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Contractual Number and type:	SGA1 D5.8.3 Resubmission - Other (mix of different types of deliveries) – This document presents them and provides the access to them
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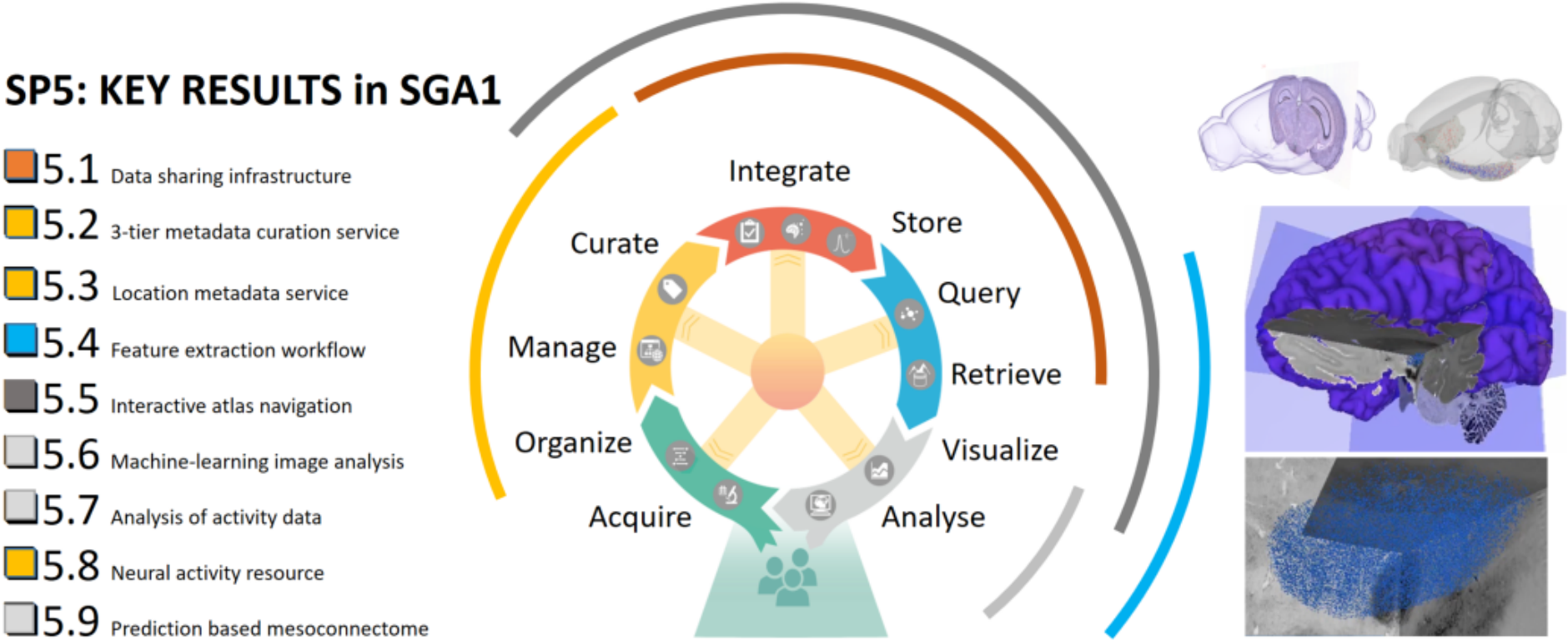
Abstract:	This is the resubmitted deliverable of the annual compound of HBP deliveries and results (outputs and outcomes) from Sub-Project SP5 – Neuroinformatics Platform. The live complete catalogue of HBP deliveries is accessible online from the HBP portal. The main deliveries from April-2017 to March-2018 have been: In close collaboration with SP7, SP5 has provided the first implementation of the data sharing and data management infrastructure for the HBP. The infrastructure allows users to search and retrieve curated data and models through the newly launched Knowledge Graph. The infrastructure is in compliance with the HBP Data Policy Manual and Data Management Plan. Furthermore, SP5 connects the users to the infrastructure and contributes to making it work by providing: 1) a novel three-tier data curation service, 2) tools and routines for transfer of data to HBP storage in the first FENIX federation site and metadata to the Knowledge Graph, 3) tools and workflows for visualisation and analysis of image data, including tools for interactive navigation of large volumetric data integrated in reference atlas space, and workflows for quantitative feature extraction from images in reference atlas space, and 3) tools and workflows for analysis of neural activity data, served by the SP5 Neural Activity Resource.
Keywords:	data curation, data management, reference atlas, rodent, human, spatial registration, image analysis, electrophysiology, neuronal activity, prediction, infrastructure, neuroinformatics



SP5 has established infrastructures and workflows facilitating sharing, management, querying, retrieval, visualisation and analysis of data and models. A key feature is spatial integration of data in reference atlases of the brain, contributing to making data FAIR (Findable, Accessible, Interoperable, and Re-usable).

Targeted users/readers	Researchers, Policy Makers
Contributing Work-Package(s):	SGA1 WP5.1, WP5.2, WP5.3, WP5.4, WP5.5, WP5.6, WP5.7, WP5.8.
Initially Planned Delivery Date:	SGA1 M24 / 31 03 2018

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Summary of Changes 27 Sep 2018	• 2.2.1 Achieved Impact: Sentence added: The Achieved impact for Tier 2 and Tier 3 curation is reported under KR5.3 and KR5.8, respectively. • 2.2.2 Component Dependencies: Components marked as "HBP Internal: Yes" - explanation has now been added (either why they will remain internal or when there will be a release / change of status) • 2.3.2 Component Dependencies: Component 141. This has been made openly available, status changes to “HBP Internal: No”. Other Components marked as "HBP Internal: Yes" - explanation has now been added (including when there will be a release / change of status) • 2.5.2 Component Dependencies: Components 1503 and 2909 have been made openly available, status changes to “HBP Internal: No”. Other Components marked as "HBP Internal: Yes" - explanation has now been added (including when there will be a release / change of status) • 2.7.2 Component Dependencies: Both component fully available, status changes to “HBP Internal: No”. • 2.8.2 Component Dependencies: All components listed in this table are accessible through links that are included in the component detail tables at the end of the document. Status corrected to “HBP Internal: No”. • 2.9.2 Component Dependencies: Components 935 and 128 have been made openly available, status changes to “HBP Internal: No”.

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1. Introduction

This document provides an overview of the outputs and related results delivered by SP5 during SGA1 Year 2. The presentation is centred on 9 Key Results (KRs). In line with the comments from the reviewers, the presentation of each Key Result has been modified and updated to reflect all what was accomplished in the last months of SGA1. Furthermore, the Conclusion and Outlook section has been expanded with a specific list of the plans for the further development and follow-up of the Key Results from SGA1.

KR1 summarises the first implementation of the **data sharing and data management infrastructure** for the HBP. This infrastructure was developed in collaboration with SP7. Data collected were uploaded to a centralised HBP storage with metadata in the new Knowledge Graph. The infrastructure allows users to search and retrieve all curated data and models. A multi-SP collaboration around the Data Policy Manual (led by Bernd Stahl in SP12) and the Data Management Plan has provided a community-informed policy framework, serving as a foundation for the data sharing effort.

KRs 2-9 outline the current workflows and tools that connect the users to the infrastructure and contribute to making it work.

KR2 summarises the **three-tier curation service** that was developed and used extensively in the reporting period. Data and models were received from SP1, SP2, SP3, SP4, SP6, SP9 and SP10.

- The Tier 1 curation team delivers a **basic service** which organizes the data in the HBP storage and tags the data and models with basic metadata, thereby making HBP data and models FAIR (Findable, Accessible, Interoperable, Re-usable), explained in KR2.
- The Tier 2 curation team delivers a **location metadata curation service** for HBP data and models, thereby contributing to making the data and models FAIR through the use of reference atlases, standardised atlas space, and structure name ontologies coupled to the reference atlases, explained further in KR3.
- The Tier 3 curation team, embedded in the **Neural Activity Resource**, contributes further to the curation process by adding specialised metadata to a range of time-series data, explained in KR8.

KRs 4-9 summarise the **tools and workflows for data visualisation and analysis** that are available at the end of SGA1. A major part of the development and testing of these workflows took place during SGA1 Period 2. The tools and workflows cover

- analysis of data categories consisting primarily of images, 2D and 3D, from subcellular to macroscopic levels, collected with a range of instruments and techniques
- analysis of neural activity data applied to a range of time series data

The image-based workflows cover quantitative feature extractions from images in reference atlas space, explained in KR4, with use of methods delivered in KR6, and interactive navigation of large volumetric data integrated in reference atlas space, explained in KR5. Analysis of neural activity data is served by the Neural Activity Resource, explained in KR8, with analysis tools and support for practical use of parallelised methods, explained in KR7.

Finally, KR9 outlines a proof of principle implementation of methods for prediction of neural connectivity at a mesoscopic level in an atlas context.

2. Results

2.1 KR5.1 "A user-driven data sharing and data management infrastructure with necessary features to enable collection, curation and sharing of heterogeneous neuroscience data on a large scale"

This KR delivers the integration of a set of services needed to provide an initial version of a large-scale data-sharing and data management infrastructure. It provides the backbone for data distribution, sharing and searching, through a publicly accessible HBP Knowledge Graph Search.

