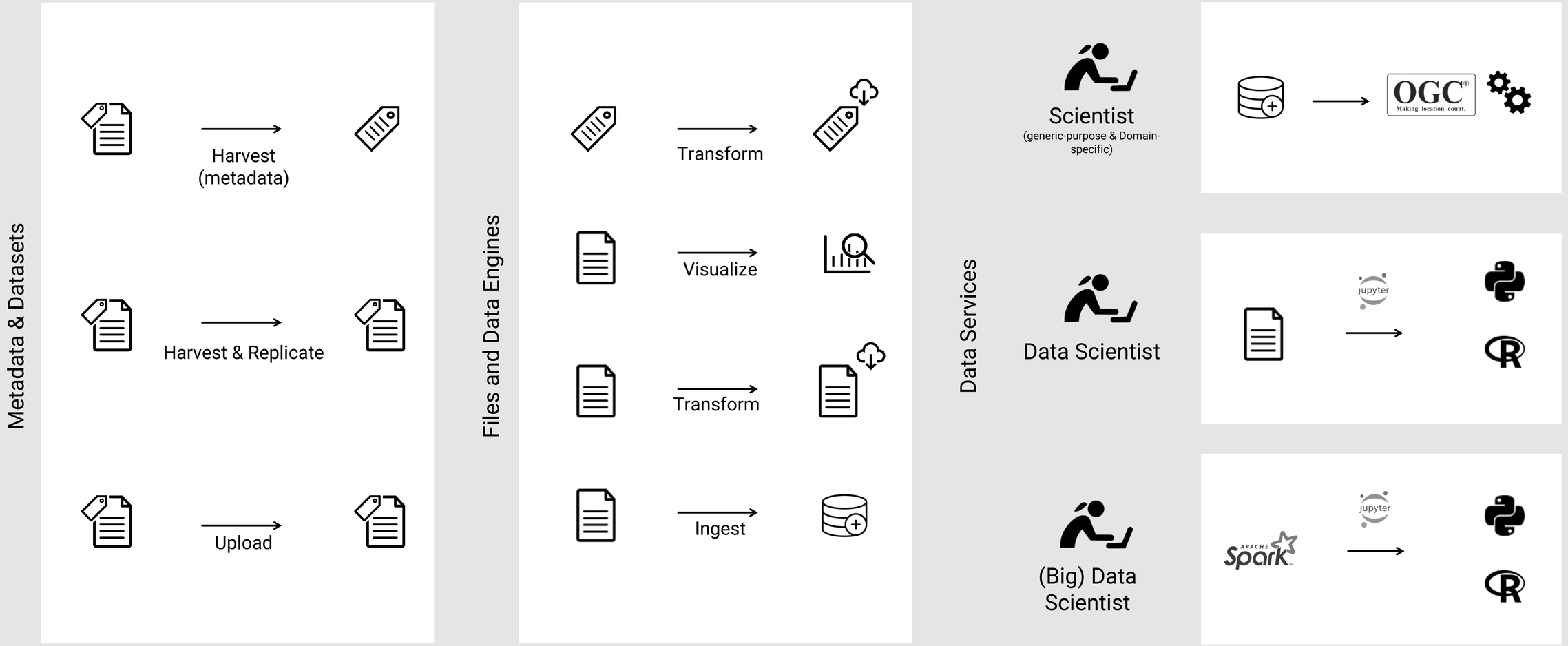
HELIX Architecture

Logical Architecture



HELIX Architecture

The data lifecycle



HELIX Architecture

HELIX-Core

- Entry point for discovering all HELIX services, resources, and guides
  - Provides the illusion of a single application (common theme)
  - Loose, API-based integration of search results for all other services (Pubs, Data, Lab)
  - Direct entry points also available (e.g., data.helix.gr)
- Custom Spring app
  - Workflow management (data ingestion, housekeeping)
  - WordPress (content management)
  - Services/code reused in other services for AAI, multilinguality support, monitoring/logging

DATA ✓ PUBS × LAB ✓

ADVANCED SEARCH

Latest news

24 Απρ 2018

Helix data principles: how well known or understood are they?

Explore the issues around health data. Learning activities specifically for people working with medi... **Read more**

24 Απρ 2018

Helix, Nectar and RDS partnership

Aligning research infrastructure Hellix is partnering with Nectar and RDS to deliver transformation in the research sector.
Read more

About Helix

Research for Data

Find, access, and reuse data from Australian research organisations, agencies and institutions via Hellix flagship service.

