EBRAINS

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EBRAINS 2.0

D6.5 Co-design strategy for WP6

Figure 1: Neuromorphic Compute Hardware presented at the EBRAINS Booth on the International Conference on Neuromorphic Computing and Engineering ICNCE24, June, 03-06 2024 in Aachen, Germany. Picture by M. Frings

EBRAINS 2.0

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Abstract:	This Deliverable summarises the Co-Design Actions for the base-infrastructure Work Package in the EBRAINS 2.0 project ("WP 6") as of Project Month 6 (June 2024).

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1.   Introduction

"EBRAINS is a dynamic research infrastructure, aiming to address and adapt to the emerging needs of the neuroscience community and brain research at large. To achieve this, a comprehensive model of the different and complementary pathways by which EBRAINS software and services can be built upon and extended by its user community at large is inherent in its architectural design."

This deliverable presents the strategy the EBRAINS 2.0 partners will follow to perform co-design activities within their respective work packages, across the entire project as well as with other project partners and external stakeholders.

Definition of Co-Design:
Co-Design is an iterative process to collect the requirements and expectations from different stakeholders and integrate them into the design and implementation of a tool, service or platform with the objective of maximising its adoption, usability, reliability, transparency and impact. Stakeholders could be project-internal users, partners from other WPs, external users, communities, indirect beneficiaries, external institutions, society, policy makers, etc.

1.1 Co-Design Strategy for EBRAINS Work Package "Base Infrastructure" (WP6)

EBRAINS "Base Infrastructure" coordinates, plans and integrates the access to base infrastructures, including cloud resources, storage, High-Performance Computing (HPC), and Neuromorphic Computing (NMC) resources from internal and external providers (e.g., EuroHPC Joint Undertaking, Fenix, commercial cloud providers, neuromorphic compute centres) to enable a sustainable EBRAINS Research Infrastructure.

The operation and maintenance of the base infrastructure resources are among the main responsibilities of this Work Package. Building on best practices from the Human Brain Project and the Interactive Computing e-Infrastructure (ICEI) project, allocation and management of resources for project- internal and external EBRAINS users is provided. Furthermore, standard processing workflows will be further developed by supporting the use of standardised containers and virtual machines. The EBRAINS Helpdesk is also part of this Work Package. Together with "Platform Services" Work Package 5 and "Community Involvement, Education Innovation and Interoperability" Work Package 7, a multi-tiered support system is established, including a scientific service team, which supports users in performing novel scientific endeavours with EBRAINS.

Here, we provide a brief overview of the Co-Design activities and opportunities with and for researchers outside the project.

EBRAINS 2.0- base infrastructure external Co-Design Activities focus mainly on:
- – EBRAINS Services running on HPC and NMC Resources
- – EBRAINS Computing Resource and User Management

– Alignment between EBRAINS associated projects e.g., Virtual Brain Twin, EDITH Project
– Onboarding support for potential new users via the helpdesk and the scientific service team

Concrete co-design activities include, at the time of this writing:

– Training and Teaching Events (e.g., Hands-on tutorials for the BrainScaleS NMC system at NICE 2024 or the participation in the Girls' Day 2024[1])
– Contact with the scientific community via participation at relevant conferences and workshops (for NMC e.g. talks at NICE 2024[2] and ICNCE24[3], workgroups at CNE 2024[4] for HPC e.g. at the ISC24[5], SC24[6], FENS[7], Bernstein Conference 2024[8])
– Participation in activities of National Nodes (e.g., EBRAINS booth at ICNCE 24, EBRAINS Booth at Bernstein Conference '24)
– EBRAINS Helpdesk and corresponding Communication
– EBRAINS Software Distribution (ESD)[9] enhancements
– The Science support team (T6.5) is currently co-leading the EBRAINS-RI Co-Design meetings. A two-weekly public meeting focussed on co-design, integrating efforts of all WPs towards the successful delivery of the 4 showcases.

