

# Datenschutzkonforme virtuelle Forschungsinfrastrukturen für Gesundheitsdaten

Actionable Multilevel Health Data

Petra Ritter



# Human Health Data



Even after directly identifying information such as names, faces, addresses, or dates of births were removed (often called 'pseudonymization'), the data is still considered as personal data under GDPR if it could be attributed to a natural person by the use of additional information (Recital 26, GDPR) and hence the requirements for protection nevertheless apply.

Typical biomedical data like MRI or genetic material contain extensive person-related information such that re-identification cannot be excluded (Byrge & Kennedy, 2018; Gymrek et al., 2013; Rocher et al., 2019)

# Service for sensitive data: Synergistic developments



<https://virtualbraincloud-2020.eu/>



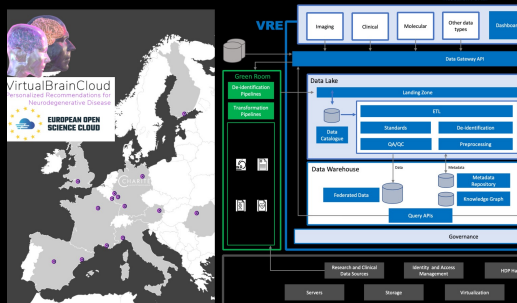
<https://ebrains.eu/service/the-virtual-brain>



[www.healthdatacloud.eu](http://www.healthdatacloud.eu)

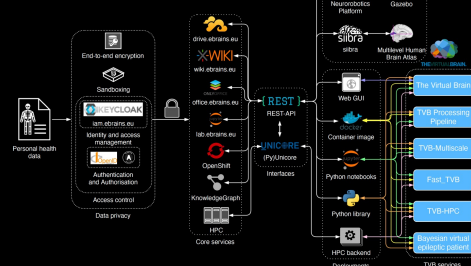


## EOSC Project Virtual Brain Cloud: Virtual Research Environment



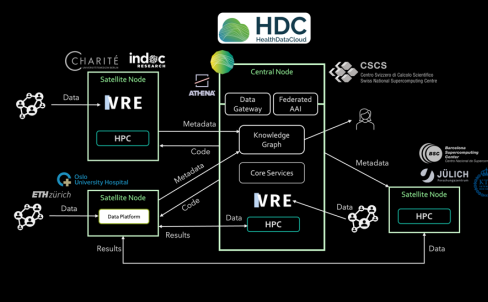
€15Mill 2018-2022 (lead: Charité)

## Human Brain Project: Codesign Project The Virtual Brain (SGA2)



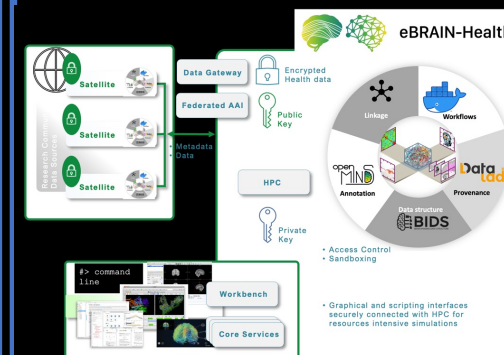
€1Mill 2018-2020 (lead: Charité)

## Human Brain Project Health Data Cloud (SGA3)



€1Mill 2022-2023 (lead: Charité)

## Horizon Europe Infrastructure eBRAIN-Health



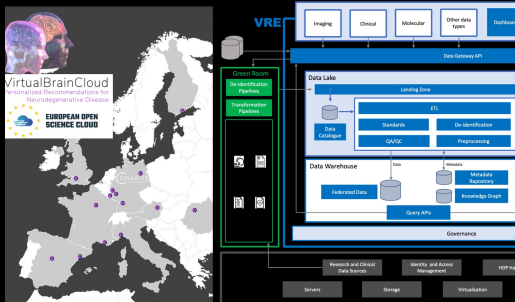
13 Mill 2022-2026 (lead: Charité)

# Service for sensitive data: Synergistic developments



<https://virtualbraincloud-2020.eu/>

**EOSC Project Virtual Brain Cloud:  
Virtual Research Environment**

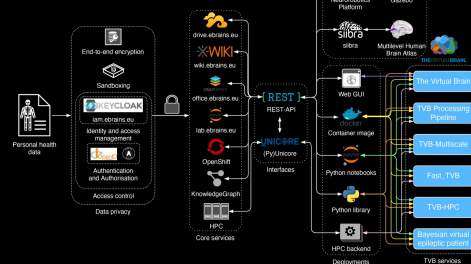


€15Mill 2018-2022 (lead: Charité)



<https://ebrains.eu/service/the-virtual-brain>

**Human Brain Project:  
Codesign Project The Virtual  
Brain (SGA2)**

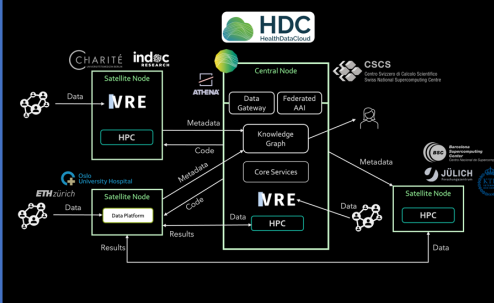


€1Mill 2018-2020 (lead: Charité)



[www.healthdatacloud.eu](http://www.healthdatacloud.eu)

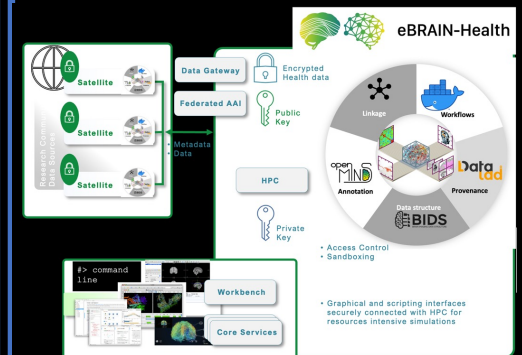
**Human Brain Project  
Health Data Cloud (SGA3)**



€1Mill 2022-2023 (lead: Charité)



**Horizon Europe Infrastructure  
eBRAIN-Health**



13 Mill 2022-2026 (lead: Charité)





EBRAINS

Services

News

Support

About

Users with Accounts:

**>5500**

**EBRAINS is powering a new era  
in Brain Research**



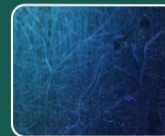
### Data and Knowledge

- Online solutions to facilitate sharing of and access to research data, computational models and software



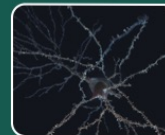
### Atlases

- Navigate, characterise and analyse information on the basis of anatomical location



### Simulation

- Solutions for brain researchers to conduct sustainable simulation studies and share their results



### Brain-Inspired Technologies

- Understand and leverage the computational capabilities of spiking neural networks

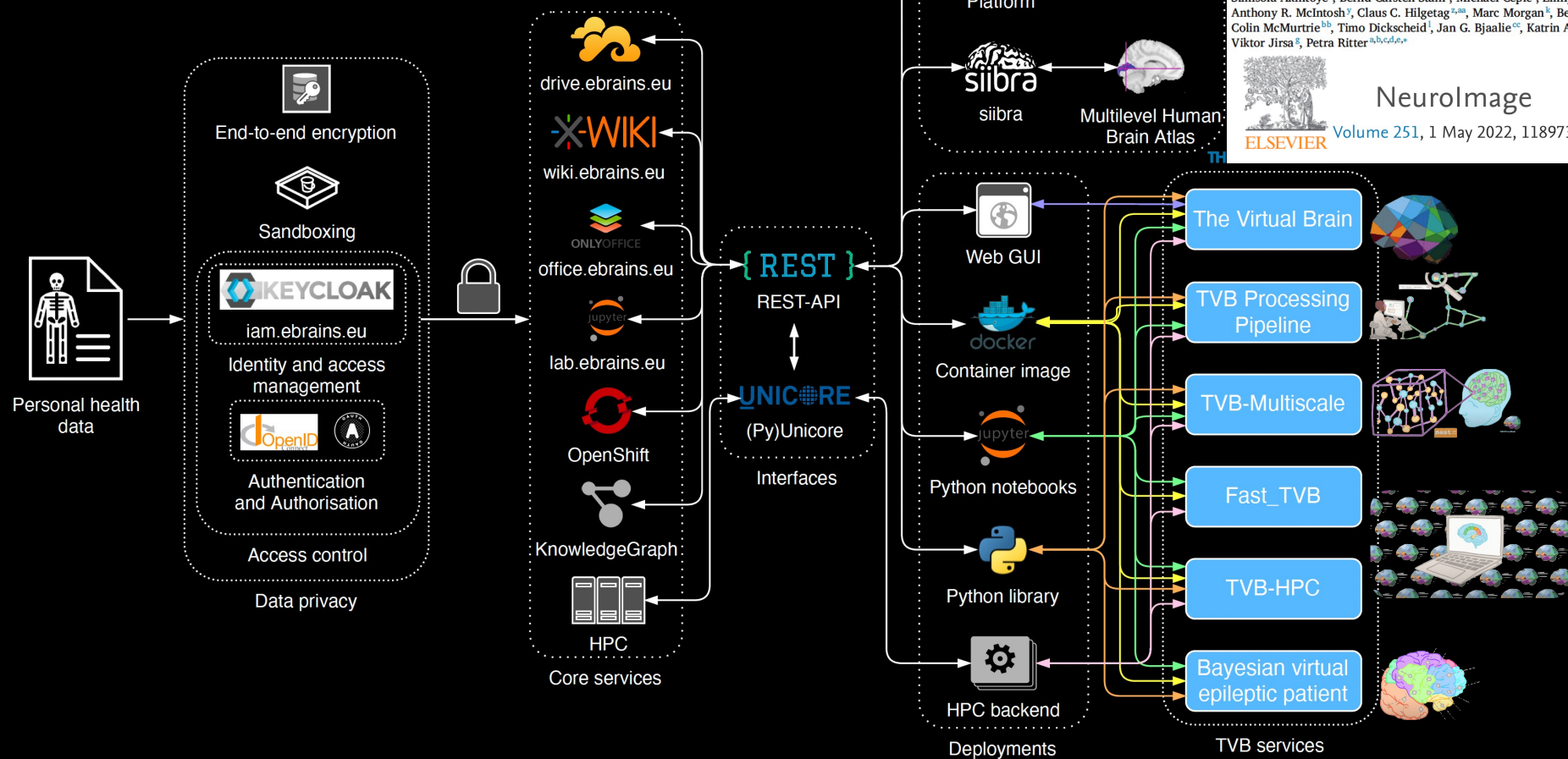


### Medical Data Analytics

- The Medical Data Analytics service provides two unique EBRAINS platforms, covering key areas in clinical neuroscience research