Find research data

Our partners

Helix collaborates with universities and other research institutions to enhance the value of data and enable new discoveries.

Who we work with

The project

Hellix-Nectar-RDS News is a great source of news, events and data jobs - sent direct to your inbox every fortnight. Sign up now to get the next edition.

Don't miss out!

Deliverables

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Data Pubs Lab Το έργο Νέα EN

Water quality

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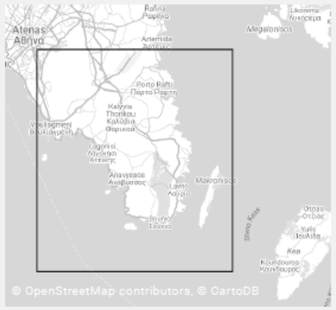
CURRENT SEARCH FIELDS

× air
× quality

Σύνθετη αναζήτηση

LOCATION



ORGANIZATIONS

- ☐ Axios
- ☐ Decentralized Sciences
- ☐ Management Agency
- ☐ Municipality of Athens

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TOPICS

- ☐ Planning
- ☐ Frotier

RESULTS \\\ ALL \\\ AIR QUALITY 1 2 3 > >>

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BIO PUBLIC OPEN SHAPEFILE WMS WFS

Πριν 8 ημέρες @ ΕΠΙΧΕΙΡΗΣΕΙΣ
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Joined on Jan 6, 2019

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EDIT PROFILE

OVERVIEW | MY REPOSITORIES 5 | STARRED BY ME 80 | MY COLLECTIONS 5

Create Collection +

Pollution
43 repositories
2 PUBS 5 DATA 12 LAB
last saved to 2 weeks ago

History and Biology - Destruction of the Greek rural habitat
50 repositories
2 PUBS 5 DATA 12 LAB
last saved to 2 weeks ago

Mountain herbs and traditional medicine
2 repositories
2 PUBS 5 DATA
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Glyphosate - The risk of the chemical compound on fumigation in ...
143 repositories
2 PUBS 5 DATA 120 LAB
last saved to 2 weeks ago

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PUBS

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Discover and share open scientific publications

HELIX Architecture

Publications

- **Search for Publications**
  - Harvested from EU-wide institutional, thematic, or ad-hoc repositories
  - Provide publications published from Greek S&T organizations
  - OAI-PMH v2.0, OAI-DC
- **Value added services** (under development/testing)
  - Infer data from publications (link data with pubs)
  - Analytics & KPIs
- **OA Training & support**

HELIX PUBS
Hellenic Data Service


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PUBS
Hellenic Data Service
Data
Pubs
Lab
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Νέα
EN
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Σύνθετη αναζήτηση
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Search by theme
Humanities and Social Sciences
Business, Economics and Law
Agricultural and Veterinary Sciences
Environmental Sciences
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Biological Sciences
Medical and Health
Physical, Chemical and Mathematical Sciences
Explore
Themed Collections
Explore selected resources by theme
Services and Tools
Access data-related services and tools
Open Data
Find open data that is reusable
Grants and Projects
Search for research grants and projects
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Institutution

IIASA

International Institutionfor Applied System Analysis

Topics

URBAN PLANNING

BEACHES

Tags

ΥΓΡΟΤΟΠΟΙ ΝΗΣΙΑ ΓΕΩΔΕΔΟΜΕΝΑ

ΥΓΡΟΤΟΠΟΙ ΝΗΣΙΑ ΓΕΩΔΕΔΟΜΕΝΑ

Share

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Air quality and greenhouse gases (AIR)

Amann, M. (2017)