The HBP Knowledge Graph Search sits on top of the HBP Knowledge Graph Service. The service leverages and extends an HBP-managed deployment of the Blue Brain Nexus software. The HBP Knowledge Graph has been released to the public via the HBP public website https://www.humanbrainproject.eu/en/explore-the-brain/search/ and is fed with metadata produced by HBP SP5 Curation teams (WP5.1, WP5.2 and WP5.3) using the Data Workbench (WP5.4).

With the release of the HBP Knowledge Graph, SP5 and Partner EPFL/BBP have aligned their respective roadmaps and succeeded in establishing a community standard for metadata based on the open source Blue Brain Nexus semantic enabled data management platform (https://github.com/BlueBrain/nexus). Furthermore, a community-governed repository for data schemas has been opened at INCF, allowing a transparent extension process to involve the community beyond HBP. The results of this work are the first operative versions of Tier 1, Tier 2 and Tier 3 curation processes (reported below under KR5.2 and KR5.3). By developing and exercising these processes, the bulk of the Ramp-Up Phase data and SGA1 data and models is prepared for inclusion in the Knowledge Graph by the end of SGA1. The data and models are readily usable through the Collaboratory and the other HBP Platforms.

Data policies applicable to users of the Knowledge Graph are available through the website: https://www.humanbrainproject.eu/en/explore-the-brain/search-terms-of-use/. First-time users of the Knowledge Graph Search are subjected to the Terms of use and have to confirm their agreement for use of the service. Conditions for use of individual datasets are provided as links in the research results.

The implemented services are strategically deployed to the first FENIX federation site at CSCS in Lugano, Switzerland, where they leverage the Virtual Machine infrastructure and Swift object storage provided by the High Performance Computing & Analytics Platform (HPAC) (SP7) to host services and data. By being so located, they represent a crucial integration milestone for SP5 and SP7, as well as a strong proof-of-concept for the upcoming ICEI programme.

The components of this KR represent the core of the Neuroinformatics Platform, ranging from tools for organising the metadata and uploading data to storage services, to Knowledge Graph search.

As of the end of SGA1, the tools and services were at TRL 6-8.

2.1.1 Achieved Impact

The public release of the HBP Knowledge Graph has made it possible for SP5 to start engaging with users inside and outside the HBP with a convincing service offering. Early responses have been very positive.

As of the end of SGA1, the users exposed to the services have primarily been from the HBP neuroscience SP1 and SP2, in the context of the submission of data to HBP data curation and storage.

2.1.2 Component Dependencies

Component ID	Component Name	HBP Internal	Comment
139	Component 99-1: Neuroinformatics Platform (NIP) web site	No	The NIP website is represented in the content available under the link https://www.humanbrainproject.eu/explore-the-brain/. This location provides guided paths through the NIP functionality and links to deeper examples and documentation in a number of subject-specific Collabs in the HBP Collaboratory.
374	HBP Identity Service	No	As will all Platforms, the NIP relies on the HBP Identify Service to authenticate users of its protected services. This service is a prerequisite for ACLs provided by Collaboratory and Collaboratory Storage services, as well as the authentication used in the UNICORE REST APIs for launching jobs on SP7-provided High Performance Analytics and Computing (HPAC) Platform facilities.
2482	Component 105-1: Collaboratory	No	Used for dissemination of key Use Cases in the form of documentation or sample usage through Jupyter notebooks.
1474	Component 93-1: Knowledge Graph Service	No	Provides the database for all metadata stored in the Neuroinformatics Platform
1477	Component 94-2: Knowledge Graph Python API	No	Known as the Pyxus API, this is the preferred interface to the HBP Knowledge Graph for Jupyter notebook users and for those with software development expertise.
2911	Component 93-2: Knowledge Graph Elastic Search Index Service	No	The NIP search interface uses a standardised, full-featured JavaScript library known as Searchkit. For this interface to function, it needs to have a specially prepared Elastic Search schema which is represented in the Knowledge Graph Elastic Search Index Component.
2620	HBP Knowledge Graph Indexer	No	The Knowledge Graph alone offers insufficient performance for a number of Use Cases, notably interactive search and the Knowledge Graph Analytics User Interface (UI). For this reason, custom daemonized indexers have been written to continually translate data into an efficient form for these additional Use Cases.
532	Component 105-1b: Collaboratory Storage UI	No	For managing data in small scientific collaborations, the Collaboratory storage UI is accessible through the Storage entry in each Collab. This web UI provides a user-friendly access to the Collaboratory Storage service Component.
373	Collaboratory Storage Service	No	The Collaboratory provides a REST-base web service for providing data management for small scientific collaborations. It provides a simple ACL model and can handle upload and download of files up to 1GB in size. It has a Python Application Programming Interface (API) for automation and interactive use from Jupyter notebooks.

1461	Component 101-1: Large-Scale Image Service	No	For the scalable distribution of HBP reference atlases to the interactive, web-based Neuroglancer viewer, the data is served over HTTP from precomputed image volumes processed according to the Neuroglancer specification.
1440	Component 7-2: Support for data transfers	No	This Component provides the customisation and deployment of the UNICORE data upload and download service in the various computing centres which is used to transfer data into Archive Storage. This component is superceded by Components 792 and 409.
1109	HPAC Data Service	No	SGA1 Data in the NIP is stored primarily in the CSCS Archive Data Storage, provided by a Swift-on-GPFS API. This API provides fine-grained ACLs which are utilised to protect data during the curation process, until the Data Owner's embargo period has expired. The other sub-Components of the HPAC Data Service are essential to this Key Result, to ensure that data can move reliably from into Archive Storage and be secured there until it ready to be shared. After public release, consistent backups, security procedures and service monitoring ensure the data stays safe, backed-up and available to NIP users. (SP7 component)
1489	Component 106-1: HBP Standard Deployment service	Yes	This service ensures that NIP services are deployed and operated in a consistent and efficient manner. NIP developers only.
1486	Component 111-1:Spatial Search API	No	A Proof-of-Concept REST service for spatial search based on Lucene indexes and the Solr clustered search engine.
2914	Component 111-2: Spatial Index for Knowledge Graph	No	A customized Lucene spatial index, allowing for efficient 3D range queries over large spatial datasets. This Component is the basis for the Spatial Search API.
1469	Component 72-2: Data Workbench	Yes	A crucial web UI and REST API used for uploading, reviewing and managing the release workflow of Tier 1 metadata provided by curators into the Knowledge Graph database and subsequently into the Knowledge Graph Search UI. Data workbench will be replaced by Knowledge Graph editor which will be a tool for external users. Release planned for SGA2 M9.

2.2 KR5.2 - "Three-tier metadata curation service making HBP data and models FAIR (Findable, Accessible, Interoperable, Re-usable) in a consistent and user-friendly way"

With this KR, HBP has delivered a fully operative three-tiered workflow for curation of metadata and data submitted by producers of experimental data and models in HBP. The workflow begins with interactions between HBP data providers and curators, and ends with fully organised and curated datasets defined in reference atlas space, with basic and method-specific metadata that are ready for release to the Knowledge Graph, where they can be found using semantic or spatial queries, visualised using HBP viewer tools, and utilised for data mining purposes. Detailed manuals and tutorials are available for data providers and curators via the HBP Collaboratory.

The following data curation tiers have been implemented:

- Tier 1 (basic metadata curation) provides guidelines, support and validation of completeness and correctness of the basic metadata provided. Standardisation and transparency of all ongoing tier 1 curation efforts are defining features of the workflow. They enable efficient collaboration within the curation team, and facilitate information exchange with data providers.
- Tier 2 (location metadata curation) evaluates metadata describing the anatomical locations from which data originate. Tier 2 curation is reported below under KR5.3.
- Tier 3 (neural activity metadata curation) provides a curation service of neural activity data, working closely with data contributors to annotate their datasets. The Tier 3 curation is included in the Neural Activity Resource (NAR), which delivers a central mechanism to register, annotate and browse activity data, reported below under KR5.8.

Workflows, tools and documentation available at the end of SGA1 has been tested and used extensively by the data curators of HBP Neuroscience SP1 and SP2. As of the end of SGA1, the tools used are at TRL 6-8.

More information is found in the following Collabs:

- Preparing data for curation and integration in the Human Brain Project Knowledge Graph https://collab.humanbrainproject.eu/#/collab/7574/nav/57656
- Tier 1 rodent curation Collab: Workflows and procedures for ingestion and curation of basic metadata https://collab.humanbrainproject.eu/#/collab/9127/nav/69005

2.2.1 Achieved Impact

This KR established tiered curation service is novel, and provides a first demonstration of how metadata for heterogeneous neuroscience data can be collected, organized and curated. This approach is potentially useful for other large-scale efforts to integrate complex and heterogeneous data, not just in the field of neuroscience. The curation workflow is ready to provide services to the Neuroscience community.

The Tier 1 curation team has in SGA1 initiated curation of 82 HBP data Components containing experimental data and finalized the curation of 55 of these. The amount of data stored at the end of SGA1 is 7.2 TB. In addition, 340 models from 40 Components have been curated. The Achieved impact for Tier 2 and Tier 3 curation is reported under KR5.3 and KR5.8, respectively.