# EBRAINS Virtual Brain Cloud

<https://ebrains.eu/service/the-virtual-brain>



Brain simulation as a cloud service: The Virtual Brain on EBRAINS

Michael Schirner<sup>a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p,q,r,s,t,u,v,w,x,y,z</sup>, Lia Domide<sup>f</sup>, Dionysios Perdakis<sup>a,b</sup>, Paul Triebkorn<sup>a,b,g</sup>, Leon Stefanovski<sup>a,b</sup>, Roopa Pai<sup>a,b</sup>, Paula Prodan<sup>f</sup>, Bogdan Valean<sup>f</sup>, Jessica Palmer<sup>a,b</sup>, Chloé Langford<sup>a,b</sup>, André Blickensdörfer<sup>a,b</sup>, Michiel van der Vlag<sup>a</sup>, Sandra Diaz-Pier<sup>a</sup>, Alexander Peyser<sup>a</sup>, Wouter Klijn<sup>a</sup>, Dirk Pleiter<sup>a</sup>, Anne Nahm<sup>a</sup>, Oliver Schmid<sup>a</sup>, Marmaduke Woodman<sup>a</sup>, Lyuba Zehl<sup>a</sup>, Jan Fousek<sup>a</sup>, Spase Petkoski<sup>a</sup>, Lionel Kusch<sup>a</sup>, Meysam Hashemi<sup>a</sup>, Daniele Marinazzo<sup>a,n</sup>, Jean-François Mangin<sup>a</sup>, Agnes Flöel<sup>a</sup>, Simisola Akintoye<sup>a</sup>, Bernd Carsten Stahl<sup>a</sup>, Michael Cepic<sup>a</sup>, Emily Johnson<sup>a</sup>, Gustavo Deco<sup>a,v,w,x</sup>, Anthony R. McIntosh<sup>a</sup>, Claus C. Hilgetag<sup>a,m</sup>, Marc Morgan<sup>a</sup>, Bernd Schuller<sup>a</sup>, Alex Upton<sup>a</sup>, Colin McMurtrie<sup>a</sup>, Timo Dickscheid<sup>a</sup>, Jan G. Bjaalie<sup>a</sup>, Katrin Amunts<sup>a,d</sup>, Jochen Mersmann<sup>a</sup>, Viktor Jirsa<sup>a</sup>, Petra Ritter<sup>a,b,c,d,e,f,g,h,i,j,k,l,m,n,o,p,q,r,s,t,u,v,w,x,y,z</sup>

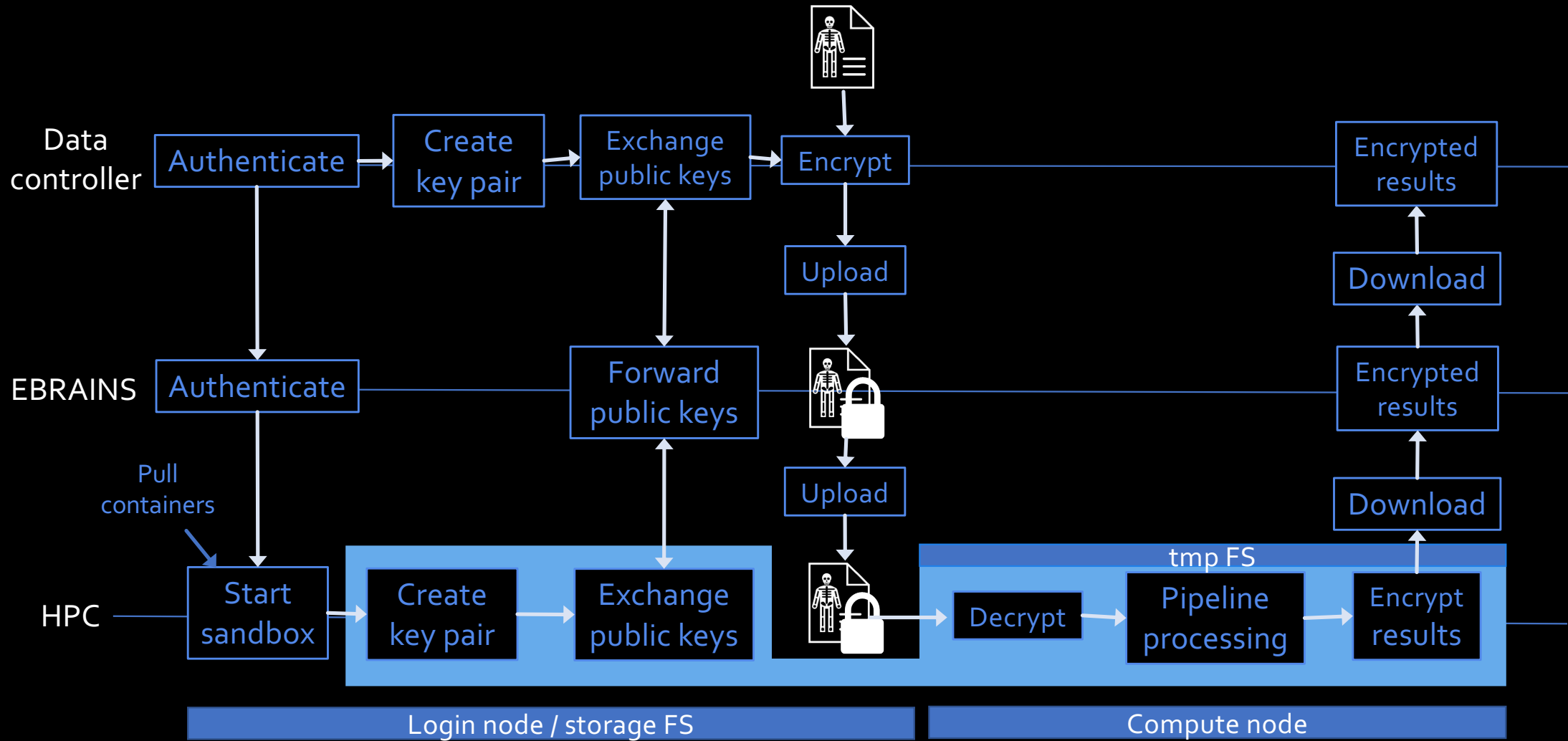


NeuroImage

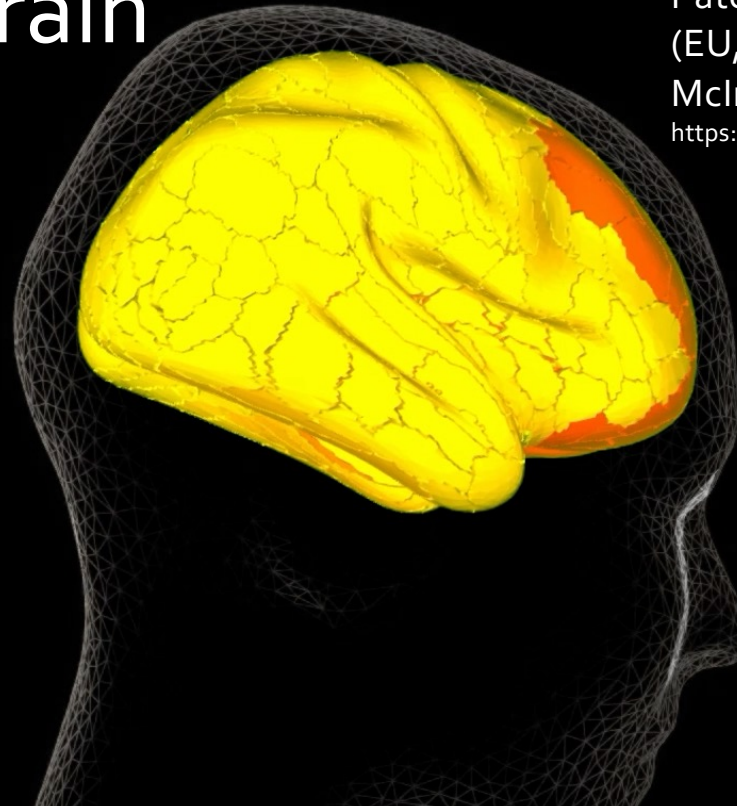
Volume 251, 1 May 2022, 118973



# Automated cryptography & sandboxing workflow



# The Virtual Brain



Patent allowance in the US  
(EU, Canada pending)


McIntosh, Mersmann, Jirsa, Ritter

<https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2014020428>

**EJN**

European Journal  
of Neuroscience

**Virtual deep brain stimulation: Multiscale co-simulation of a spiking basal ganglia model and a whole-brain mean-field model with The Virtual Brain**

 Jil M. Meier, Dionysios Perdikis, André Blickensdörfer, Leon Stefanovski, Qin Liu, Oliver Maith, Helge Ü. Dinkelbach, Javier Baladron, Fred H. Hamker, Petra Ritter

ceosc



The screenshot displays the Virtual Brain Cloud interface. On the left, a map of Europe is shown with numerous purple dots indicating data locations. Above the map is the Virtual Brain Cloud logo and the text "EUROPEAN OPEN SCIENCE CLOUD". On the right, a detailed system architecture diagram is presented. The diagram is organized into several layers: a top navigation bar with options like "Hiring", "Clinical", "Molecular", "Other data types", and "Guidelines"; a "Data Gateway (H)" layer; a "Data Lake" layer containing a "Loading Zone" with "Data Uploads", "Variables", and "DataV", and a "Data Warehouse" with "Federated Data", "Data", "Metadata", "Knowledge Graph", and "Query API"; and a bottom "Governance" layer with "Research and Clinical Data Access", "Identity and Access Management", and "HCP". A green box highlights the "Green Room" section, which includes "Data Identification Platform" and "Transformation Platform".