Cited By 2081

PUBLICATION: 20 - 10 - 2010
LAST REVISION: 14 - 09 - 2013
LANGUAGE: GREEK
TYPE: CONFERENCE OBJECT

PUBLICATION TOPICS ACTIVITY STREAM

Το σύνολο γεωχωρικών δεδομένων απεικονίζει μικρούς νησιωτικούς υγροτόπους έκτασης μικρότερης των 80 στρεμμάτων, όπως εγκρίθηκαν από τον Υπουργό Περιβάλλοντος Ενέργειας και Κλιματικής Αλλαγής, με την εξουσιοδότηση του νόμου για τη Διατήρηση της Βιοποικιλότητας (ν.3937/2011) και μετά από επαρκή επιστημονική τεκμηρίωση. Το σχέδιο Προεδρικού Διατάγματος για την προστασία των μικρών νησιωτικών υγροτόπων με τον τίτλο: «Έγκριση καταλόγου μικρών νησιωτικών υγροτόπων και καθορισμός όρων και περιορισμών για την προστασία και ανάδειξη των μικρών παράκτιων υγροτόπων που περιλαμβάνονται σε αυτόν» υπεγράφη από τον Υπουργό την 1η Φεβρουαρίου και προωθήθηκε στο Συμβούλιο Επικρατείας για επεξεργασία.

LINK TO PROJECT LINK TO RESEACH DATA DOWNLOAD

CITE THIS ARTICLE

BibTeX

Amann, M. "Air Quality and Greenhouse Gases (AIR)," January 27, 2017.

HELIX

DATA

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Find, view, and use open scientific data

HELIX Architecture

Data

- **CKAN-based Data Catalogue & Repository** extended via multiple plugins
  - Core **CKAN v2.8** (started from v2.2, soon will port to v3.0)
  - Plugins: **CKAN + PublicaMundi** (metadata, geo) + **HELIX** (metadata/workflow)
  - Custom roles/profiles/organization structure
- **Core CKAN services & HELIX-specific services**
  - Search, view, visualize, download
- **Data management**
  - Dataset upload (files) **open** to all publishers (size-limited, admin QA & sanitization)
  - Multiple **replication** policies for harvested datasets
  - Automated **independent** and **asynchronous** data **ingestion** policies (files to data)

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Data Services

- Core Metadata and Standard Schemas
  - **DataCite-based** schema (default, common, simple)
  - Support for **domain-specific** metadata schemas (e.g., ISO 19131)
    - **Upload/harvest** (e.g., INSPIRE or Public Data catalogues)
    - Extensible programmatic homogenization/**mapping** (to Core), **UI generation** (editor) and **on-the-fly transformations** (all metadata files available)
- **Personal data collections** (check later, send to others, use in Lab)
- Datasets **linked** with **Data Services** (how/where to use) & **Pubs** (manual & automated via OpenAIRE)
- User **hierarchies/rights** (organization, curators, authors)
- Flexible **DMP** support (confidential, embargo)

Data as a Service

- **Data catalogue & repository** provided as **a Service** to **Research** Organizations, Scientific **Infrastructures**, Domain-specific **communities**, **Government**/**NGOs**
  - **Follow the data and the users** (high-value data, large user groups) and bring the services **closer** to their **needs** (e.g., domain-specific schemas and services)
  - Low-cost, low-effort, inclusive **institutional data catalogues**/**repos** with integrated **OA** support & DMP facilities
- Sub-domain in HELIX (**group**)
- **White-labelling**

Data as a Service

Featured Data sets

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Ministry of Environment, Energy and Climate Change

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BEACHES

Tags

ΥΓΡΟΤΟΠΟΙ ΝΗΣΙΑ ΓΕΩΔΕΔΟΜΕΝΑ ΥΓΡΟΤΟΠΟΙ ΝΗΣΙΑ ΓΕΩΔΕΔΟΜΕΝΑ

License

Air Quality In Attiki Urban Area

ΕΛ

PUBLICATION: 20 - 10 - 2010
LAST REVISION: 14 - 09 - 2013

DATA | TOPICS | ACTIVITY STREAM | DEVELOPERS

Το σύνολο γεωχωρικών δεδομένων απεικονίζει μικρούς νησιωτικούς υγροτόπους έκτασης μικρότερης των 80 στρεμμάτων, όπως εγκρίθηκαν από τον Υπουργό Περιβάλλοντος Ενέργειας και Κλιματικής Αλλαγής, με την εξουσιοδότηση του νόμου για τη Διατήρηση της Βιοποικιλότητας (ν.3937/2011) και μετά από επαρκή επιστημονική τεκμηρίωση. Το σχέδιο Προεδρικού Διατάγματος για την προστασία των μικρών νησιωτικών υγροτόπων με τον τίτλο: «Έγκριση καταλόγου μικρών νησιωτικών υγροτόπων και καθορισμός όρων και περιορισμών για την προστασία και ανάδειξη των μικρών παράκτιων υγροτόπων που περιλαμβάνονται σε αυτόν» υπεγράφη από τον Υπουργό την 1η Φεβρουαρίου και προωθήθηκε στο Συμβούλιο Επικρατείας για επεξεργασία.