Contact Information for EBRAINS "Base Infrastructure":

The **EBRAINS Support Team** can be reached via: https://www.ebrains.eu/contact
Before reaching out to the Support Team, please take a look at the Documentation, which is collected and updated regularly. From user-level **documentation** for EBRAINS tools and services to technical developer documentation to information on how to access EBRAINS and the Collaboratory, this page provides a common entry point to documentation: https://wiki.ebrains.eu/bin/view/Collabs/documentation

EBRAINS "Base Infrastructure" Management Team can be reached via email:
base-infra-coord@ebrains.eu

For Computing Resources and User Management please find further details on the website:
https://ebrains.eu/hpc or email us via base-infra-resources@ebrains.eu

Media contact: press@ebrains.eu

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[1] https://www.physik.uni-heidelberg.de/girlsday/programm?menuid=274
[2] https://niceworkshop.org/nice-2024/agenda#9580,
[3] https://www.icnce-2024.de/Programme.html
[4] https://capocaccia.cc/en/event/ccnw24/workgroups/
[5] https://www.isc-hpc.com/
[6] https://sc24.supercomputing.org/
[7] https://www.fens.org/meetings/fens-forum/upcoming-fens-forums
[8] https://bernstein-network.de/bernstein-conference/
[9] https://ebrains.eu/esd

"Sensitive" Annex

In order to be able to meaningfully describe all the Co-Design activities relevant for the base infrastructure work package WP6 - including the interactions among WP6 tasks and with the other EBRAINS 2.0 WPs, we use project internal task- and WP identifiers, which are irrelevant for non-project members and thus do not appear in the preceding "public" section of this Deliverable.

The planning of the co-design deliverables (D1.6, D2.5, D3.6, D4.4, D5.5 and D6.5) was developed in close coordination between the work packages, and the template for the reporting was developed jointly over several iterations.

2.   Co-Design Roadmap

2.1   Identified Co-Design Activities

This deliverable provides an overview of co-design actions as of M6 aimed at achieving key goals of WP6 in the domain of maintaining the base infrastructure for the EBRAINS RI, designing and implementing tools, services, or platforms to maximise adoption, usability, reliability, transparency, and impact. WP6 co-design actions are partially specific to WP6 but mainly integrated into actions across the EBRAINS 2.0 project as a whole. All actions are regularly monitored and, if necessary, updated throughout the project.

The co-design actions can be categorised among the involved stakeholders:

- amongst contributors to WP6 tasks (Table 1)

- between WP6 contributors and contributors from tasks of other EBRAINS 2.0 WPs (Table 2 and Table 3)

- between WP6 contributors and contributors from external projects (Table 4)

The identification of the co-design actions was guided by the following questions:

- What are the needs and requirements of the users of WP6-relevant tools/services/platforms?
- How can information about user needs and requirements effectively be collected?
- How can success in terms of adoption, usability, reliability, transparency, and impact of WP6-relevant tools/services/platforms be measured?
- How can the consortium effectively deliver co-design actions?

2.1.1 Co-Design Activities within WP6

WP6- internal co-design activities mainly result from the project-specific tasks and the responsible teams. There are regular task-internal meetings and bi-weekly Technical Board Meetings attended by WP6 Task Leaders, Work Package Leaders and Management. These meetings are e.g. a forum to discuss recent developments, provide technical updates, align on timelines, foster cooperation, and plan Dissemination and Outreach activities (for further details, please see Table 1).

Table 1 Overview of WP6-internal actions in order to organise co-design activities

Goal	Action	Responsible for Action (Task, WP, Partner or Person)	Time line (Project Month)	Indicators
Neuromorphic Computing (NMC) access: PyNN	Align on NMC access for SpiNNaker, BrainScaleS and the NMPI component	UHEI, UMAN, TUD, CNRS	continuous activity	KPI13, KPI23
Multi-site workflow support	Aligning on the accessibility of HPC, Cloud and NMC resources for workflow access as well as on container creation	NMC partners (UMAN, UHEI, TUD, CNRS) and HPC partners (FZJ, CINECA, CEA)	continuous activity, part of the weekly EBRAINS on HPC meetings	KPI06, KPI13, KPI23
EBRAINS software distribution ("ESD") on all EBRAINS HPC	Weekly EBRAINS on HPC meetings	WP6 NMC and HPC partners	continuous activity,	KPI13, KPI23
Increase understanding of GDPR related issues	D6.4 Report Sensitive data in EBRAINS, HPC and cloud landscape	T6.5	18	
WP6 internal alignment	Bi-weekly WP6 Technical Board meetings	WP6 leadership and all WP6 Task-leaders (FZJ, CINECA, UHEI)	Bi-weekly during the entire project	
	T6.1 meetings	CINECA, UHEI, FZJ, CSCS, CEA	Bi-weekly during the project	
	T6.2 meetings	FZJ, CINECA, UHEI, CNRS	Bi-weekly during the project	
	T6.4 meeting	FZJ, CINECA, UHEI, ATHENA	Bi-weekly during the project	

	T6.6 meetings	FZJ, UHEI	Weekly during the project	

2.1.2   Co-design activities with project-internal stakeholders

Table 2 shows the identified actions in order to organise the co-design activities EBRAINS 2.0 project-internal.