The diagram illustrates a secure, multi-tenant, multi-modal, and multi-protocol system architecture. It is organized into several functional layers and components:

- Data Ingestion and Security:** Personal health data is input into a 'Data ingestion' box, which also handles 'End-to-end encryption' and 'Sanitization'.
- Data Storage and Management:** The data is stored in a 'Data storage' box, which includes 'AES-256', 'Identity and Access management', 'Data governance', and 'Data privacy'.
- Core Services and Data Sources:** The system connects to various data sources and services, including 'drive', 'wiki', 'office', 'lab', and 'Overlith', as well as a 'KnowledgeGraph' and 'HPC' (High-Performance Computing).
- APIs and Interfaces:** The system uses a 'REST API' and 'NIC-IRE' (Network Interface for Cloud Resource Interactions) interfaces for communication.
- AI/ML and Human Interaction:** The system integrates 'AI/ML' (Artificial Intelligence/Machine Learning) components, including 'Multitask Human (Brain) RL' and 'AI/ML model'.
- TVB (Telemedicine Virtual Brain) Components:** The system connects to various TVB components, including 'TVB Processing System', 'TVB Multi-task', 'Fast TVB', 'TVB-HPC', and 'TVB sensor'.
- NIC-IRE Basic and NIC-IRE:** The system also includes 'NIC-IRE basic' and 'NIC-IRE' components.

The diagram illustrates the eBRAIN-Health architecture, showing the flow of data from remote sensing to clinical and research applications.

**Data Source:** Three **Satellite** icons are shown, each with a green lock icon, indicating encrypted data. A vertical label on the left reads **Encrypted Remote Sensing Data**.

**Data Flow:** An arrow labeled **Metadata Data** points from the satellites to the **Data Gateway**.

**Data Gateway:** A box containing a green lock icon and the text **Encrypted Health data**.

**Public Key:** A green key icon labeled **Public Key**.

**HPC:** A box labeled **HPC** (High-Performance Computing).

**Private Key:** A green key icon labeled **Private Key**.

**Central Data Hub:** A circular hub with various components:

- Linkage** (Network icon)
- Workflows** (Ship icon)
- openMIND Annotation** (MIND icon)
- Data Id** (ID card icon)
- Provenance** (Document icon)
- Data structure** (Database icon)
- BIDS** (Brain Imaging Data Structure icon)

**Access Control & Sandboxing:** A box labeled **Access Control** and **Sandboxing**.

**Workbench:** A box labeled **Workbench**.

**Core Services:** A box labeled **Core Services**.

**Graphical and scripting interfaces:** A box labeled **Graphical and scripting interfaces** for resources intensive simulations.



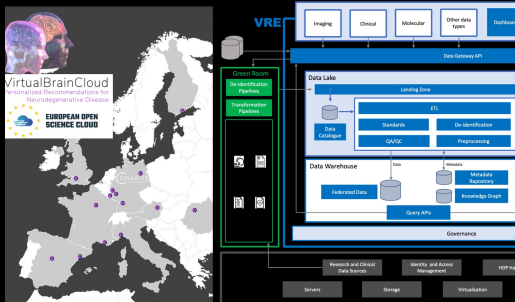
CHARITÉ  
UNIVERSITÄTSMEDIZIN BERLIN

# Service for sensitive data: Synergistic developments



<https://virtualbraincloud-2020.eu/>

**EOSC Project Virtual Brain Cloud:  
Virtual Research Environment**

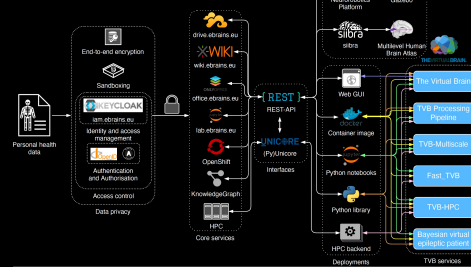


€15Mill 2018-2022 (lead: Charité)



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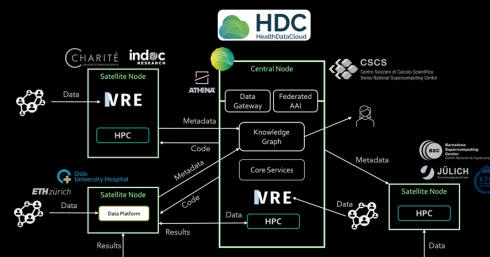


€1Mill 2018-2020 (lead: Charité)



[www.healthdatacloud.eu](http://www.healthdatacloud.eu)

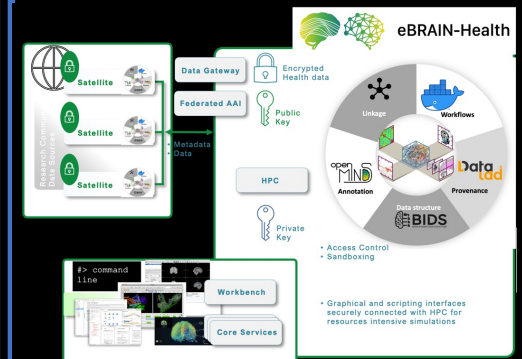
**Human Brain Project  
Health Data Cloud (SGA3)**



€1Mill 2022-2023 (lead: Charité)