DATA AND RESOURCES

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METADATA

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ΕΠΙΚΟΙΝΩΝΙΑ	ΟΡΓΑΝΙΣΜΟΣ	Υπουργείο Περιβάλλοντος Ενέργειας και Κλιματικής Αλλαγής
	EMAIL	info@geodata.gov.gr
ΑΠΟΣΠΑΣΜΑ	Κάλυψη γης για την Ελλάδα και το έτος 2000, σύμφωνα με τα παραδοτέα του προγράμματος CORINE της Ευρωπαικής Ένωσης	
ΓΛΩΣΣΕΣ ΠΟΡΩΝ	gre, eng	
CONFORMITY	TITLE	Title text
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HELIX

LAB

Hellenic
Data
Service

Learn, experiment, and build with data

HELIX Architecture

Lab

- **Open-ended collection of independent services and applications for experimenting and using data**
  - No interdependencies or single point of failure
  - Fast and simple to replace/extend services in operation
  - Service portfolio constantly expanding, with varying TRL/access levels
  - Replicate/expand the industry emerging paradigms (e.g., Azure, Google)
- **All have automated & configurable access to the repository's data**
  - Data available as files or databases/data processing frameworks
  - Flexible data availability policies per type/data set (e.g., depending on size, popularity, importance, domain, resource-utilization)

HELIX Architecture /// Lab

Data Science Notebooks

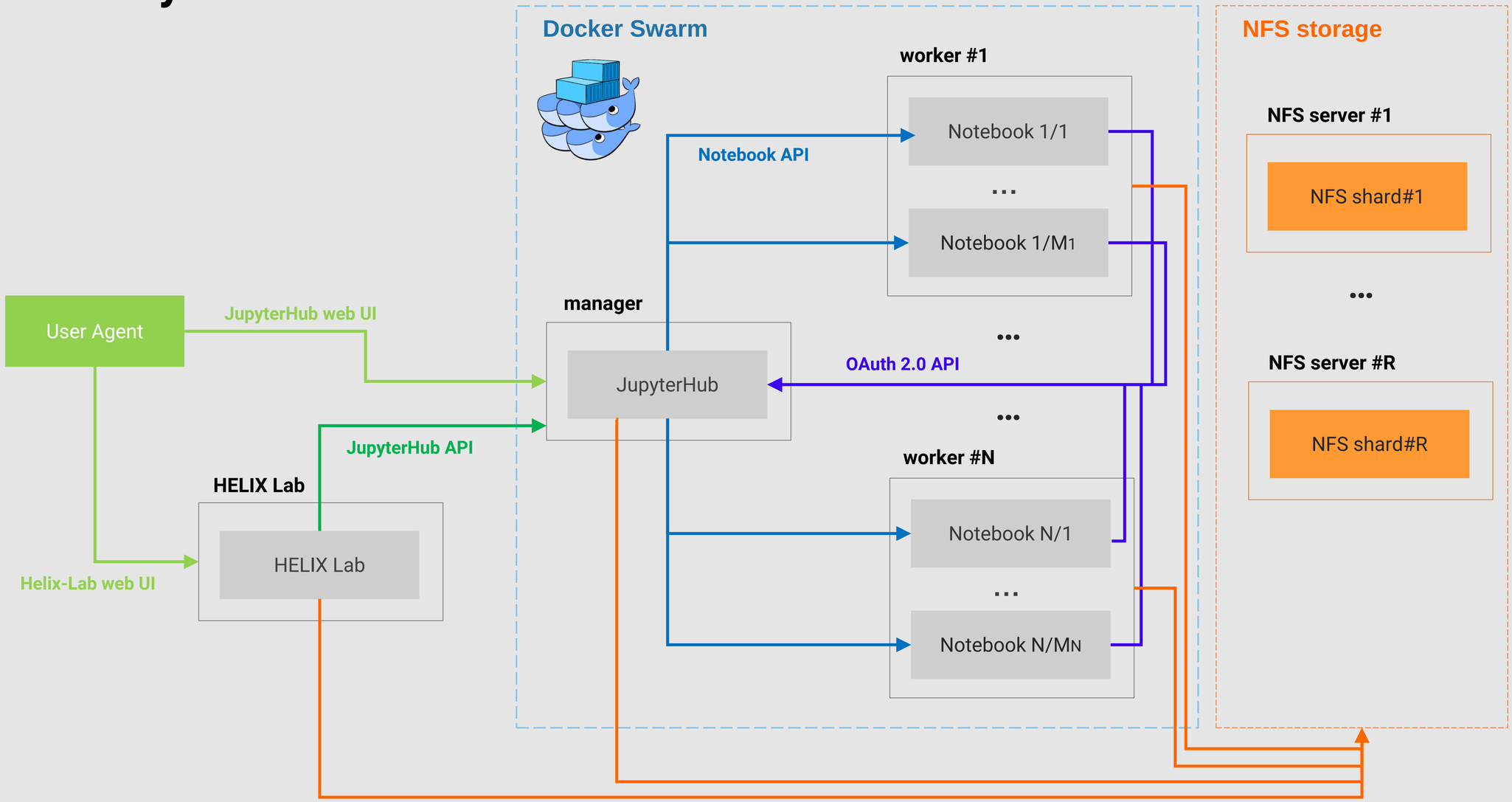
- **Jupyter Lab/Hub** (open beta)
  - **Tiered** kernel/resource per user (from R, to HPC)
  - Repository data available in user's notebooks (my data collection; minimize time/effort to discover & use data)
  - Support for under/post-grad **courses** (share data/exercises) and **research teams** (collaborative editing)
  - Constantly expanded with additional facilities & services to support **Data Science** and targeted domain needs
- **Apache Zeppelin** (invitational beta)
  - Notebook-like facility for **Apache Spark** (Java/Scala)
  - Dedicated clusters for **Big Data** experimentation & benchmarking
- **Reproducible & Operational research** (TBA)
  - Containerized algorithms & data
  - Deployment-ready