Table 2 Overview of Actions for co-design activities with project-internal stakeholders

Goal	Action	Responsible for Action (Task, WP or Person)	Time line	Indicators	Co-Design Partner / Stakeholder
EBRAINS Co-Design	Co-design meetings to facilitate EBRAINS Co-Design activities	Support team (Wouter Klijn), Technical Coordination	Monthly		WP1-6
EBRAINS Software Distribution ("ESD")	Weekly meetings	T5.4, T6.4	continuous	KPI13, KPI23	WP3, WP4, WP5, WP6
EBRAINS software distribution on HPC	Weekly meetings and part of the biweekly wider TC meetings	T6.4	continuous	KPI13, KPI23	WP 5 and HPC-software providers
Multi-site workflows	Hands-on developer work to specific problems: CodeJam meeting	T6.6	Y1, Y2	KPI06	WP1, WP2, WP3,WP4,WP5, WP6
	Identify software dependencies — inclusion into the ESD Identify service dependencies		continuous		WP5, WP6 and the respective tool provider
Improved CoDesign	Facilitation of EBRAINS Co-Design activities, co-design meetings	T6.5	continuous		All project members
Information distribution	Helpdesk	T6.5	continuous		All project members
Project internal alignment on management level	Leadership Board meetings	WP (Co-) Leader	continuous		All WPs
	WP managers meetings	T6.6	Bi-weekly		All WPs
Transparent access for EBRAINS users to EBRAINS resources	AAI integration into EBRAINS base infrastructure		continuous		WP5, WP6
Technical coordination in EBRAINS	bi-weekly TC meetings		Bi-weekly		WP1-6

	In person WP5-WP6 kick off meeting in Heidelberg (7-9/2/2024)	WP5-WP6	M2		WP5, WP6
EBRAINS Security	EBRAINS monthly security meetings: CSIRT meetings — identify the security teams for the base	ATHENA, AISBL, T6.1			WP5, WP6
EBRAINS Services Quality	Working Group (WG) dedicated to maintaining and enhancing the quality of services offered by EBRAINS				
Platform Services	infrastructure, the platform, the services and how they will interact in EBRAINS.	T6.1	continuous		WP5, WP6
EBRAINS service architecture evolution	EBRAINS service architecture working group	T6.5, T5.2, WP5	meetings starting in M5		WP5, WP6
EBRAINS Education Coordination	Education WG	T7.1 Education Coordination Team (Judith Kathrein/ Franziska Vogel)	Monthly		WP1-8

Four showcases have been identified and described in the grant agreement (Table 3). In the table the components provided by WP6 are marked in bold.

Table 3 Overview of showcases identified in EBRAINS 2.0 and contribution from each WP. In D6.5, Co-design actions related to showcases are supported by T6.5. This overview compliments the work package-specific Co-Design deliverables for EBRAINS2.0, all due at M6.

Showcase	Description	Requirements	Work Packages involved
Atlas-driven analysis of multimodal feature maps (Figure 2)	Workflow for anatomical localisation and microstructural characterisation of whole-brain feature maps from multimodal human imaging experiments (structure, function, metabolism, electrical)	IaaS: **FENIX, virtual machines, storage, high bandwidth network access** PaaS: Atlas, workflow automation and deployment, siibra SaaS: Knowledge Graph, Workflow dashboard, Atlas APIs, Jupyter notebooks	WP1, WP2, WP4, WP5, WP6, and WP7