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eBRAIN-Health**

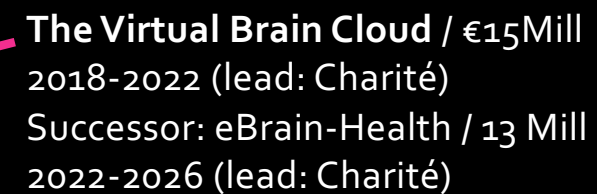


13 Mill 2022-2026 (lead: Charité)



<https://virtualbraincloud-2020.eu/>

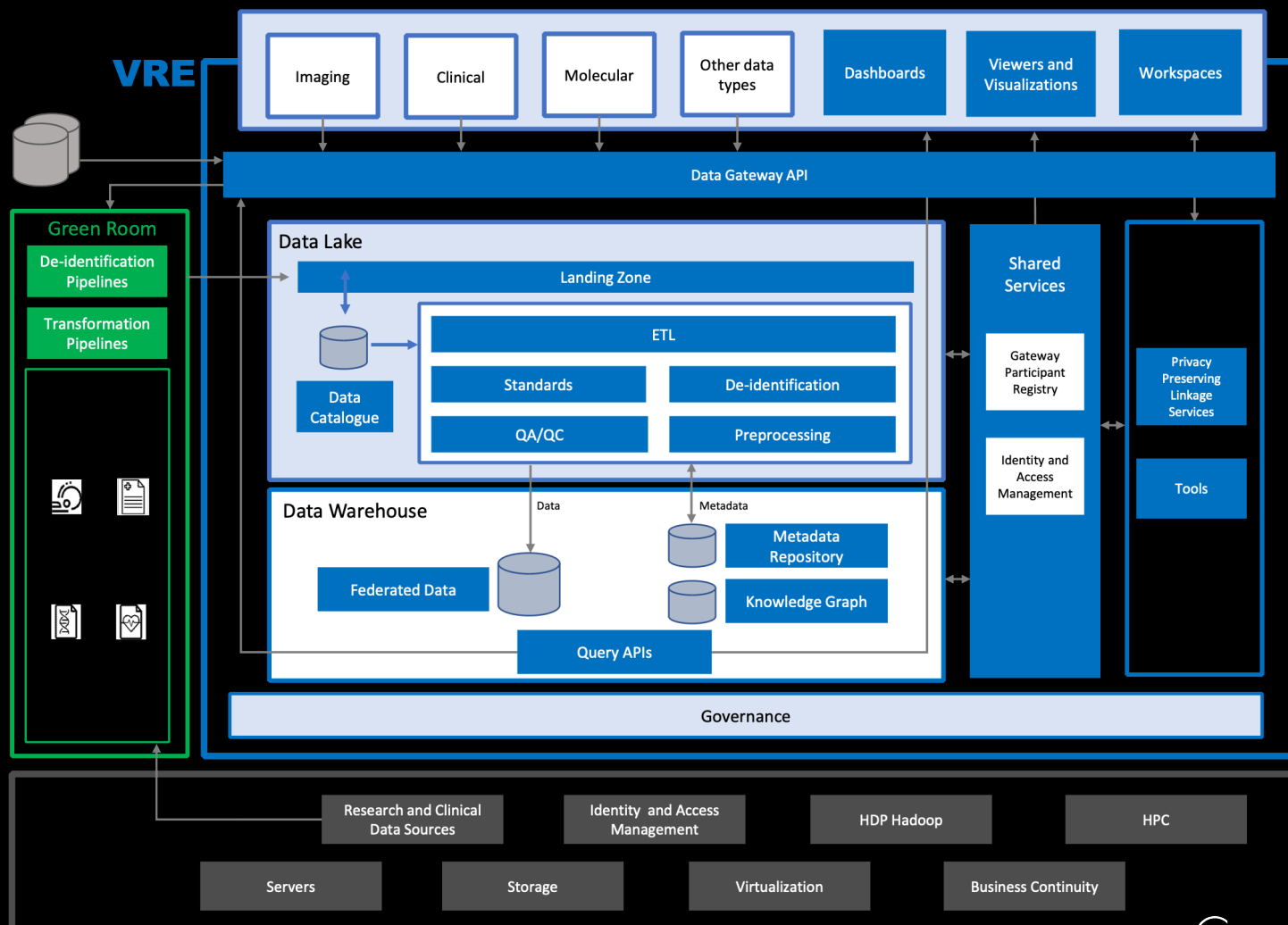
## EOSC Projects





# EOSC Project VirtualBrainCloud **VRE** Virtual Research Environment

Research Portal



# Virtual Research Environment

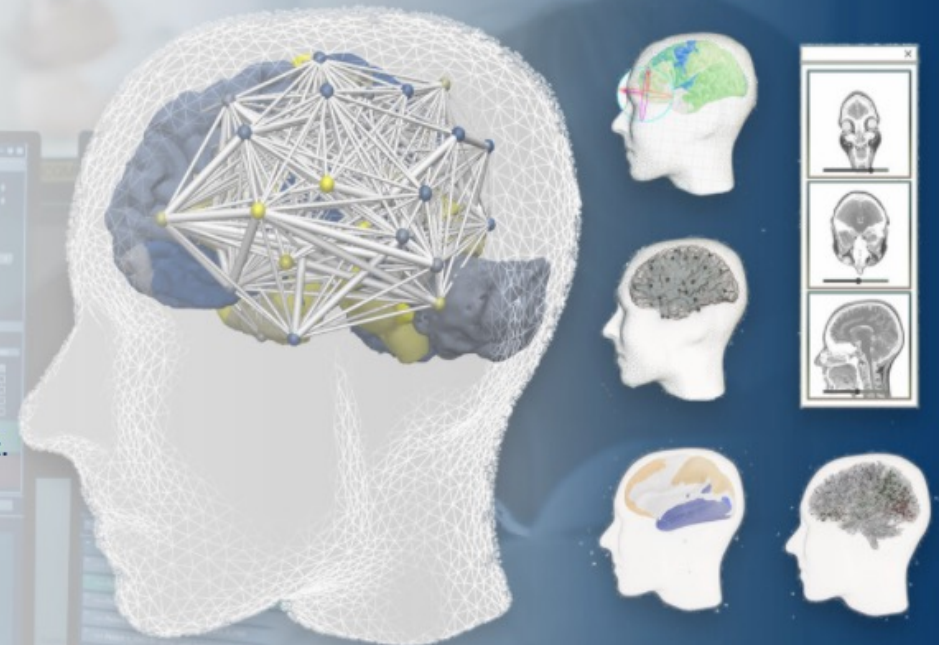
Making it easier for researchers to manage, share,  
and process complex research data.

[Learn more](#)



**GDPR READY**

The VRE has undergone a successful GDPR Service Readiness audit.



# Community

The VRE is a community development project. We follow the FAIR guiding principles for scientific data management - Findability, Accessibility, Interoperability, and Reusability.

Please contact us to learn more about how to join the VRE community and participate in the development. We want to ensure that this development is open and accessible to all clinicians and scientists at Charité, BIH, and beyond, so we can solve today's pressing medical challenges together!

 **88**  
Members

 **15**  
Projects

 **156** GB  
Data

 **21**  
Virtual Machines

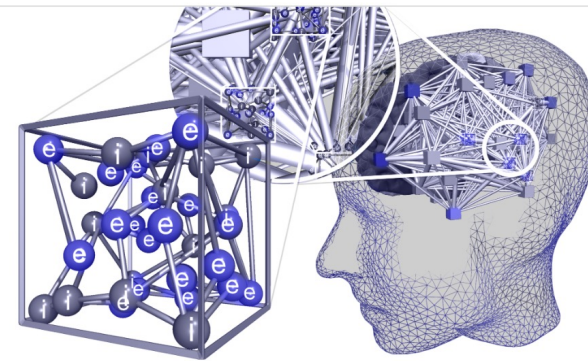
 **244**  
Cores

 **1503** GB  
RAM

neuroscience.

- The initiative brings together **data collectors, data users and technology providers** to develop processes for data management in research with specific emphasis on neuroscience.
- The consortium works **to build a community to develop the conceptual and practical basis** of research data management for the neurosciences.

[Learn more about the initiative](#)



## Latest news



### Global survey on data-sharing barriers in neuroscience

6. October 2022 /// No Comments

The INCF Infrastructure Committee is trying to identify barriers to data sharing and reuse among neuroscience researchers worldwide, with a brief anonymous survey. The results

[Read More »](#)



**BRAIN-Health**

### eBRAIN-Health project awarded funding by European Union!

5. July 2022 /// No Comments

NFDI-Neuro is proud to announce that the eBRAIN-Health project: "Actionable Multilevel Health Data", coordinated by our Consortium spokesperson, Prof. Petra Ritter, has been funded with

[Read More »](#)



### NFDI Neuroscience Co-Spokesperson Thomas Wachtler contributed to the

## Upcoming events

NOV November 7 @ 09:00 - November 10 @ 19:00 CET

**7 EBRAINS Training Event – Simulate with EBRAINS**

[View Calendar](#)

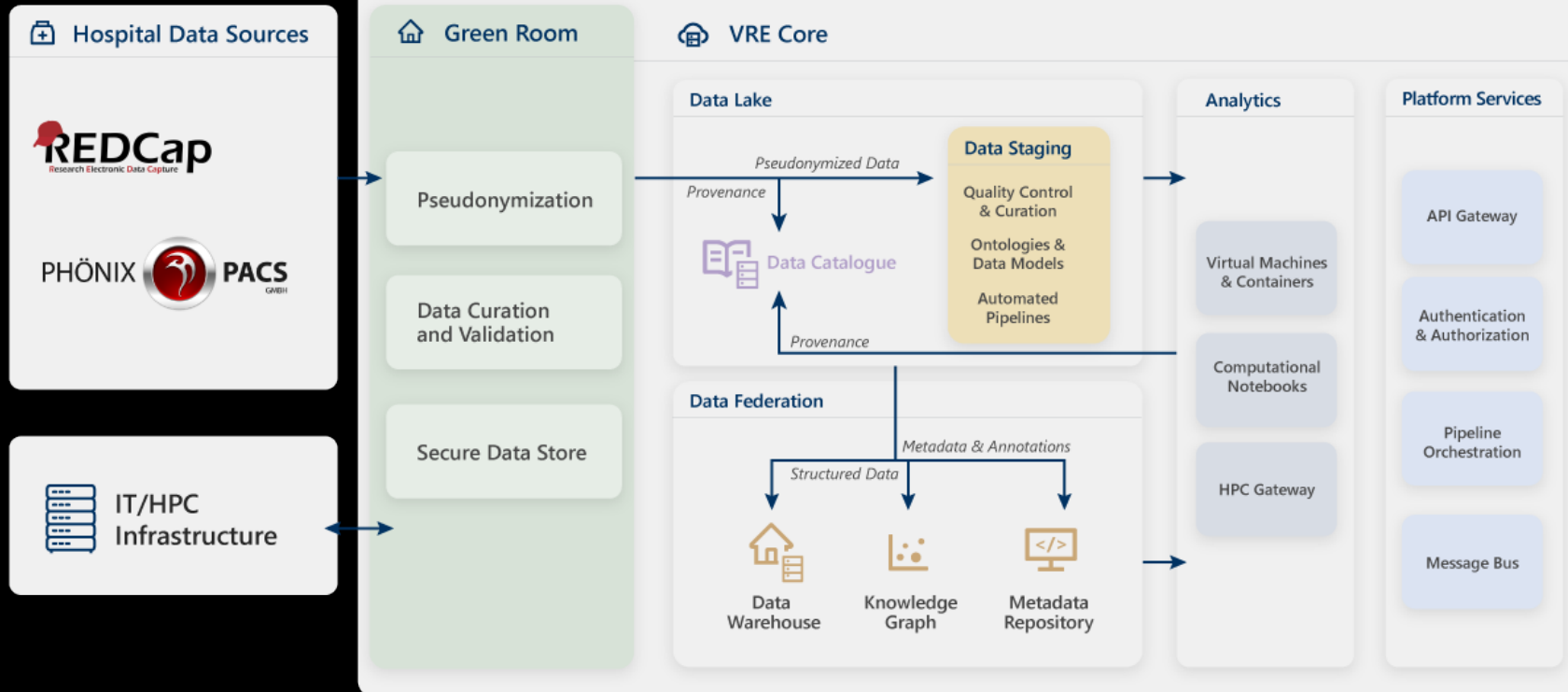
## VRE Virtual Research Environment Community Meeting

The Virtual Research Environment (VRE) is a collaborative project, developed for the research community and with the research community. VRE Community Meetings are organized for members of the research community to discuss their projects and use cases and for the development team to update on new features and development activities.

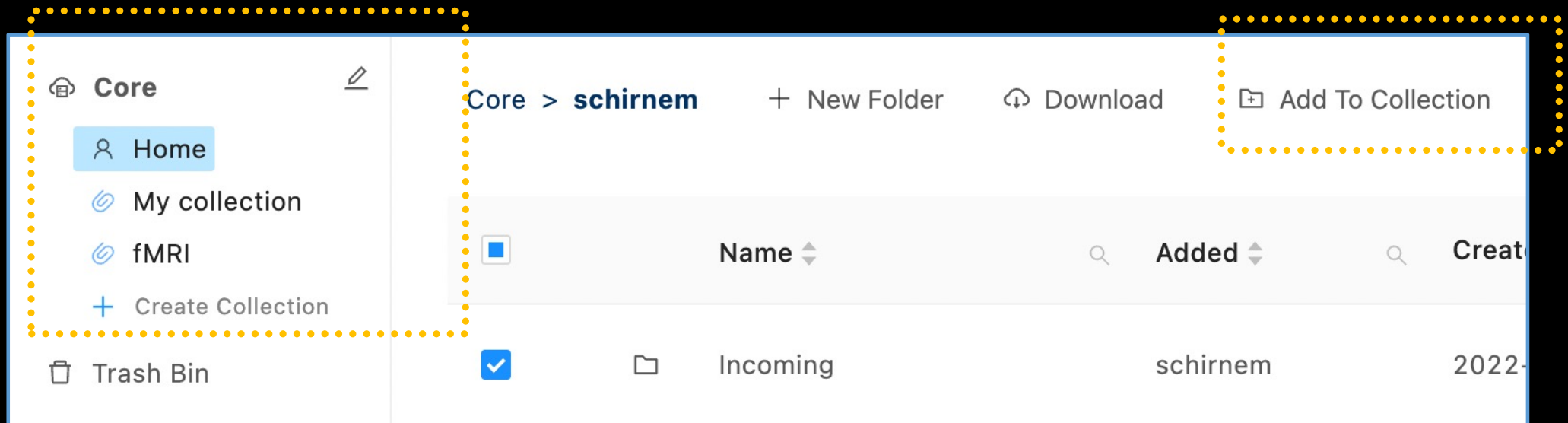
[Registration link for the biweekly Virtual Research Environment Community Meetings](#)