Interactive computing

Scalable Computing

HELIX Architecture /// Lab

Scalability



Βρείτε δεδομένα συμβατά με Jupyter

Πηγές από 100+ κυβερνητικές υπηρεσίες και ερευνητικά ιδρύματα

Interactive coding in your browser

Free, in the cloud, powered by Jupyter

Powerful Languages

Azure Notebooks provides execution environments for Python 2, Python 3, F#, and R.

Use the languages of Data Science

Numerous Charting Libraries

Quickly visualize your data and results using plotting libraries such as ggplot, matplotlib, bokeh, and seaborn.

Inline Graphs

Introduction to Python

Learn the basics of Python 3 in Azure Notebooks. Learn Python syntax, standard data types, as well as how to write a simple program.

Introduction to R

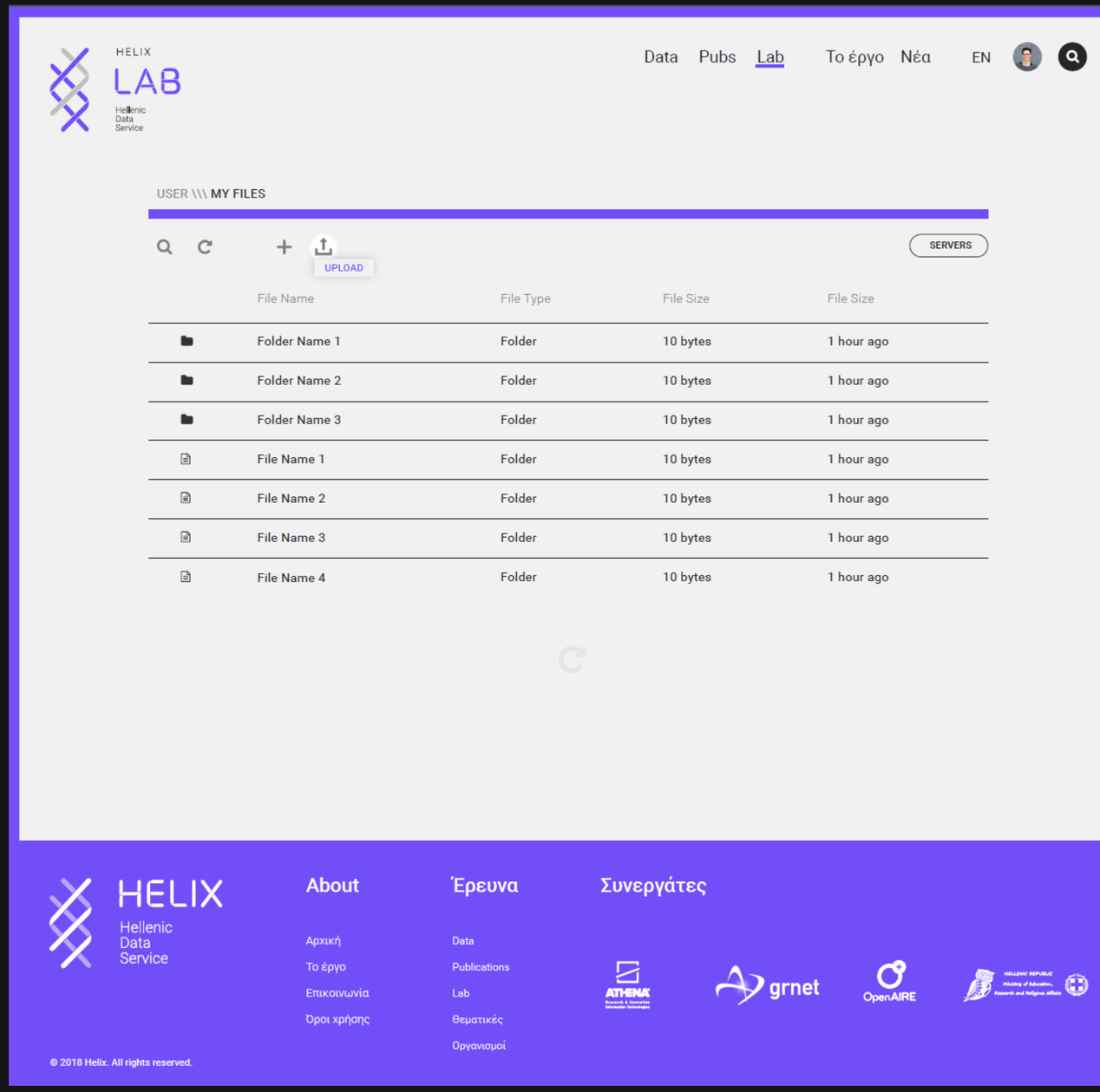
Get a brief introduction to charting and graphing capabilities of R in the Jupyter Notebook. You will learn how to make line charts, pie charts and scatter plots.

Introduction to F#

Get a brief introduction to using F# in the Jupyter Notebook.

Introduction to Python 3

Learn the basics of Python 3 in Azure Notebooks. Learn Python syntax, standard data types, as well as how to write a simple program.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File Type
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Folder Name 2