|		IaaS: **FENIX, virtual machines, storage, high bandwidth network access, HPC, job scheduling**	
QUINT workflow for the analysis of rodent microscopy Data (Figure 3)	The QUINT WF is an analysis solution for rodent microscopy data, answering the need for brain mapping and brain-wide quantification in several subfields of neuroscience.	IaaS: **FENIX, virtual machines, storage, high bandwidth network access, HPC, job scheduling** PaaS: OpenShift, Knowledge Graph, WebAlign, WebWarp, Nutilweb, Webilastik, MeshView, LocaliZoom, workflow automation and deployment, SaaS: Collaboratory, Atlas APIs	WP1, WP3, WP4, WP5, WP6, and WP7
Collaborative Brain Wave Analysis Pipeline (Cobrawap) (Figure 4)	Computational workflow for evaluating the statistical properties of spatially organised cortical activity enabling robust comparisons across a spectrum of multi-modal activity data types from experiments and simulations.	IaaS: **FENIX, Containers (input to task system), storage, UNICORE** PaaS: Fairgraph, Neo, Elephant (in the future: NetworkUnit) SaaS: Knowledge Graph, Collaboratory /JupyterHub,	WP1, WP2, WP3, WP4, WP5, WP6, and WP7
Personalised multiscale brain models for the creation of digital twins in clinical applications (Figure 5)	This WF provides an integrated and optimised set of interoperable components and processes for the creation of digital brain twins guiding diagnosis and therapeutic interventions, illustrated for the example of patients with drug resistant epilepsy	IaaS: **FENIX, HPC,** sensitive data processing resources, **storage,** j**ob scheduling, UNICORE** PaaS: Atlas. The Virtual Brain, AI tooling SaaS**:** Knowledge Graph, Collaboratory, Workflow dashboard, APIs, Jupyter notebooks	WP1, WP2, WP3, WP4, WP5, WP6, and WP7
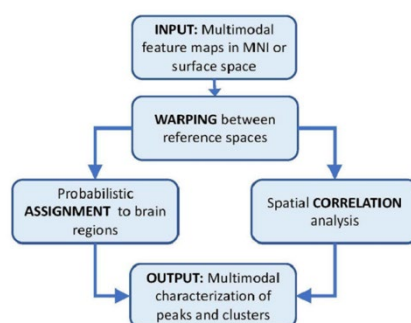
Figure 2: Schematic overview of the workflow for atlas-driven analysis of multimodal feature maps
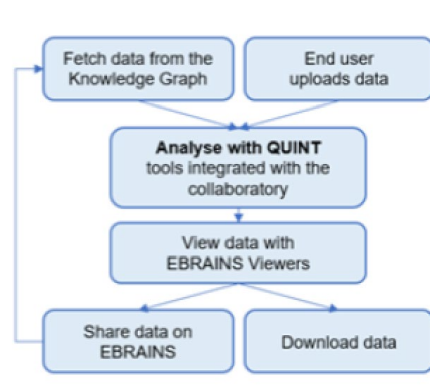

Figure 3: Online QUINT workflow steps for analysis of 2D brain section image data
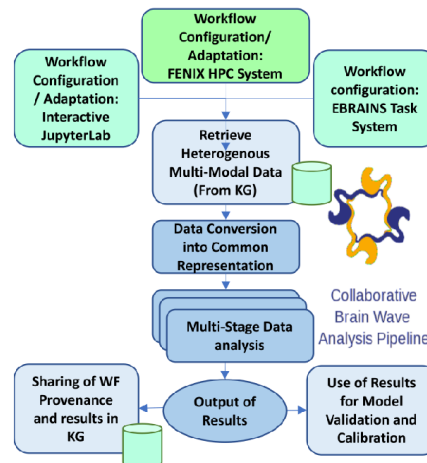
Figure 4: Outline of the Collaborative Brain Wave Analysis Workflow for multi-modal data
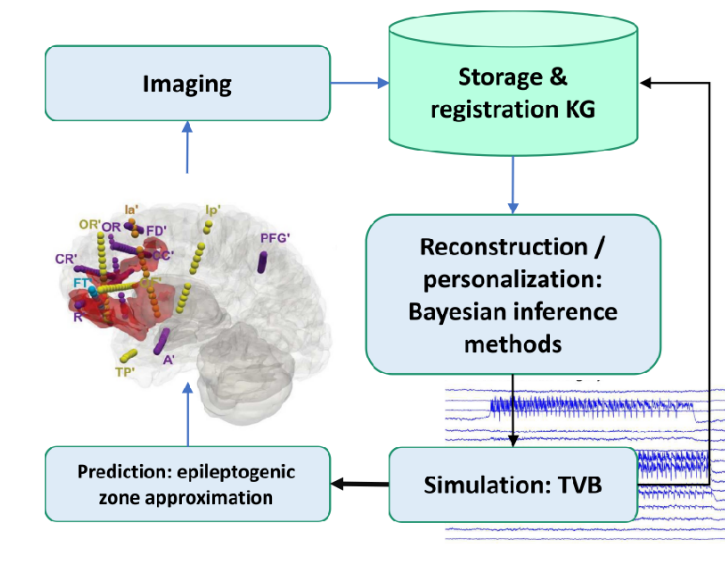

Figure 5: Outline of the workflow for the creation of multi-scale brain models of digital twins in clinical applications

2.1.3   Co-design activities with project-external stakeholders

The co-design activities of WP6 with project-external stakeholders are described in the public part of the Deliverable (please see p 5-6). Table 4 provides a detailed overview of Co-Design Actions.