2.2.2 Component Dependencies

Component ID	Component Name	HBP Internal	Comment
1435	Component 1-1a: Metadata used to enrich RUP data and models	No	Schematas defined
2283	Component 1-1b: Metadata used to enrich SGA1 data and models	No	Schematas defined
1437	Component 3-1: Identification of HBP users' Use Cases	Yes	Extensive activity in SGA1 on alternative Use Cases, followed by in-depth analysis and convergence in SGA2 Use cases. Internal report for HBP use.
2285	Component 4-2: Ontology for data/model discoverability annotation	No	Basic ontologies defined
1469	Component 72-2: Data Workbench (API, WebApp, MetaData DB)	Yes	Online DataWorkbench available and tested. In most cases, metadata are entered by curation team through API. Data workbench will be replaced by Knowledge Graph editor which will be a tool for external users. Release planned for SGA2 M9.
1439	Component 6-1: Support for data upload and download	Yes	Service established. This component will be available for external users from the launching of the HLST, October 2018.
1440	Component 7-2: Support for data transfers	Yes	Service established. This component will be available for external users from the launching of the HLST, October 2018.

2.3 KR5.3 "Location metadata service for HBP data and models: FAIR data through use of reference atlases"

This KR delivers a fully operative location metadata curation service. With this service, location metadata (descriptions of where in the brain the data are from) are assigned to the range of heterogeneous data generated by HBP data producers. The workflow has been extensively tested and validated through curation of numerous RUP and SGA1 data sets received so far.

Location metadata are either reference atlas coordinates (spatial metadata) or structure names (semantic metadata). The curation process ensures that data are properly associated with spatial or semantic metadata in the reference atlases developed and used by HBP. The location metadata service builds on several tools for spatial registration of image data in reference atlas space, together with tutorials, user support and training services.

The location metadata curation service comprises:

- The reference atlases with spatial coordinate systems for mouse, rat and human brain, defined and made available through the via the HBP public website https://www.humanbrainproject.eu/en/explore-the-brain/atlases/
- Tools, workflows and tutorials for spatial alignment of 2D and 3D image data to reference space, including QuickNII and LandmarkReg
- Metadata curation workflow for validation of spatial metadata
- A database with user interface for entering metadata to the Knowledge Graph

Workflows, tools and documentation available at the end of SGA1 have been extensively tested and used to curate data delivered by the HBP Neuroscience SP1 and SP2. As of the end of SGA1, the tools are at TRL 6-8.

More information is found in the following Collabs:

- Tier 2 rodent atlas curation: Workflow for creation and curation of spatial metadata https://collab.humanbrainproject.eu/#/collab/8911/nav/67417
- Mapping 2D and 3D image data in reference atlas space https://collab.humanbrainproject.eu/#/collab/5484/nav/42798
- Interactive spatial alignment tool https://collab.humanbrainproject.eu/#/collab/1924/nav/17485

2.3.1 Achieved Impact

The overall curation workflow is novel, and this KR provides a first demonstration of how different types of data can be defined in the context of common reference atlases through structured semantic or coordinate-based location metadata. These location metadata are of key importance for making research data FAIR (Findable, Accessible, Interoperable, Reusable; Wilkinson *et al.*, 2016, Sci Data 3:160018). The location metadata enable researchers to: 1) find data through semantic and spatial queries of the Knowledge Graph, 2) interpret and compare research data, 3) perform automated analysis in atlas-defined regions-of-interest, 4) co-display data and extracted features in atlas space, and 5) place data elements in appropriate anatomical context in computational models.

The workflow has been tested on a wide range of data and employed in completed (Bjerke *et al.*, Eur Psychiatry 50:70-76 2018; and other reports, currently under review) and ongoing research projects. The spatial registration tools have received considerable interest and positive feedback during live demonstrations during the 2017 HBP Summit in Glasgow, during the pre-conference programme of the 2017 annual meeting of the Society for Neuroscience in Washington, and during the 2018 outreach event “DutchBrain” in Amsterdam. Feedback has been collected and will be considered for guiding further developments. The registration tools have also been used in practice by several neuroscientists in Jülich, to anchor high-resolution datasets to the Big Brain. It was the first time that they were able to carry out such a 3D interactive process interactively at high resolutions. It was especially appreciated that the resulting transformation matrices were directly compatible with the NeHuBa viewer, so that an immediate overlay preview with the target atlas could be shared via URL without explicit warping of the source volume.

2.3.2 Component Dependencies

Component ID	Component Name	HBP Internal	Comment
1446	Component 31-1: Tutorials, training and supervision in assignment of spatial metadata	No	Tool/training for performing the alignment
1447	Component 32-2: Validation and approval of spatial metadata before final entry in Knowledge Graph	No	Curation
1450	Component 34-4: Procedure for anchoring of 3D image data to reference atlas	No	Tool/training for performing the alignment

1448	Component 37-7: Curation of semantic spatial metadata delivered in T5.4.1.	Yes	Curation. This component will be available for external users from the launching of the HLST, October 2018.
1476, 1492, 325, 249, 862, 327, 248, 341, 1473	Datasets registered and curated: Whole Human Brain Cytoarchitectonic and Maximum Probability Maps, from RUP Human V1 laminar profiles from RUP Component 50-3: Big Brain Release 2015 Component 51-4: Infant atlas and major tracts in infant brains Quantitative human receptor data in selected areas, from RUP Morphologies of selected human neurons, from RUP Whole brain connectivity atlas, from RUP Human Intracranial Database, Component 56-9: Wistar rat brain fibre orientation model	No	Template spaces and initial datasets Description of the data components has been done in the corresponding data components of SP2 per curation component. The corresponding data components are: 1462 -> 325 (cytoarchitectonic maps), 1483 -> 249 (receptor distributions), 1471 -> 862 (laminar v1 profiles), 1485 ->327 (morphologies), 1487 ->248 (connectivity atlas), 1490 ->341 (intracranial).
2424, 2425, 2426, 2427	Cross-scale Interactive Spatial Alignment Tools for Partial Volumes: Component 61-1: Selection, management and navigation of many landmarks Component 61-2: Affine transformation estimation from landmarks Component 61-3: Iterative workflow loop for landmark adjustment Component 61-4: Connection and interoperability NIP services	Yes	Tool/training for performing the alignment. The first public release of this tool is estimated to SGA2 M13. Current use (SGA1 and start of SGA2) is by HBP curators, who help streamlining the prototype to a user-ready tool.
141	Registration in Knowledge Graph	No	Interface to the database developed (RUP component), available to users via API.
1470	Component 83-9:QuickNII v 2.0: updated functionality and new procedures for propagation of anchoring information through large series of images	No	Tool/training for performing the alignment
1474	Component 93-1: Knowledge Graph Service	No	Database

176	Waxholm Space rat brain atlas, v.2.0	No	Reference atlas for rat dataset.
1443	Component 28-20: Allen mouse brain reference atlas with white matter structures parcellated	No	Reference atlas for mouse dataset.

2.4 KR5.4 "Atlasing workflow going from heterogeneous experimental image data to extracted quantitative features defined in reference atlas space"

This KR delivers a new capability to integrate and analyse data in reference atlas space. The analytic workflow allows researchers to spatially register different types of experimental image data to a standardised 3D reference atlas, extract features of interest in atlas-defined regions of interest, and combine, co-visualise, and analyse features from selected experiments together with surface models of different anatomical regions from the atlas. The workflow has been extensively validated.

The workflow takes a starting point in the location metadata workflow outlined in KR5.3. After having registered 2D and 3D image data to reference atlas space, the second step is extraction of features of interest from the images. This can be done manually, using the LocaliZoom tool, or semi-automatically, using the machine learning tool ilastic, as outlined in KR5.6 and KR5.7, below. The third step uses the new Neuroscience Data Utility Toolkit: "Nutil", also developed in SGA1. Nutil organizes the extracted features according to atlas-defined regions and prepares the data for further visualisation and analysis. The workflows thus delivers coordinates of extracted features in atlas space (suitable for visualisation of the feature distributions) as well as tabular overviews of classified objects with 3D atlas coordinates sorted according to anatomical regions.

Workflows, tools and documentation available at the end of SGA1 has been tested and used on data from the HBP Neuroscience SP1 and SP2 and data from other sources. Data categories successfully tested include light sheet microscopy data, axonal tracing data, and *in-situ* hybridisation data. The tools used are currently at TRL 6-8.

More information is found in the following Collabs:

- Mapping 2D and 3D image data in reference atlas space
  https://collab.humanbrainproject.eu/#/collab/5484/nav/42798
- Interactive spatial alignment tool
  https://collab.humanbrainproject.eu/#/collab/1924/nav/17485
- Extracting and comparing features from images mapped in reference atlas space
  https://collab.humanbrainproject.eu/#/collab/5401/nav/42067
- Neuroscience image processing and analysis utilities (Nutil)
  https://collab.humanbrainproject.eu/#/collab/9129/nav/69017

2.4.1 Achieved Impact

This workflow represents a novel approach to spatial integration of heterogeneous data in a common reference atlas space. Using this workflow, the analysis of distribution of features extracted from images will be made interpretable and reproducible. The neuroscience field of today suffers from frequent use of non-reproducible / non-standardised methods for feature extraction and assignation of location to data, leading to challenges with interpretations and re-use of data.

In combination with the other KRs here reported, this workflow contributes to the first demonstration of how users can search and retrieve curated data and use a suite of tools for viewing, comparing and analysing data.