# Virtual Research Environment

**VRE** Virtual Research Environment



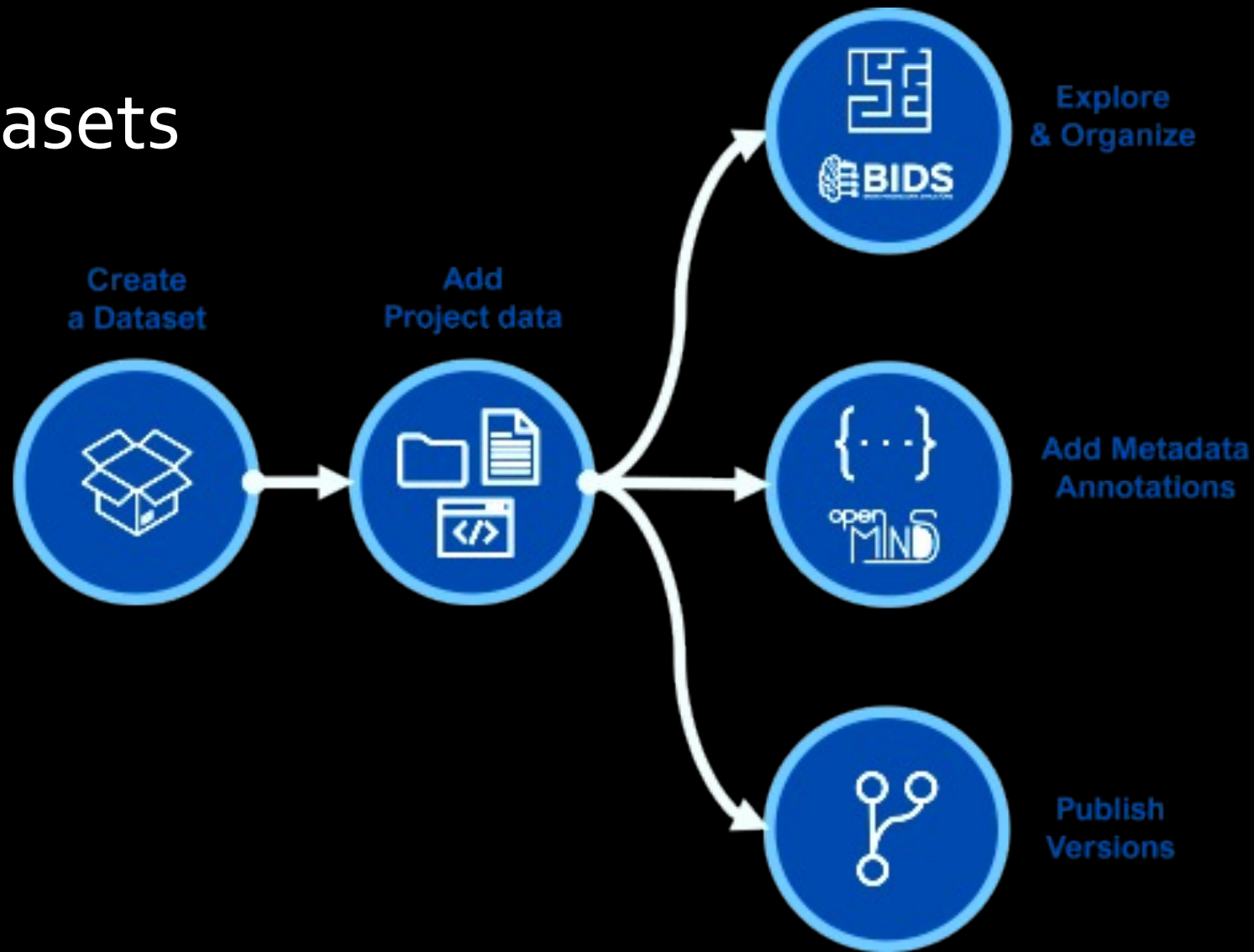
# Collections



Virtual folders to **group files** without affecting their storage location or data lineage



# Datasets





# Datasets—Manage Datasets

The screenshot displays the VRE (Virtual Research Environment) interface for managing datasets. The top navigation bar includes 'Projects' and 'Datasets' tabs, with 'Datasets' selected. The user's name 'schirnem' and a notification bell icon are visible in the top right.

The main content area is titled 'My new Dataset' with a 'Versions' tab. Below the title, it shows the 'Dataset Code: shortcode / Created on 2022-03-21 by schirnem' and a 'Download' button. A 'connectome' label is present next to the 'Download' button.

The left sidebar contains a 'Dataset Information' section with the following details:

- Title: My new Dataset
- Authors: Marie Curie, Albert Einstein
- Type: BIDS
- Modality: neural connectivity, computational modeling, anatomical approach
- Collection Method: dwMRI
- License: CC BY 4.0

The right sidebar contains a 'Description' section with the text: 'MRI data of two famous scientists.'

The bottom section is labeled 'Tags' and contains a 'connectome' tag.

Key interactive elements highlighted with yellow dotted boxes include:

- The 'Datasets' tab in the top navigation bar.
- The 'My new Dataset' title and 'Versions' tab.
- The 'Download' button and 'connectome' label.
- The 'Release new version' button in the top right.

# Datasets—Validate Datasets

The screenshot displays the VRE (Virtual Research Environment) interface for managing datasets. The top navigation bar includes 'Projects' and 'Datasets' tabs, with 'Datasets' selected. The user 'schirnem' is logged in, and there are 0 notifications. The main content area shows details for 'My new Dataset', including its code 'shortcode', creation date '2022-03-21', and file statistics (6 files, 1.16 MB). A 'Download' button and a 'connectome' button are visible. The 'Explorer' tab is active, showing a 'Bids Validation' section with a red status 'Not Validated' and '1 Errors'. A message states 'We found 1 Errors in your dataset.' with the last validation time '2022-03-21 16:35'. A pink bar indicates 'view 1 errors in 1 files'. A detailed error message is shown: '[Code 61] QUICK\_VALIDATION\_FAILED' for '1 file'. The error details include 'data', 'Location: data', and 'Reason: Quick validation failed - the general folder structure does not resemble a BIDS dataset. Have you chosen the right'. A 'Release new version' button is located in the top right of the Explorer section. A file icon with the text 'click to preview' is also present.

VRE Virtual Research Environment

Projects Datasets

0 Support schirnem

< My new Dataset Versions

Dataset Code: shortcode / Created on 2022-03-21 by schirnem

Download

Files 6 Size 1.16 MB

connectome

Home Explorer Metadata Activity

Release new version

Explorer

Bids Validation

Not Validated 1 Errors

We found 1 Errors in your dataset.

Last validated time: 2022-03-21 16:35

view 1 errors in 1 files

[Code 61] QUICK\_VALIDATION\_FAILED 1 file

data

Location:  
data

Reason:  
Quick validation failed - the general folder structure does not resemble a BIDS dataset. Have you chosen the right

click to preview

# Datasets—Metadata schemas

The screenshot displays the VRE (Virtual Research Environment) Datasets interface. The top navigation bar includes 'VRE Virtual Research Environment', 'Projects', 'Datasets', a notification bell, 'Support', and a user profile 'schirnem'. The main header shows 'My new Dataset' with a 'Versions' link, 'Files 6', and 'Size 1.16 MB'. A 'connectome' button is visible. Below the header, tabs for 'Home', 'Explorer', 'Metadata', and 'Activity' are present, along with a 'Release new version' button.

The 'Metadata' tab is active, showing two sections: 'Existing Schema' and 'Schemas'.

**Existing Schema:** This section lists available schemas. A table shows 'VRE Schemas' with a file named 'essential.schema.json' (Default) and 'openMINDS Schemas'.

**Schemas:** This section allows selecting a schema to complete. A dropdown menu is open, showing options: 'Contributors', 'Disease', 'Distribution', 'Essential - Filled', 'Grant', 'Subjects', and '+ Create Custom Schema'. The 'Essential - Filled' option is highlighted. Below the dropdown, the 'Schemas' section displays metadata for a dataset titled 'My new Dataset' (Dataset Code: shortcode). The 'Type' is 'BIDS'. The 'Authors' are 'Marie Curie' and 'Albert Einstein'. The 'Description' is 'MRI data of two famous scientists.' The 'Modality' is 'neural connectivity', 'computational modeling', and 'anatomical approach'.

# Datasets—Versioning

The screenshot displays the VRE (Virtual Research Environment) interface for managing datasets. The main panel shows the 'Versions' tab for a dataset named 'My new Dataset'. A modal dialog titled 'Releasing Dataset Version' is open, prompting the user to select between a 'Minor Release: 1.2' or a 'Major Release: 2.0'. The dialog also includes a text area for 'Version Notes' and a 'Submit' button. In the background, the 'Activity' tab is visible, showing a list of recent actions performed on the dataset, such as renaming files and adding new ones. The interface includes a top navigation bar with 'Projects' and 'Datasets' tabs, and a bottom footer with 'Terms of Use' and 'Privacy Policy' links.

**VRE** Virtual Research Environment

Projects Datasets

My new Dataset Versions

Dataset Code: shortcode / Created on 2022-03-21

Download

Home Explorer Metadata Activity

All Activity View All 1 D 1 W

Date Action

2022-03-22 12:51:58 Version 1.1

2022-03-22 12:51:31 Renamed a file/folder from: sample\_csv.csv to sample\_csv\_newname.csv

2022-03-22 12:50:48 Renamed a file/folder from: sample\_csv.csv to sample\_csv\_newname.csv

2022-03-21 16:27:26 Added file(s)/folder(s): folder\_1207, tEST\_csv\_1638922083.csv, TEST\_csv\_1638921913.csv, sample\_csv.csv, T...