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10 bytes
1 hour ago
Folder Name 3
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File Notebook Editor Terminal Console Help

Files Commands

drivendata › deep-water

Name	Last Modified
data_clean	5 months ago
data_raw	5 months ago
img	2 months ago
plots	5 months ago
rsconnect	2 months ago
report.ipynb	2 months ago
cleaning.R	5 months ago
data_load.R	5 months ago
data_water.Rproj	5 months ago
eda.R	5 months ago
helpers.R	5 months ago
machine_learning.R	5 months ago
maps.R	5 months ago
notes.Rmd	5 months ago
report.html	2 months ago
report.Rmd	2 months ago

Launcher | report.ipynb

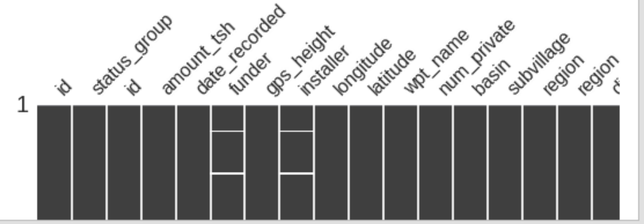
Code | Python 2

```
In [2]:
import pandas as pd
import missingno

%matplotlib inline
```

```
In [4]:
# collect data urls
train_features_url = "http://s3.amazonaws.com/drivendata/data/7/pub
train_labels_url = "http://s3.amazonaws.com/drivendata/data/7/publi
test_features_url = "http://s3.amazonaws.com/drivendata/data/7/publ

# read in data
train_features = pd.read_csv(train_features_url)
train_labels = pd.read_csv(train_labels_url)
test_features = pd.read_csv(test_features_url)
```

```
In [5]:
# merge dataframes
train = pd.concat([train_labels, train_features], axis = 1)
```

```
In [6]:
# missing data visualise
missingno.matrix(train)
```