The workflow has been tested on experimental materials in several projects and on several data types. As of the end of SGA1, results have been published (Bjerke *et al.*, 2018) and presented at several conferences (abstracts), including the HBP 2017 summit (Glasgow), Nordic Neuroscience Meeting 2017 (Stockholm), and the Annual meeting of the Society for Neuroscience (2017). Further publications are underway. The broad interest in the workflow comes also from laboratories outside HBP, including from leading institutions in USA and Asia. Considerable uptake is expected in SGA2.

2.4.2 Component Dependencies

Component ID	Component Name	HBP Internal	Comment
1446	Component 31-1: Tutorials, training and supervision in assignment of spatial metadata	No	This Component comprises documentation of workflow and tools used to map 2D and 3D image data to 3D reference atlases. https://collab.humanbrainproject.eu/#/collab/5484/nav/42798 To facilitate data ingestion to HBP, the rodent atlasing team (UIO) provides support and training, as well as full image registration services through SGA1. The material produced serves as a basis for a publication currently being prepared on recommended (best) practices for assignation and documentation of anatomical location for experimental neuroscience research data from rodent.
1447	Component 32-2: Validation and approval of spatial metadata before final entry in Knowledge Graph	Yes	This service Component is delivered by the rodent brain atlasing curation team (UIO) through a 7-phase curation workflow, in which the spatial accuracy and completeness of spatial metadata assigned to experimental rodent brain data delivered to the Neuroinformatics Platform is evaluated, and release of spatial metadata to the Knowledge Graph is approved. This component will be available for external users from the launching of the HLST, October 2018.
1449	Component 33-3: Optimised procedure for anchoring of 2D image data to reference atlas	No	This Component describes the revised procedure used to anchor (serial) 2D rodent brain image data to reference atlas space using QuickNII v 2.0 with improved functionality (Component #1470). The procedure is documented as part of Component #1446): https://collab.humanbrainproject.eu/#/collab/5484/nav/42798
1450	Component 34-4: Procedure for anchoring of 3D image data to reference atlas	No	This Component describes the procedure used to anchor 3D rodent brain image data to reference atlas space using the Landmark-Reg tool. The procedure is documented as part of Component #1446): https://collab.humanbrainproject.eu/#/collab/5484/nav/42798
1448	Component 37-7: Curation of semantic spatial metadata delivered in T5.1.1	No	This service Component is delivered by the rodent brain atlasing curation team, who evaluate semantic spatial metadata provided, and contribute to translating and associating these to appropriate anatomical terms in the HBP rodent brain atlases
1470	Component 83-9: QuickNII v	No	The QuickNII software tool allows the registration of rodent brain section images to 3D atlas space. The section images are

	2.0: updated functionality and new procedures for propagation of anchoring information through large series of images		visualised, and the angles of the template adjusted to match the cutting plane of the sections. The images are subsequently aligned to key anatomical landmarks, and the tool used to generate accurate anatomical maps corresponding to the section images.
1498	Component 85-11: LocaliZoom: viewer for series of 2D images with reference atlas superimposed	No	Web-viewer tool for viewing of series of 2D images that have been anchored to reference atlases. The tool allows display of the relevant reference atlas cut planes superimposed on the images at a user-defined level of transparency. The tool will have additional functions for graphical and semantic annotation functionality and reading of spatial coordinates (Waxholm Space and Bregma coordinates) for points-of-interest in the images. Spatial coordinates can be exported to MeshView v 2.0.
2432	Component 86-12: MeshView v2.0: updated functionality, viewing of annotations from LocaliZoom	No	The next generation of the MeshView web-viewer for interactive viewing of volumetric vector-based meshes from reference atlases and cutting of the reference atlas volumes in arbitrary, user-defined planes, providing customised atlas plates. The new version provides functionality for viewing of annotations from LocaliZoom. MeshView v2.0 thus delivers results aggregated from series of 2D images, anchored to reference atlas using QuickNII and annotated in LocaliZoom.
1442	Component 27-19: Customised versions of Allen mouse brain atlas tailored for different analyses	No	The full version of the Allen Mouse Brain Reference Atlas contains a very large number of small structures. For many types of analyses, this level of granularity is inappropriate. To facilitate semi-quantitative analysis of spatial distributions of labelled markers in images that have been anchored to the Allen Mouse Brain Reference Atlas, we have created several custom versions of the atlas with different granularity (i.e. number of structures). These custom versions are bundled in the QuickNII tool.
1443	Component 28-20: Allen mouse brain reference atlas with white matter structures parcellated	No	Reference atlas for mouse dataset.

2.5 KR5.5 “Tools to enable complete workflows for spatial integration and interactive navigation of large volumetric brain images”

This KR delivers a web-based solution to interactively visualise and explore a large volumetric dataset on the web, such as Big Brain, including overlays of multiple datasets and meshes and arbitrary oblique slicing. The software is realised as an extension of the Neuroglancer project referred to as NeHuBa (“Neuroglancer for Human Brain Atlasing”). It includes a completely reworked 3D webGL viewport, and an API to control the viewer from other applications and make it easily usable as a central software component for different NIP services.

With NeHuBa, the 1 Terabyte Big Brain dataset can be conveniently navigated at full resolution in 3D using only a web browser, with very moderate bandwidth requirements. Use examples include viewing of receptor distributions for a whole set of brain areas, downloaded directly from an

interactive 3D view of the reference atlas. At the prototype level, an instance of the viewer allows for interactive coordinate-based search of electrode recordings. Furthermore, NeHuBa has an interface to the prototype for interactive linear anchoring of a 3D volume to the large 3D atlas template (T5.3.3). Thereby, through the use of the spatial anchoring / location metadata service (KR5.3) NeHuBa can display a superimposition of the two volumes, applying the currently estimated spatial transformation on the fly. This enables the user to see the spatial correspondence without explicitly resampling the source or target image to be defined in transformed coordinates space.

As of the end of SGA1, the tools are at TRL 4-5.

More information is found in the following Collabs:

- Atlas viewer development: https://collab.humanbrainproject.eu/#/collab/2689/nav/22557
- Interactive spatial alignment tool: https://collab.humanbrainproject.eu/#/collab/1924/nav/17485

2.5.1 Achieved Impact

This KR is a response to a particular Use Case in which a user wants to bring a volume of interest, acquired at microscopic resolution, into alignment with the Big Brain template. As both datasets are too large to be loaded into the client's working memory (i.e. into the user's local browser), the HBP toolset must provide efficient and intuitive streaming of the 3D data for interactive anchoring and viewing. This is now solved with NeHuBa.

The new online atlas viewer and spatial anchoring application for large image volumes have reached a development status that allows us to present it to external users in hands-on sessions and workshops. Live demos were offered to the international community in November 2017 during a workshop at SfN2017 in Washington D.C., during the DutchBrain outreach event in Amsterdam in February 2018, and at the Cellular level 3D Coordinate frameworks for the Human Brain meeting in Washington D.C. in March 2018.

The release of a specific NeHuBa instance for browsing the Big Brain (http://bigbrain.humanbrainproject.org) has been appreciated by over 800 visitors as the first intuitive online 3D presentation of this Terabyte-sized dataset. Users from the functional neuroimaging field suggested including a dynamic display of connectivity in the form of heatmaps, making the atlas viewer more relevant for this large group of potential users. This work has been started.

The interactive spatial anchoring tool (landmark-reg) has been used by several neuroscientists in Jülich to anchor high-resolution datasets to the Big Brain, enabling them to carry out this process interactively, at such high resolutions, for the first time.

2.5.2 Component Dependencies

Component ID	Component Name	HBP Internal	Comment
1503	Component 89-1: Web-based big data viewer for navigating the Big Brain in three planes at different resolutions	No	Provides functionality to interactively explore overlays of Terabyte-sized brain volumes on the web in 3D. The software is released to the public as a service on the NIP website.
2909	Component 89-2: Extension of web-based 3D viewer for selecting and displaying a parcellation as a semi-transparent overlay	No	Provides functionality to select and switch between different brain templates and parcellations while exploring large 3D volumetric atlas data. The software is released to the public as a service on the NIP website.

2424	Component 61-1: Selection, management and navigation of many landmarks	Yes	Key Component for interactively aligning volumetric data. The first public release of this functionality is estimated to SGA2 M13. Current use (SGA1 and start of SGA2) is by HBP curators, who help streamlining the prototype to a user-ready version.
2425	Component 61-2: Affine transformation estimation from landmarks	Yes	Key Component for interactively aligning volumetric data. The first public release of this functionality is estimated to SGA2 M13. Current use (SGA1 and start of SGA2) is by HBP curators, who help streamlining the prototype to a user-ready version.
2426	Component 61-3: Iterative workflow loop for landmark adjustment	Yes	Key Component for interactively aligning volumetric data. The first public release of this tool is estimated to SGA2 M13. Current use (SGA1 and start of SGA2) is by HBP curators, who help streamlining the prototype to a user-ready version.

2.6 KR5.6 "Machine learning-based image analysis tools for Neuroinformatics Platform"

This KR delivers improvements in the well-established interactive learning and segmentation toolkit ilastik (www.ilastik.org) in response to requirements of HBP project workflows as described in KR5.4 and the new HBP viewer as outlined in KR5.5. Both inner improvements user interface developments have been implemented.