Releasing Dataset Version

Please select if this is a minor or major release.\*

☐ Minor Release: 1.2 ☐ Major Release: 2.0

Version Notes\*

0/250

Recent changes since 1.1

Version 1.1

Cancel Submit

Files 6 Size 1.16 MB

connectome

Release new version

Last update: 18 minutes ago

By schirnem

schirnem

schirnem

schirnem

< 1 > 10

Terms of Use Privacy Policy

Version 1.8.0 / Documentation Copyright © 2022, Indoc Research. All Rights Reserved.

# Data lineage



## Current File

Represents the current state of the file in its lineage. Hover over the file node to view the *Type*, *Name*, and *Process Time* of the current file.



## Processing Node

The Processing node indicates a processing activity such as a processing pipeline, or copy/delete action. Hover over the Processing node with your cursor to view the processing action and the date and time it was completed.



## Upstream or Downstream Version of Current File

Represents either an upstream or downstream version of the current file. Hover over the file node to view the *Type*, *Name*, and *Upload Time* of the file.

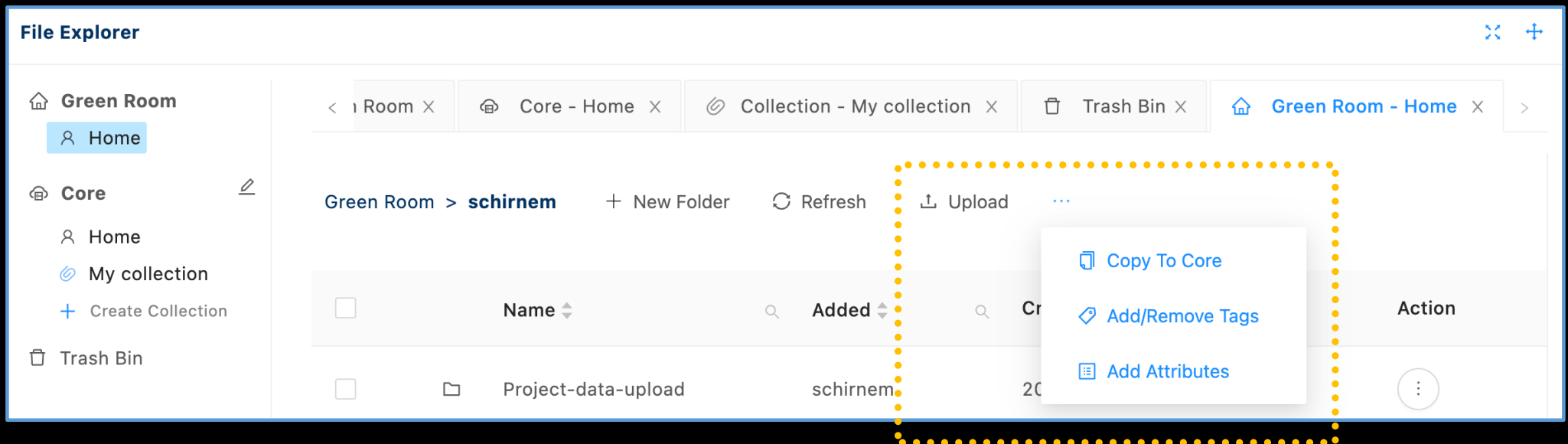


## Data Transfer Node

This node represents data transfer or copy from the Green Room to the Core.

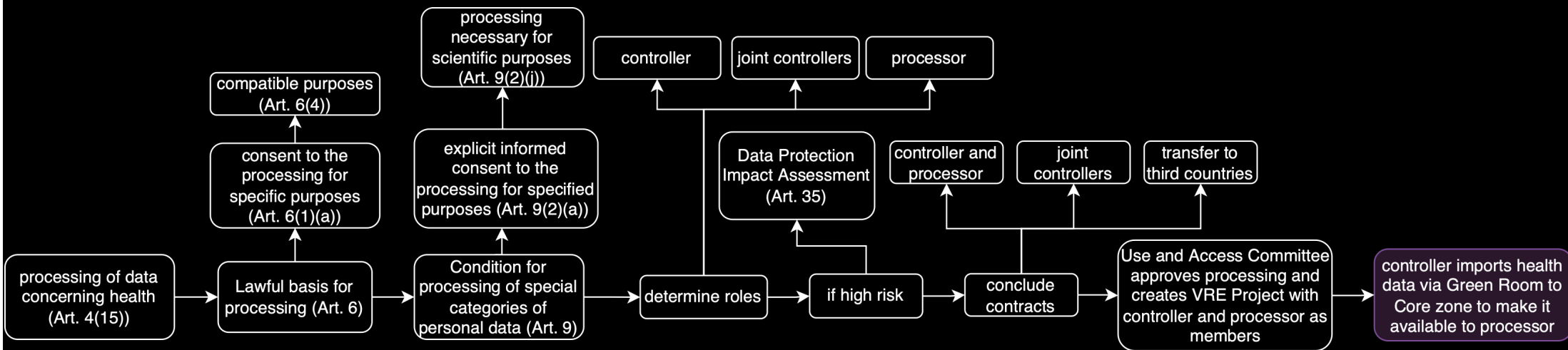


# Data onboarding—User roles



- **Project Contributors** can only upload files to isolated (user-specific) spaces in the Green Room or private Core zone
- Only **Project Administrators** can make data accessible to the entire Project team
- All files that can be accessed by a user, can also be downloaded by that user

# T&O measures for lawful processing



- Only after the **Use and Access Committee** approved all necessary contracts a dedicated VRE Project is created by a **Platform Administrator** and adds the specified controller and processor as team members
- Controller can then import the purpose-specific health data to make it available to processor for performing the processing operation



# Wiki with support resources

- User guide
- Policies and templates to assist researchers with GDPR compliance

The image displays three overlapping screenshots of the VRE Wiki interface, illustrating its structure and content.

**Top Screenshot: 3 File Commands**

- Navigation:** A sidebar menu with categories like Home, Developer Guide, Governance and Data Protection, Platform Administrator Guide, VRE User Guide, and Managing Data. The '3 File Commands' page is highlighted.
- Breadcrumbs:** Home / ... / 4 Managing Data / Command Line Tool / 3 File Commands
- Page Title:** 3 File Commands
- Last modified by:** Emily Martens on 2021/10/26 15:55
- Content:** A section titled 'vrecli file' with a 'Help' section showing usage and options.

**Bottom Screenshot: Data Processing Agreement**

- Navigation:** Similar sidebar menu, with 'Data Processing Agreement' highlighted under 'Governance and Data Protection'.
- Breadcrumbs:** Home / Governance and Data Protection / Data Processing Agreement
- Page Title:** Data Processing Agreement
- Last modified by:** Emily Martens on 2021/10/07 21:13
- Content:** A section titled 'Data Processing Agreement' with a version number (2021-10-07) and download links for PDF and MS Word versions.

**Left Screenshot: Navigation Menu**

- Navigation:** A sidebar menu with categories like Home, Developer Guide, Governance and Data Protection, Platform Administrator Guide, VRE User Guide, and Managing Data. The '3 File Commands' page is highlighted.

# T&O measures—IT infrastructure

- VRE is hosted at the IT center of the Berlin Institute of Health at Charité
- As a designated '**critical infrastructure**' of the German government Charité IT implements state of the art security measures and industry best practices (certification every two years)
- independent data protection evaluation of the VRE completed in July 2021 concluded that the services of the VRE can be offered as commissioned data processing for health-related research projects in compliance with the requirements of the European GDPR

# T&O measures—Isolation of data and resources

- VRE **restricts direct access** to its resources such as storage and compute
- Users can interact with resources only via controlled routes via the GUI and the CLI
- Kubernetes **namespaces** to create isolated zones
- Additionally, zones are hosted on different VMs; traffic restricted by **network filters**
- Copy To Core can only be authorized by Project Administrators and uses a **multi-step protocol** to prevent accidental exposure

# T&O measures—Encryption

- Data are encrypted during transmission to/from the VRE
- Data stored (“at rest”) on the VRE are encrypted using disk-level (hardware) encryption

# T&O measures—Authentication and authorization

- Keycloak/OpenID Connect for single sign-on and to authenticate communications between the VRE front-end, API Gateway (which connects all back-end services), and workbench tools
- Identity of VRE users federated between the VRE identity and access management system (IAM) Keycloak and the Charité IAM Microsoft Active Directory (AD)
  - Registration in the Charité AD is a precondition for using the VRE
  - external users must complete a registration procedure and provide a form of **personal identification** and **evidence of a contractual relationship** with the Charité to be authorized for inclusion in the Charité AD
  - Account information and credentials are stored in the Charité AD and not within the VRE itself
- Password complexity requirements and session inactivity timeouts reduce the risk of unauthorized access

# T&O measures—Access control

- Fine-grained role-based and project-based access control governed by transparent Use and Access Policies that promote fair and democratic access to the VRE
- Onboarding a new project follows a streamlined procedure: Service Agreement, Data Processing Agreements, Terms of Use, and positive Research Ethics Board evaluation
- After approval, Project Administrator is first granted access by invitation from the Platform Administrator; Project Administrator can then invite specified users to access the project data
- a VRE user may be a member of multiple projects and may have different roles in each project



# EGI: Advanced computing for research

We support data-intensive research with a wide range  
of advanced computing services





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The screenshot displays the Virtual Brain Cloud interface. On the left, a map of Europe is shown with numerous purple dots indicating data locations. Above the map is the Virtual Brain Cloud logo and the text "EUROPEAN OPEN SCIENCE CLOUD". On the right, a detailed system architecture diagram is presented. The diagram is organized into several layers: a top navigation bar with tabs for "Hiring", "Clinical", "Molecular", "Other data types", and "Guidelines"; a "Data Gateway (H)" layer; a "Data Lake" layer containing a "Loading Zone" with sub-components like "Data Uploads", "Variables", "DataViz", "DB Identification", and "Programming"; a "Data Warehouse" layer with "Federated Data", "Data", "Metadata", "Knowledge Graph", and "Query API"; and a bottom "Governance" layer with tabs for "Research and Clinical Data Access", "Identity and Access Management", and "HCP". A green box highlights the "Green Room" section, which includes "Data Identification Platform" and "Transformation Platform".