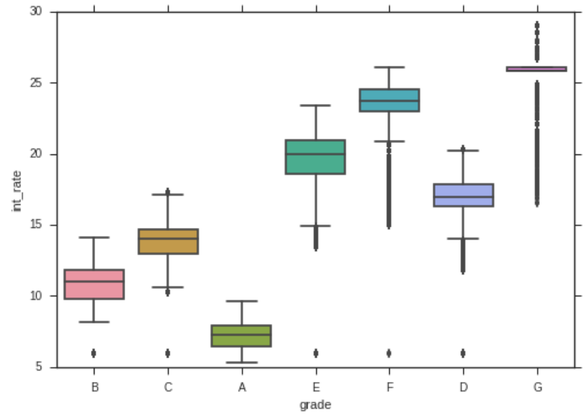


lending_club.ipyn

Markdown | Python 2

```
In [6]:
sns.boxplot(x = data_raw.grade, y = data_raw.int_rate)
```

```
Out[6]:
<matplotlib.axes._subplots.AxesSubplot at 0x7fd42ebc6290>
```




```
In [7]:
data_raw.shape
```

```
Out[7]:
(887379, 74)
```

```
In [15]:
sns.distplot(data_raw['loan_amnt']);
```

..ta/deep-water

```
-rw-r--r--  1 boyanangelov  staff      256 Feb 16 20:16 maps.R
-rw-r--r--  1 boyanangelov  staff      706 Feb 16 20:16 notes.Rmd
drwxr-xr-x  3 boyanangelov  staff      102 Feb 16 20:16 plots
-rw-r--r--  1 boyanangelov  staff     7316 Jun  5 21:07 report.Rmd
-rw-r--r--  1 boyanangelov  staff  3136447 Jun  5 21:09 report.html
-rw-r--r--  1 boyanangelov  staff   395119 Jun  5 21:00 report.ipynb
drwxr-xr-x  3 boyanangelov  staff      102 Jun  5 21:00 rsconnect

# boyanangelov @ mac-home in ~/ds/drivendata/deep-water on git:master x [11:54:12]
$
```

Running

Other Services

- **Interactive Data Services/widgets** (evaluate & use)
  - Presentational (tables, charts, maps) for tabular data
  - File transformations (schemas/formats, CRS)
- **End-points & APIs** (for third system/apps)
  - OGC Services for geospatial (Catalogue, WMS, WFS, WPS-experimental)
  - Linked Open Data (SPARQL, GeoSPARQL end-points)
  - JavaScript Data API (simple filter/SQL-type queries over tabular data)
  - JavaScript Mapping API (custom standalone/embeddable maps)

hellenic**data**service.**gr**

We need you to

Publish Data
Data stories
Share code
Data curricula
Partners

Universities
Research Centers
Scientific Infrastructures
Digital Libraries
Communities

We can provide you with

Data catalogue & repository
Harvest
Data Science
OA & DMP training

We need you to

Use Data
Publish Data
Data stories
Build
Spread the word

Scientist
Researcher
Innovator
Citizen Scientist
Student

We can provide you with

High-value data
Interactive Computing
Scalable Computing

We need you to

Publish Data
Promote OA
Align policies
Support expansion

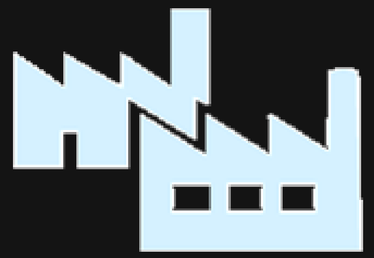
Public Sector
Grant manager
NGO

We can provide you with

Open Data
Citizen engagement
Data Services
OA Policy

We need you to

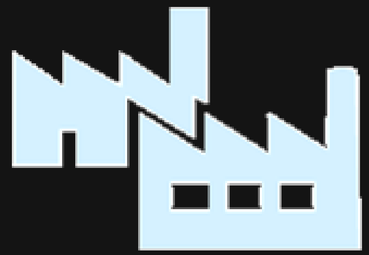
Discover & Harness Data
Build data-driven services
Contribute data & stories



Industry
Innovators
Startups

We can provide you with

High-value data
Computing Infrastructures
Data Science Training



Thank you

DEMO

Find, view, and use open scientific data

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