The inner architecture of ilastik has been re-worked in order to allow integration of ilastik with the workflows implemented in SP5 and with the HBP web-based viewer, for execution of algorithms on HBP computing resources. This work has led to inner improvements and user-facing developments. The inner improvements include: 1) separation of the lazy computation back end and the Qt-based front end to allow for direct access to the back end from a different viewer; 2) development of the HTTP API for communication with other NIP Components; 3) development of a reader for NeHuBa image source; 4) extension of the classification module to allow for deep convolutional neural network classifiers (prototype stage). The user-facing developments include: 1) benchmarking and optimisation for the segmentation of very large 2D image processing - the most frequent HBP Use Case; 2) classifiers developed and trained to solve challenging tasks of semantic and instance segmentation for electron and light microscopy data; 3) integration with the HBP web-based viewer NeHuBa to allow for interactive computation of ilastik predictions directly in the viewer (prototype stage).

Ilastik is a well-established and mature software. As of the end of SGA1, the changes introduced in the software are at TRL 4.

- Example of using ilastik along with HBP atlas tools: https://collab.humanbrainproject.eu/#/collab/5401/nav/42067

2.6.1 Achieved Impact

Ilastik provides non-expert users the possibility to apply machine learning-based algorithms to their images in an interactive manner. As the current prototype integration is expanded and solidified, we will provide a convenient interface for interactive training of shallow machine learning algorithms directly from the HBP web-based viewer, for the many Use Cases where extensive ground truth data is not available. For the selected problems with densely labelled ground truth data, we will train deep neural networks which can then be applied by users interactively on similar data in ilastik.

Live ilastik demo sessions were offered as part of the INCF booth at the SfN 2017 congress in Washington D.C., and as part of the Open Source Software Lounge at the Neubias Annual Symposium, with a total of 300 attendees.

In addition to the live demo sessions we have prepared a set of demonstration/ training videos that have been well-received by the community:

- Pixel-classification: https://youtu.be/5N0XYW9gRZY (3,168 views)
- Carving: https://youtu.be/xGyTriPQXHI (360 views)
- Counting: https://youtu.be/N-QhiTWVDmk (340 views)

2.6.2 Component Dependencies

Component ID	Component Name	HBP Internal	Comment
1495	Component 109-1: Connection of ilastik to HBP 2D and 3D viewers (software)	No	Enables visualisation of ilastik internal image layers inside the HBP viewer running inside a client browser
1496	Component 110-1: Connection of ilastik to other HBP services (software)	No	Enables running ilastik as a server on HBP computing resources and accessing HBP storage

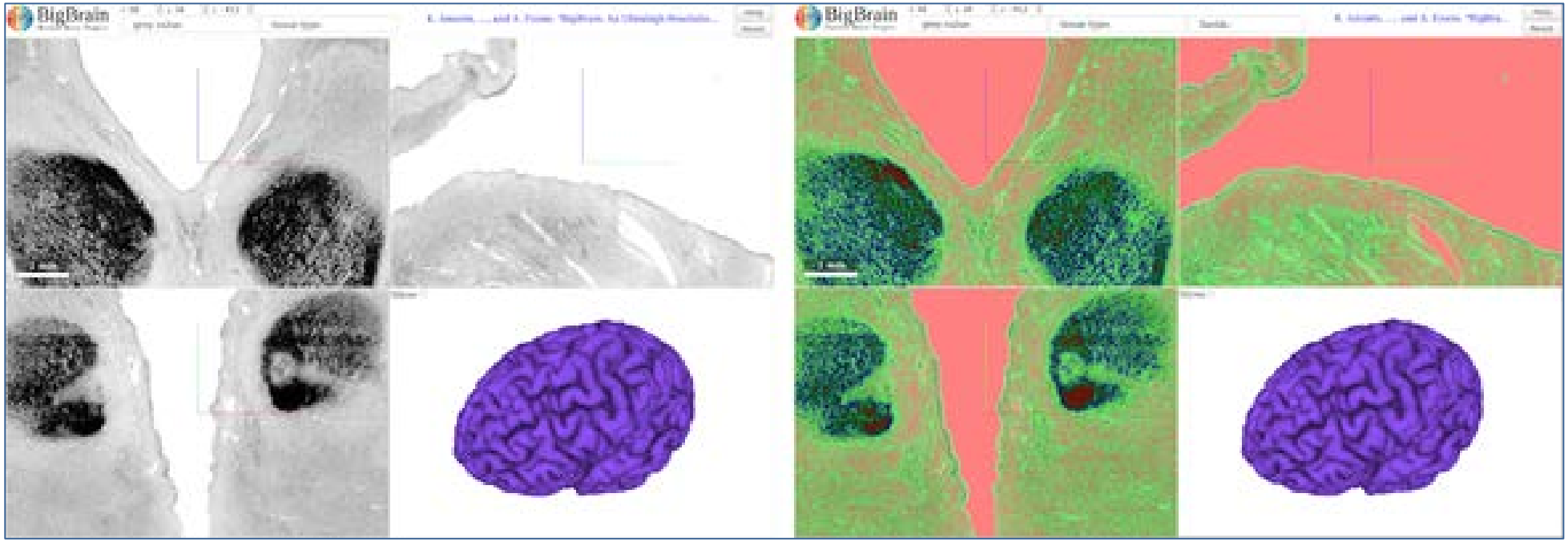

Figure 1: Integration of ilastik with the HBP viewer (NeHuBa)

The left screenshot shows the BigBrain dataset displayed in NeHuBa in grey level values. On the right, the ilastik-layer shows pixel probabilities calculated live for the field-of-view using a user supplied pre-trained classifier. Predictions were computed on demand for the field of view on HBP computing resources.

A basic data processing workflow (example dataset shown in Figure 2) with ilastik and anchoring to the atlas space for atlas-based analysis has been described in the following Collab: https://collab.humanbrainproject.eu/#/collab/5401/nav/42303 .

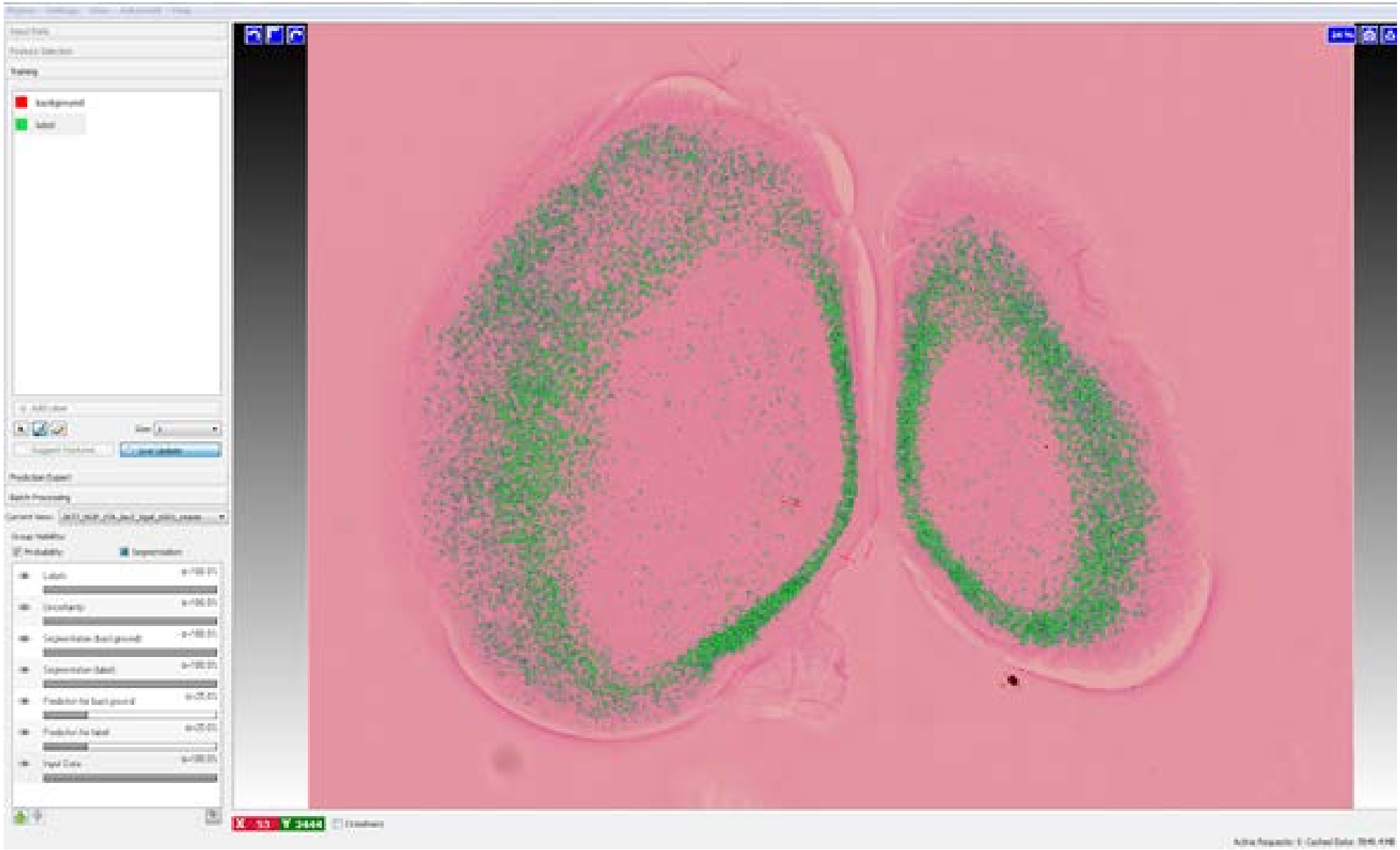

Figure 2: An ilastik pixel classification result on a Nop-tTA/tetO-lacZ-nls-GFP mouse dataset

2.7 KR5.7 "Comprehensive analysis tools for the analysis of electrophysiological activity data from experiment and simulation, including support for parallelisation".