[illegible]

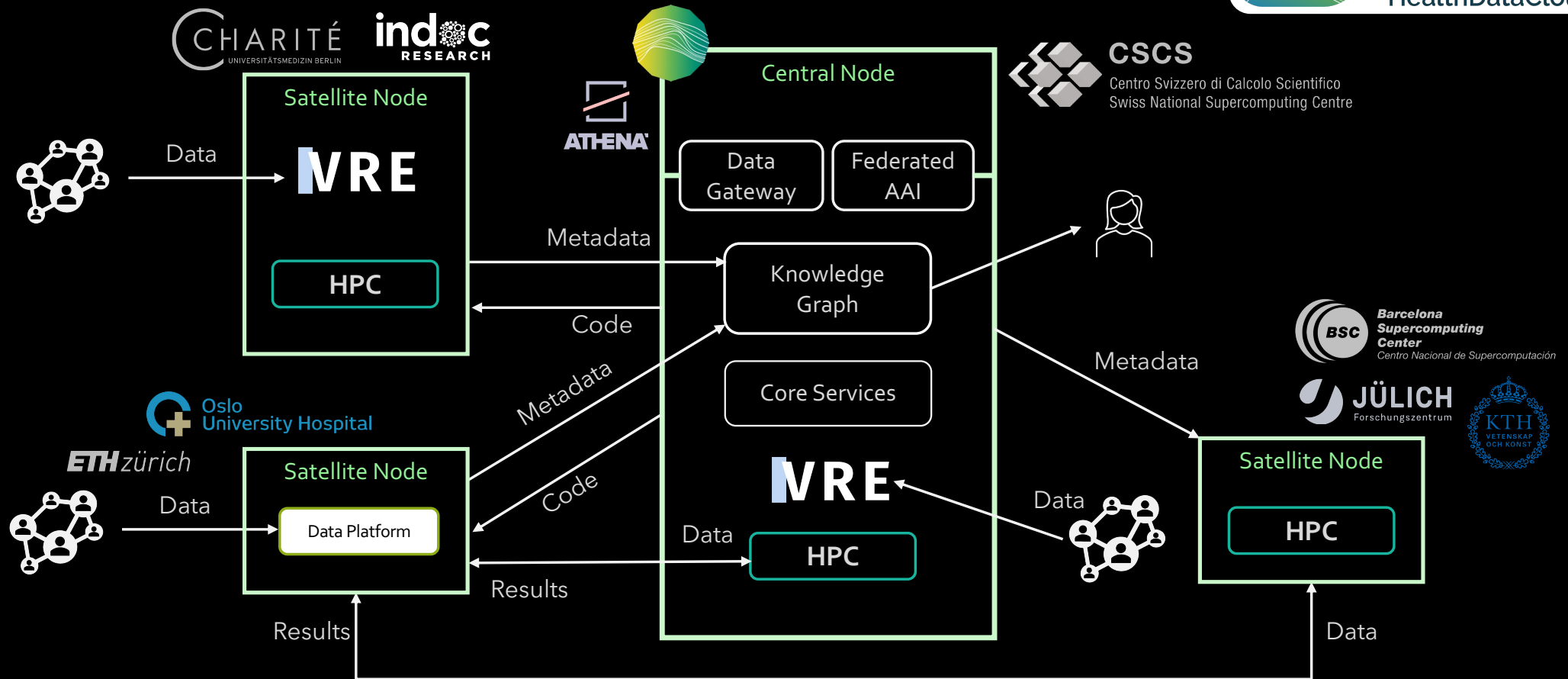
The diagram illustrates the eBRAIN-Health architecture, showing the flow of data and services. It is divided into several main components:

- Data Source:** Three "Satellite" icons are shown, each with a lock icon, indicating encrypted data. They are connected to a "Data Gateway" (lock icon) and a "Federated AAI" (key icon).
- Data Flow:** A green arrow labeled "Metadata Data" points from the "Federated AAI" to the "HPC" (High-Performance Computing) block.
- Security:** A "Public Key" (key icon) is shown next to the "Federated AAI", and a "Private Key" (key icon) is shown next to the "HPC".
- Central Hub:** A large circular hub contains several icons representing different data and service components:
  - Linkage** (network icon)
  - Workflows** (blue ship icon)
  - Data Id** (purple cube icon)
  - Provenance** (purple cube icon)
  - BIDS** (brain icon)
  - Data structure** (purple cube icon)
  - Annotation** (purple cube icon)
  - openMIND** (purple cube icon)
- Access Control:** A list of services is shown:
  - Access Control
  - Sandboxing
- Workbench:** A section labeled "Workbench" shows a terminal window with a command prompt and several application windows displaying brain data and analysis results.
- Core Services:** A section labeled "Core Services" shows a terminal window with a command prompt and several application windows displaying brain data and analysis results.



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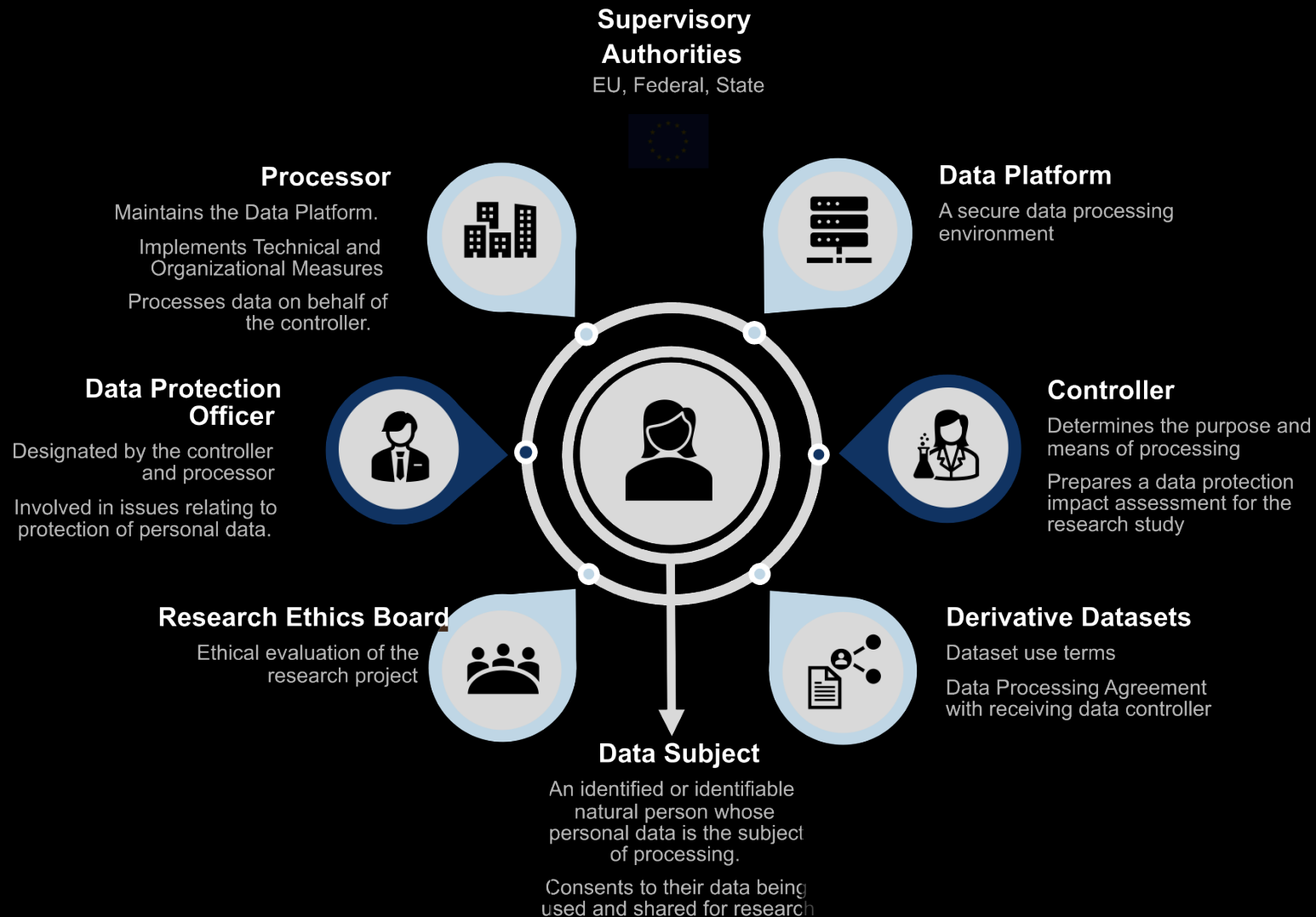
# EBRAINS Health Data Cloud



[www.healthdatacloud.eu](http://www.healthdatacloud.eu)



# Governance



# Service for sensitive data: Synergistic developments



<https://virtualbraincloud-2020.eu/>



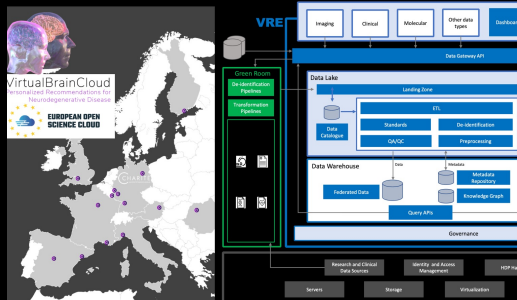
<https://ebrains.eu/service/the-virtual-brain>



[www.healthdatacloud.eu](http://www.healthdatacloud.eu)

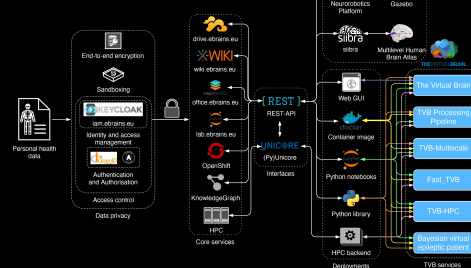


## EOSC Project Virtual Brain Cloud: Virtual Research Environment



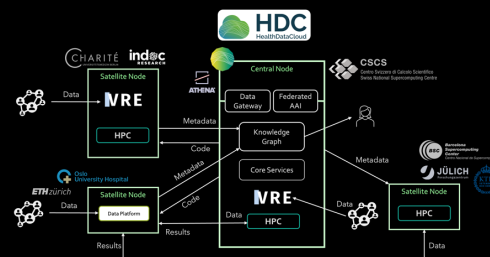
€15Mill 2018-2022 (lead: Charité)