Table 4 Overview of Actions for co-design activities with project-external stakeholders

Goal	Action	Responsible for Action	Time line	Indicators	Co-Design Stakeholder
EBRAINS RI uptake (NMC perspective)	Inform external scientists about the currently existing NMC capabilities: Publications and talks regarding features and libraries as well as contributions to EBRAINS events / booths	T6.3 partners	Continuously (e.g. NICE 2024, EBRAINS German National Node booth at the ICNCE 2024)	KPI18, KPI19, KPI23	External Users
	Inform external scientists about the currently existing NMC capabilities and collect feature suggestions via Hands-on NMC trainings	T6.3, partner UHEI, UMAN	M4 (NICE 2024: BrainScaleS), M16 (NICE 2025)	KPI06, KPI19, KPI23	External Users
	Inform external scientists about the currently existing NMC capabilities and collect feature suggestions via project workshops	T6.3, partner UHEI	M5 (CNE 2024: BrainScaleS)	KPI06, KPI19, KPI23	External Users
	Inform external scientists about the currently existing NMC BrainScaleS capabilities: public accessible tutorial notebooks for use via the EBRAINS RI:	T6.3 partners	Continuous public availability at e.g. https://electronicvisions.github.io/documentationbrainscales2/latest/brainscales2-demos/tutorial.html		External Users
	EBRAINS RI NMC entry level event (school children level): Girls' day participation	T6.3, partner UHEI	M4 (Girls' day Germany 2024),	KPI19, (long term also KPI20 related)	External audience (non-expert level)
	External user support – access to the support channel is described on the web-pages reachable via https://ebrains.eu/nmc)				External Users
EBRAINS RI uptake (HPC perspective)	Inform external scientists about HPC Developments relevant for WP6. Publications, talks, workshops, as well as contributions events and booths	T6.1, T6.2, T6.4, T6.6	Continuous (e.g., ICNCE 24, FENS2024, Bernstein Conference 2024, PLUS)	KPI18, KPI19, KPI23	External Users
	Inform external scientists about available HPC, storage, cloud Resources and monitor the uptake	T6.2	Continuous	KPI18, KPI19, KPI23	External Users

EBRAINS Software Distribution (ESD) enhancements (Public access to the ESD at: https://ebrains.eu/esd)	Increase of available systems (expand from Lab and EBRAINS HPC centres to Euro HPC centres and container download options for decentral use, integrate EBRAINS into the European Environment for Scientific Software Installations (ESSI)	T6.4, WP5	Continuous		Extern Platforms and Infrastructure Providers, ESSI-Project
	Promoting the ESD at conferences (EBRAINS booths, talks, tutorials, ...)	WP6, WP5			External Users
Alignment with Virtual Brain Twin and EDITH project	Communication with respective project partners	WP6, WP3, WP5			Relevant PIs of the distinct projects
Identification of GDPR ready hardware solutions	Interactions with commercial stakeholders	T6.5, WP5, WP6			Commercial stakeholders
Identify links to FENIX (if applicable) for EBRAINS AAI	Evaluate, if FENIX Services can be used for EBRAINS AAI needs	T6.1, T6.4, WP5, WP6			FENIX Consortium
EBRAINS services running on EuroHPC resources	Apply for Benchmark access	T6.2, FZJ, ATHENA	M7		EuroHPC
	Apply for Community access	T6.2	M15		EuroHPC
Resources allocation though PRACE	Establish and implement the resource allocation process	T6.2	M8		PRACE
Support for Onboarding of new users	Scientific Support Service	T6.5	Continuous		Extern Users

2.1.4 Outlook

WP6 Base Infrastructure Management will support the corresponding Tasks in carrying out their Co-Design Activities by, e.g., supporting the organisation of meetings, teaching and training events as well as Communication and Dissemination activities project-internally and with external stakeholders. WP6 Management also supports the Task Leaders in creating user surveys, e.g., after training events. WP6 representatives are actively engaged in all EBRAINS 2.0-wide meetings, including Co-Co meetings, Co-Design meetings, WP Manager meetings, Technical Coordination meetings, and Education Task Force meetings, to ensure a regular exchange and regular monitoring of Co-Design activities. Furthermore, EBRAINS 2.0 WP6 has close contact with the National Node Germany and other related EBRAINS projects, such as the Virtual Brain Twin 1 and EDITH 2, so there is a regular exchange on the above-mentioned co-design activities. We will regularly evaluate the Co-Design Activities mentioned in this deliverable and expand or change them in the future if necessary.