This KR delivers improvements and new developments in the Electrophysiology Analysis Toolkit (Elephant), an open-source Python library, extending its spectrum of capabilities to cover additional analysis approaches. State-of-the-art analysis methods for electrophysiology data (i.e. parallel spike data, and time series data, such as local field potentials) are developed, collected, curated and disseminated via Elephant. New analysis methods from multiple labs were incorporated into the tool to increase its range of applications.

As methods to analyse massively parallel data are often computationally demanding, we have started the implementation and benchmarking of parallelised versions of such methods in order to enable their practical use and uptake. To facilitate its use across different data modalities, Elephant is built on the Neo library component that provides a common data model for various sources of electrophysiological data, including equal treatment of experimental and simulated data. The data analysis is facilitated by various file back ends shipped with the Neo library, which were further extended in SGA1 to cover a broader range of data file formats.

Analysis methods are routinely tested for quality control and reproducibility. In the latest SGA1 release of Elephant we practically established a new testing process, based on the validation of an analysis method implementation against the original 1997 publication, thus establishing a ground truth for reproducibility. This process is a feature unique to the Elephant tool and will serve as a blueprint for future method validations.

We integrated Elephant as a statistics and dynamics analysis back end for the initial version of the validation framework for activity data developed together with T6.4.4, T4.5.1 and T9.1.5 in SGA1. Using this framework, activity data from network simulations have been successfully validated against simulation output of alternative models formulated on different descriptive levels and running on different simulation engines.

As of the end of SGA1, the tools are at TRL 7.

More information is found in the following Collabs:

- Activity data analysis demonstration
  https://collab.humanbrainproject.eu/#/collab/5185/nav/40161
- HBP Young Researcher Event: Activity Data Project
  https://collab.humanbrainproject.eu/#/collab/5183
- NEST SpiNNaker Elephant Validation Demo
  https://collab.humanbrainproject.eu/#/collab/507/nav/6326
- Analysis of resting state data
  https://collab.humanbrainproject.eu/#/collab/2493
- Elephant Tutorial
  https://collab.humanbrainproject.eu/#/collab/651

2.7.1 Achieved Impact

Based on the the breadth of functionality covered by the Elephant tool at the end of SGA1, it represents a unique asset for the analysis of electrophysiological data. Elephant's design makes it easy to apply analysis methods across a range of different source data, including equal treatment of experimental and simulated electrophysiological data. This feature was crucial for the

integration of Elephant as a back end for validation frameworks for activity data developed together with T6.4.4, T4.5.1 and T9.1.5 in SGA1 within the emerging HBP Validation Framework Component. This was done in such a way that simulations can be quantitatively matched against the biological reality of interest, and that simulation outputs of models on different descriptive levels are meaningfully compared.

Active use of the Neo data model in real-world Elephant-based analysis scenarios (e.g. contributing to KR3.2) leads to continuous improvements in its design and in the quality of file back ends to enable a seamless source-independent data flow (see KR5.8 for usage statistics).

The availability of standardised data representations and analysis methods for electrophysiological data through Neo and Elephant is a key element to efficiently conduct student teaching activities (e.g. the ANDA data analysis courses) that focus on open, flexible data analysis projects, as opposed to rigid, pre-designed, standardised exercise-based course concepts. A number of data analysis schools and tutorials were successfully conducted using the developed tools, in particular the 2-week ANDA spring schools in Juelich (2017 and 2018), and the project contributed as well to the HBP young investigator meeting in Geneva (2017).

Elephant promotes the dissemination and sharing of advanced data analysis methods, and supports the formalisation of the analysis workflow with 47 analysis methods at the end of SGA1. Download statistics are not available, but the Elephant repository on GitHub has been "starred" 28 times and forked 48 times, and more than 23 authors have made contributions to Elephant. The Elephant library is referenced by 6 peer-reviewed publications.

2.7.2 Component Dependencies

Component ID	Component Name	HBP Internal	Comment
348	Component 115-3: Elephant (software)	No	Analysis software for functional activity data
361	Component 115-3b: Neo (software)	No	Data model for Elephant

2.8 KR5.8 "The Neural Activity Resource as a central mechanism to register, annotate and browse activity data sets within the HBP".

This KR is a a collection of tools (web services and apps, Python client) and documents (ontologies, metadata schemas, user guides) for the management, curation and use of datasets containing recordings of neural activity. It is referred to as the Neural Activity Resource. A key part is the Python library Neo for representing electrophysiology data supporting the reading of a wide range of file formats. This KR thus enables the NAR curation service. In the curation service, the NAR team works closely with data contributors to annotate their datasets and feed metadata into the HBP Knowledge Graph.

The fine-grained metadata available from the Knowledge Graph via the NAR Python client enables automation of common modelling tasks; for example, finding all registered morphological reconstructions of hippocampus CA1 pyramidal neurons and all recordings of patch-clamp current injections into these neurons, and using these data and their associated protocols to optimise models of this neuron type.

The components developed by the NAR complement extend the core components of the Neuroinformatics Platform. For example, they provide more fine-grained metadata schemas for the Knowledge Graph, that enable a more complete and detailed description of neurophysiology recordings and the experimental protocols used to obtain them, together with Collaboratory apps, Javascript and Python tools for visualising and curating such metadata.

As of the end of SGA1, most of these tools and documents are at the proof-of-concept / prototype stages (TRL 3/4). Tools for browsing data and metadata are accessible to end-users; tools for annotation and registration are currently only available internally to curators.The NAR curation service is, however, fully operative and has been tested on multiple data sets.

More information is found in the following Collab:

- Neural Activity Resource
  https://collab.humanbrainproject.eu/#/collab/1635

2.8.1 Achieved Impact

The collection of tools enabled data and metadata curation services for activity data, and was thus critical for establishing the overall curation service (see also KR5.2). Neo has had a broad impact, in as the basis for the Elephant data analysis toolkit (see KR5.7), and in simplifying data analysis workflows both within and outside the HBP, by greatly reducing file format conversion as a blocker / bottleneck.

The tools developed by the NAR, and the Tier 3 metadata registered and curated by NAR scientists in collaboration with experimentalists from SP1, are beginning to be used in SP6's Brain Simulation Platform (BSP) workflows, and to replace the ad hoc solutions used by the BSP until now.

As quantitative indicators of this impact, we note that the Neo repository on GitHub has been "starred" 95 times and "forked" over 110 times, and that 29 people, of whom 21 are not HBP members, have made contributions to Neo in the past two years. The majority of non-HBP contributors are graduate students or postdocs in neuroscience, who find Neo useful for their own work, but have a problem such as a file format that Neo cannot handle and who contribute their extensions back to the project. These numbers represent lower bounds, since the total number of users is almost certainly much higher than the number of contributors. Concerning the other Neural Activity Resource tools, there has as yet been insufficient time for them to have an impact.

2.8.2 Component Dependencies

Component ID	Component Name	HBP Internal	Comment
3004	NARCI (data)	No	Ontology for calcium imaging experiments
3005	Metadata schemas for neural activity data (data	No	Metadata schemas (as SHACL documents for the HBP Knowledge Graph) for patch clamp, intracellular sharp electrode, tetrode, multi-electrode-array electrophysiology recordings and calcium imaging recordings.
3006	Neural activity resource browser (service)	No	A Collaboratory app for browsing and visualising activity datasets stored in the Knowledge Graph (prototype)
3007	Viewer for time-series data (service)	No	A web service and JavaScript library for interactive visualisation of electrophysiology recordings (proof-of-concept)
3009	Python client for the NAR (software)	No	To facilitate access to activity data (stored in the Pollux-SWIFT archive storage at CSCS) and metadata (stored in the Knowledge Graph) from within Jupyter notebooks (prototype)
3008	Neural activity metadata editor (service)	No	A Collaboratory app for curators, to facilitate metadata entry (proof-of-concept)
361	Component 115-3b: Neo (software)	No	A Python library for representing electrophysiology data in Python, together with support for reading a wide range of neurophysiology file formats. Provides

			a data model and I/O modules for certain data in the Neural Activity Resource. This is an existing tool that was extended and improved during SGA1, notably with a simplified API, based on user feedback, improved testing/continuous integration and support for additional file formats.

2.9 KR5.9 "Prediction-based mesoconnectome"

This KR is a first step towards providing connectomics predictions, at the mesoscale level (region-to-region connections) to be further empowered by data generated by new anatomical techniques over the next five years. The pilot implementation uses gene expression patterns to predict the mesoconnectome and explores the use of cell-type specific expression patterns for their ability to predict relative cell density, in order to build future tools for cell-type specific predictions of the mesoconnectome.

The prediction tools have been developed in Matlab, using pre-processed data, and ported to Python to make use of the Neuroinformatics Platform infrastructure and to demonstrate the capabilities in a Jupyter notebook. To assess whether the gene expression data of slices provided by the Allen Institute for Brain Science are appropriately aligned, and to which extent the prediction of connectivity matches the measured ones, we developed a lightweight JavaScript viewer (also as part of the HBP Partnering Project FIIND).

The new prediction tool is a prototype, TRL 4.