## Human Brain Project: Codesign Project The Virtual Brain (SGA2)



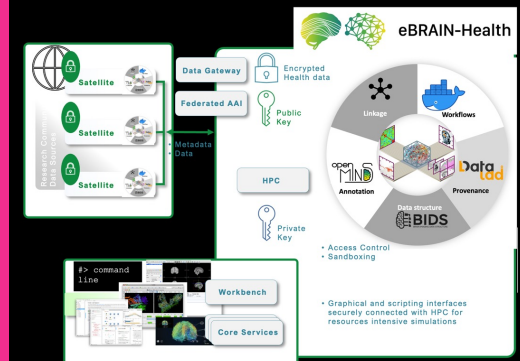
€1Mill 2018-2020 (lead: Charité)

## Human Brain Project Health Data Cloud (SGA3)



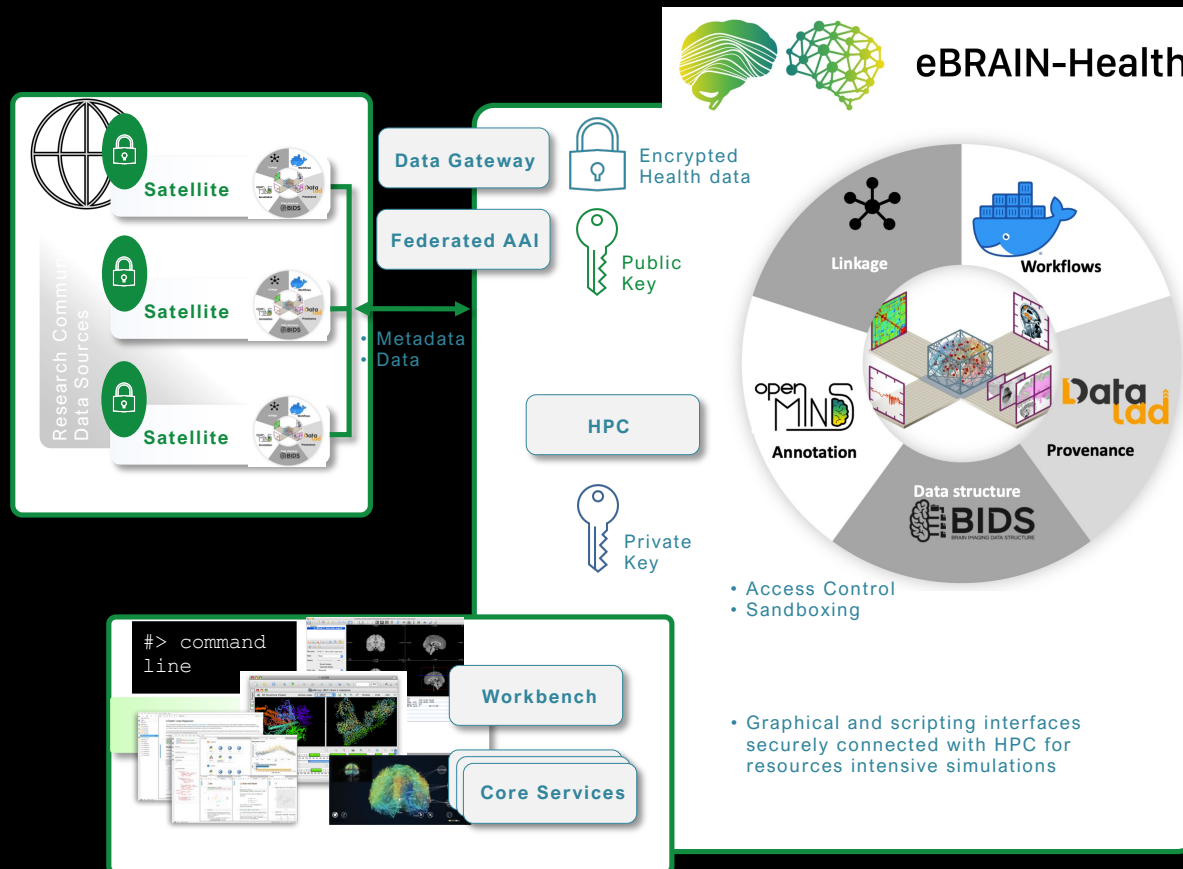
€1Mill 2022-2023 (lead: Charité)

## Horizon Europe Infrastructure eBRAIN-Health



13 Mill 2022-2026 (lead: Charité)

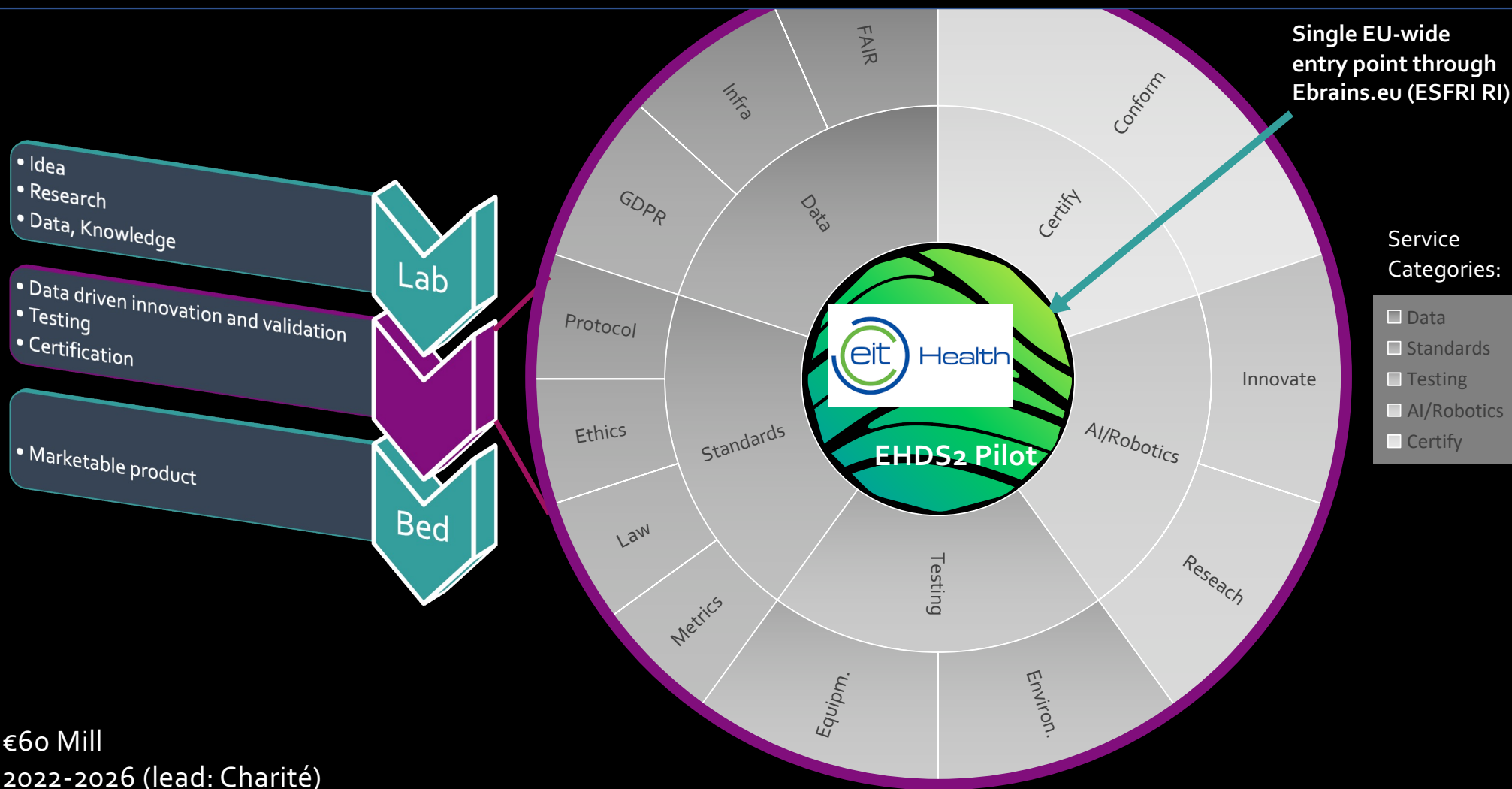
# EBRAIN-Health



In collaboration with:



# Action: Closing the Gap in the Innovation Chain for Health-AI & Robotics





# World Health Summit 2022



## PD 11 - How to Achieve a Global Health Data Space

Oct. 18, 2022, CEST: 09:00 AM - 10:30 AM / UTC: 07:00 AM - 08:30 AM

### Panel Discussion (PD 11) - Europe

Breaking the data silos is essential to reshape the future of healthcare and crisis preparedness. digital health and artificial intelligence (AI), we are, more than ever before, in the pole position that could help to treat and govern data for health as a global public good. However, across an divide in the capacity to effectively work with data. The 2021 I-DAIR Global Research Map reveals leaders based in a small number of countries and the rest of the world is growing. Additionally, race, and age limit the universal benefit and the trust in data use.

Only when used equitably and ethically, the work with data can offer an unprecedented possibility well-being and achieve UHC 2030. Impact at the global level will thereby only be possible with from different disciplines including from countries of relatively lower income and/or with smaller we wish to spark stakeholder engagement for a transparent data system that protects citizens' healthcare and research.

#### **Chairs:**

[Prof. Dr. Petra Ritter](#)

Charité - Universitätsmedizin Berlin | Berlin Institute of Health (BIH) | Professor for Brain Simulation

#### **Speakers:**

[Dr. Marlies Dorlöchter](#)

DLR Project Management Agency | International Health Research | Head of Division | Germany

[Dr. Mehdi Snène](#)

International Digital Health and Artificial Intelligence Research Collaborative (I-DAIR) | CEO and

[Paweł Świeboda](#)

Human Brain Project | Director-General | Belgium



# Thank you!