2.9.1 Achieved Impact

The connectomic composition tools have been presented so far in various locations as posters: the Society for Neuroscience meeting in San Diego (2016), the INCF Congress on Neuroinformatics in Reading (2016), the Computational Neuroscience meeting in Antwerp (2017), the HBP Summits in Florence (2016) and Glasgow (2017), and the 2nd HBP student conference in Ljubljana (2018).

The tools have also been demonstrated in talks for the Association of biology students at the University of Utrecht (2018), for an audience of 50-100 students,and at the HBP DutchBrain conference (2018) for 80 participants, students and senior scientists. At the DutchBrain conference, we also provided demos of the lightweight viewers developed to visualise results.

2.9.2 Component Dependencies

Component ID	Component Name	HBP Internal	Comment
935	Component 47-2: The connectomic composition predictor (software)	No	The Key Result is a description and implementation of this Component which is a python script in a public collab.
132	Morphology Viewer	No	Visual inspection of pilot results (development tool, RUP component)
133	Scalable Brain Atlas: embedding in the Neuroinformatics Platform.	No	Visual inspection of pilot results (development tool, RUP component)
128	QuickNII: stand-alone tool for anchoring of 2D experimental image data to 3D atlas templates	No	Part of pre-processing pipeline for unionised data (RUP component)

3. Conclusion and Outlook

The HBP is committed to wide sharing of HBP-produced data and models, as this is seen as a key prerequisite to achieving HBP's Strategic Objectives. To achieve the required infrastructure, a strong collaboration between developers from the High Performance Computing & Analytics Platform (SP7) and the Neuroinformatics Platform (SP5) was established during SGA1, together with a strong collaboration among scientific teams from HBP that produce models and data, and the SP5 data curation and Platform development teams. The first implementation of the HBP Platform Architecture is described in SGA1 Deliverables D11.3.1 and D5.6.2. The present document outlines Key Results demonstrating how SP5 will share and manage data and models and contribute to providing relevant analytical workflows.

The newly developed infrastructure covers 1) the uploading of data to storage managed by SP7; 2) the process of organising data and curating metadata; 3) making data FAIR (Findable, Accessible, Interoperable, and Re-usable); 4) the transfer of metadata to the Knowledge Graph; 5) faceted search; 6) access to data with extensive information available; and 7) access to tools and workflows of relevance for the visualisation and analysis of the data.

Thus, at this stage in the Project, the HBP delivers a comprehensive range of data, organised and managed through the infrastructure, and accessible through the Knowledge Graph. The procedures and tools for organising and managing the data have been challenged by the heterogeneity of the data and the distributed nature of the HBP. So far, the solutions developed have scaled well, passed extensive testing and are now fully operational. However, in order to be able to ingest an increasing amount of data and possibly an even broader range of data with higher complexities, emphasis will be placed on continuous optimisation and simplification of all steps involved in the process, from uploading of data to HBP storage to eventually making data available for search and retrieval through the Knowledge Graph.

Several tools and workflows, tailored for future use, have been developed and tested, with the data organised and managed through the infrastructure (KR5.1). Some of the workflows are parts of the process of organising and managing the data (KR5.2 and KR5.3). These workflows are the most heavily tested and mature ones. Other workflows belong to a later stage, when data are retrieved for analysis and visualisation (KR5.4, KR5.5, KR5.6, KR5.7, KR5.8 and KR5.9).

Developing analytical workflows relevant for all data categories in HBP will be challenging. Prioritisation will therefore be important. The current workflows match the requirements of many Use Cases. Access to a broad range of tools and flexibility in terms of using different tools combinations in pipelines will be key to ensure future extensive use and re-use in new combinations of the research data managed and stored by the HBP infrastructure.

The specific next steps, relevant for the Key Results here reported, are:

- for the Knowledge Graph: improve usability following testing of the user interface, improve spatial search capabilities, and integrate with existing model catalogues and web-based HBP data viewers
- for data curation and ingestion of data in the Knowledge Graph: establish the business model required for a broader use of the relevant SP5 tools and services outside of HBP, in collaboration with the new High-Level Support Team to be established in SGA2 - thereby accelerating the process of populating the HBP Knowledge Graph with heterogeneous rodent and human neuroscience data and computational models
- for all workflows and tools: adjust and improve descriptions and tutorials, and deliver support in collaboration with the new High-Level Support Team (to be established in SGA2) to the research groups (HBP internal and external) that will be utilising the workflows and tools
- for NeHuBa: extend the viewer to support more image modalities in a newly initiated collaboration with developers at McGill University (A. Evans lab), and exploit spatial transformations between different template spaces on the fly

- for the ilastik tool: establish tighter integration of ilastik with the new atlas viewer and, once available, with the image service of the Neuroinformatics Platform; train neural networks for the currently available ground truth data, thereby preparing feature extraction from images for a wide range of data types used in HBP
- for the Elephant tool: further improve the support of parallelisation for selected analysis methods, formalise analysis method validation tests started in SGA1, add new visualisation capabilities, and add specific data analysis usage scenarios for SGA2 Use Cases
- for metadata schemas: extend and refine the in-depth schemas, in collaboration with the data providers, and prioritise curation of datasets that are needed most urgently by the modelling teams in SP6 and by other data consumers
- for the broader community: strengthen dissemination efforts and interactions with external users through publications, presentations, the voucher system, and the High-Level Support Team to be established in SGA2

4. Component Details

The following is a list of the internal Components listed under each KR in this deliverable. Detailed information is given for components developed during SGA1 and not reported in other SPs Deliverables. Separate annex for all HBP.

4.1 Component 128: (RUP component, replaced by 1470 in SGA1)

4.2 Component 132: (RUP component)

4.3 Component 133: (RUP component)

4.4 Component 139 (99-1): Neuroinformatics Platform website

Field Name	Field Content	Additional Information
ID	139	
Component Type	service	
Contact	MULLER, Jeffrey	
Component Description	The NIP website is represented in the content available under the link https://www.humanbrainproject.eu/explore-the-brain/. This location provides guided paths through the NIP functionality and links to deeper examples and documentation in a number of subject-specific Collabs in the HBP Collaboratory.	
Latest Release	2018-03-31	
TRL	TRL7 (monitored but SLA undefined)	
Location	https://www.humanbrainproject.eu/explore-the-brain/	
Format	web	
Curation Status	NA	
Validation - QC	Pass	Agile QA, Product Owner Allan Francani
Validation – Users	Yes	3,105 unique pageviews (Feb 21-Mar 21, 2018)
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	

Sharing	anonymous - share with anonymous non-consortium members	
License	Closed source - contact software owner	
Component Access URL	https://www.humanbrainproject.eu/explore-the-brain/	
Technical documentation URL	NA	
Usage documentation URL	NA	
Component dissemination material URL	NA	

4.5 Component 141: (RUP component)

4.6 Component 176: (RUP component)

4.7 Component 248: New human brain parcellations based on microscopic post mortem and *in vivo* data

Field Name	Field Content	Additional Information
ID	248	
Component Type	data	
Contact	MANGIN, Jean-Francois	
Component Description	Connectivity-based over-parcellation of freesurfer Desikan atlas available at the group and individual level (80 subjects of Archi database, 400 subjects of HCP database)	
Latest Release	2017-09-30	
TRL	NA	
Location	data hosted by subproject providing dataset	
Format	Texture in freesurfer reference space	
Curation Status	Uploaded to an approved HBP data repository location	
Validation - QC	Pass	(computation of dedicated connectivity matrices)
Validation – Users	Yes	Application to Bipolar Disorder in Cingulate area, to asymmetry studies in temporal areas. Used also to generate connectivity matrices tuned to

		individual subject architecture.
Validation – Publications	No	in progress
Privacy Constraints	Human Research	
Sharing	consortium - share with any consortium members	
License	Attribution Non-Commercial ShareAlike	
Component Access URL		
Technical documentation URL		
Usage documentation URL		
Component dissemination material URL	https://doi.org/10.1016/j.media.2016.01.003	

4.8 Component 249: Quantification of multiple receptor distributions for selected areas (see SP2 Deliverable D2.7.1)

4.9 Component 325: Cytoarchitectonic probability maps (see SP2 Deliverable D2.7.1)

4.10 Component 327: Morphological data of human neocortical pyramidal neurons (see SP2 Deliverable D2.7.1)

4.11 Component 341: Human iEEG recordings (see SP2 Deliverable D2.7.1)

4.12 Component 348: Elephant

Field Name	Field Content	Additional Information
ID	348	
Component Type	software	
Contact	DENKER, Michael	
Component Description	The Electrophysiology Analysis Toolkit (Elephant) is a toolbox for the analysis of electrophysiological data. Elephant provides fundamental methods to analyse both spike time data as well as time-series data (e.g., LFP). Besides methods to characterise the dynamics of	

	single neurons or population signal recordings, its focus is on methods that analyse the ensemble activity in massively parallel data, as well as methods that bridge scales of observation (e.g. spike-LFP relationships).	
Latest Release	2018-03-30	
TRL	TRL 7 - Operational Integration	
Location	data hosted by other non-HBP 3rd party	
Format	NA	
Curation Status	NA	
Validation - QC	Pass	Agile Quality Assurance
Validation – Users	Yes	
Validation – Publications	Yes	https://scicrunch.org/resolver/scr_003833
Privacy Constraints	No Privacy Constraint	
Sharing	anonymous - share with anonymous non-consortium members	
License	BSD license	
Component Access URL	http://www.python-elephant.org/	
Technical documentation URL	http://elephant.readthedocs.org/en/latest/index.html	
Usage documentation URL	http://elephant.readthedocs.org/en/latest/index.html	
Component dissemination material URL	http://www.python-elephant.org/	

4.13 Component 361: Neo

Field Name	Field Content	Additional Information
ID	361	
Component Type	software	
Contact	DAVISON, Andrew	
Component Description	Neo is a package for representing electrophysiology data in Python, together with support for reading a wide range of neurophysiology file formats, including Spike2, NeuroExplorer, AlphaOmega, Axon, Blackrock, Plexon, Tdt, and support for writing to a subset of these formats plus non-proprietary formats including HDF5. The goal of Neo is to improve interoperability between Python tools for analysing, visualising and generating electrophysiology data (such as OpenElectrophy,	

	NeuroTools, G-node, Helmholtz, PyNN) by providing a common, shared object model. In order to be as lightweight a dependency as possible, Neo is deliberately limited to representation of data, with no functions for data analysis or visualisation.	
Latest Release	0.6.1	2018-03-23
TRL	TRL 7 - Operational Integration	
Location	data hosted by other non-HBP 3rd party	
Format	Library	
Curation Status	NA	
Validation - QC	Pass	Agile Quality Assurance
Validation – Users	Yes	Neo has been in wide use for several years now. We have no download statistics; a lower bound for the number of users is the number of forks on GitHub (116).
Validation – Publications	Yes	https://scholar.google.com/scholar?oi=bibs&hl=en&cites=5928782347334382431 https://www.ncbi.nlm.nih.gov/pubmed?linkname=pubmed_pubmed_citedin&from_uid=24600386
Privacy Constraints	No Privacy Constraint	
Sharing	anonymous - share with anonymous non-consortium members	
License	BSD license	
Component Access URL	http://neuralensemble.org/neo/	
Technical documentation URL	http://neo.readthedocs.org/	
Usage documentation URL	http://neo.readthedocs.org/	
Component dissemination material URL	http://neuralensemble.org/neo/	

4.14 Component 373: Collaboratory Storage Service

Field Name	Field Content	Additional Information
ID	373	
Component Type	service	

Contact	MULLER, Jeffrey	
Component Description	The Collaboratory provide a REST-base web service for providing data management for small scientific collaborations. It provides a simple ACL model and can handle upload and download of files up to 1GB in size. It has a Python API for automation and interactive use from Jupyter notebooks.	
Latest Release	2018-03-31	
TRL	TRL8	
Location	https://collab.humanbrainproject.eu	
Format	web	
Curation Status	NA	
Validation - QC	Pass	Agile QA, Product Owner Allan Francani
Validation – Users	Yes	See Collaboratory
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	public authenticated - share with authenticated non-consortium members e.g. public Collab	
License	Closed source - contact software owner	
Component Access URL	https://collab.humanbrainproject.eu	
Technical documentation URL	https://collab.humanbrainproject.eu/#/collab/54/nav/18342	
Usage documentation URL	https://collab.humanbrainproject.eu/#/collab/54/nav/18342	
Component dissemination material URL	https://collab.humanbrainproject.eu/#/collab/54/nav/18342	

4.15 Component 374: HBP Identity Service

Field Name	Field Content	Additional Information
ID	374	
Component Type	service	
Contact	MULLER, Jeffrey	
Component Description	This service implements the OpenID Connect protocol and accreditation workflows for Community and various types of HBP Member accounts. It provides the authentication protocol and database for the Service Oriented Architecture around the Collaboratory, including many of the platform services provided by SP5-SP10	

Latest Release	2018-03-31	
TRL	TRL8	
Location	https://services.humanbrainproject.eu/oidc/login	
Format	NA	
Curation Status	NA	
Validation - QC	Pass	Agile QA, Product Owner Allan Francani
Validation – Users	Yes	see Collaboratory
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	anonymous - share with anonymous non-consortium members	
License	Closed source - contact software owner	
Component Access URL	https://services.humanbrainproject.eu/oidc/login	
Technical documentation URL	https://collab.humanbrainproject.eu/#/collab/54/nav/4853	
Usage documentation URL	https://collab.humanbrainproject.eu/#/collab/54/nav/4853	
Component dissemination material URL	https://collab.humanbrainproject.eu/#/collab/54/nav/4853	

4.16 Component 532 (105-1b): Collaboratory Storage UI

Field Name	Field Content	Additional Information
ID	532	
Component Type	service	
Contact	MULLER, Jeffrey	
Component Description	For managing data in small scientific collaborations, the Collaboratory storage UI is accessible through the Storage entry in each collab. This web UI provides a user-friendly access to the Collaboratory Storage service component.	
Latest Release	2018-03-31	
TRL	TRL8	
Location	https://collab.humanbrainproject.eu	
Format	web	
Curation Status	NA	

Validation - QC	Pass	Agile QA, Product Owner Allan Francani
Validation – Users	Yes	See Collaboratory
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	public authenticated - share with authenticated non-consortium members e.g. public collab	
License	Closed source - contact software owner	
Component Access URL	https://collab.humanbrainproject.eu	
Technical documentation URL	Not applicable – end-user only component	
Usage documentation URL	None provided. Follows standard UI paradigms for file browsing.	
Component dissemination material URL	None provided.	

4.17 Component 862: Ultra-high field fMRI of sub-units in higher-level visual areas and face areas in human and monkey (see SP2 Deliverable D2.7.1)

4.18 Component 935: Connectomic composition predictor

Field Name	Field Content	Additional Information
ID	935	
Component Type	software	
Contact	TIESINGA, PAUL	
Component Description	The current version of the tool is implemented in python. It uses supervised learning, either logistic regression or random forest to predict using gene expression data (in a matrix gene versus brain area) to predict the projections of specified source area. It also has tools to determine which genes are most valuable for the prediction and tools to visualise the results in a light-weight way.	
Latest Release	2018-01-03	
TRL	TRL 4 - Prototype Component	
Location	data hosted by collaboratory storage	
Format	NA	

Curation Status	NA	
Validation - QC	Unchecked	
Validation – Users	Yes	Tool has been made public within the Collaboratory, two internal users have accessed it (Nestor Timonidis, Rembrandt Bakker, Paul Tiesinga).
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	consortium - share with any consortium members	
License	GPLv2/GPLv3	
Component Access URL	https://collab.humanbrainproject.eu/#/collab/8650/nav/65518	
Technical documentation URL	https://collab.humanbrainproject.eu/#/collab/8650/nav/65518 (via jupyter in-line markdown documentation blocks)	
Usage documentation URL	https://collab.humanbrainproject.eu/#/collab/8650/nav/65518 (jupyter notebook provides information how to use the tool)	
Component dissemination material URL	Abstract of presentation by developer Nestor Timonidis at https://education.humanbrainproject.eu/documents/362088/377767/Scientific_Programme_2nd_Student_Conference.pdf/00f2f77e-68aa-42e0-8030-49ad662b9090 conference will be published later.	

4.19 Component 1109: CSCS Archive Repository Service: defined by SP7 Component 409

Field Name	Field Content	Additional Information
ID	409	
Component Type	Service	
Contact	SCHULTHESS, Thomas	
Component Description	Archive data repositories are defined as follows: • They are optimised for capacity, reliability and (tier-1) availability • They are used for storing large data objects permanently • They hold the main/master copy of the data Data is not replicated to other sites and thus will be temporarily unavailable when the repository is unavailable	

Latest Release	Not applicable	
TRL	TRL 9	
Location	Data hosted by HPAC Platform	
Format	The service relies on Object Storage and archiving systems available at all HPAC sites	
Curation Status	Not applicable	
Validation - QC	Pass	
Validation – Users	Yes	
Validation – Publications	Not applicable	
Privacy Constraints	No privacy constraint	
Sharing	Not applicable	
License	Not applicable	
Component Access URL		Archive data repositories can be accessed in different ways, depending on how they are implemented by the different sites; see documentation for more details
Technical documentation URL	https://hbp-hpc-platform.fz-juelich.de/?page_id=676	https://pollux.cscs.ch (for archive at ETHZ-CSCS)
Usage documentation URL	Not applicable	
Component dissemination material URL	Not applicable	

4.20 Component 1435 (1-1a): Metadata used to enrich RUP data and models (data)

Field Name	Field Content	Additional Information
ID	1435	
Component Type	report	
Contact	ANDERSSON, Krister	
Component Description	RUP Data and Models will be enriched so as to make them discoverable via the Neuroinformatics Platform (NIP).	
Latest Release	2018-03-31	
TRL	NA	

Location	data hosted by collaboratory storage	
Format	web	
Curation Status	NA	
Validation - QC	Pass	KLEVEN, Heidi
Validation – Users	Pass	ANDERSON, Krister; KLEVEN, Heidi
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	anonymous - share with anonymous non-consortium members	
License	NA	
Component Access URL	https://collab.humanbrainproject.eu/#/collab/9127/nav/69005	
Technical documentation URL	https://collab.humanbrainproject.eu/#/collab/9127/nav/69005	
Usage documentation URL	https://collab.humanbrainproject.eu/#/collab/9127/nav/69005	
Component dissemination material URL	https://collab.humanbrainproject.eu/#/collab/9127/nav/69005	

4.21 Component 1437 (3-1): Identification of HBP users' Use Cases (report)

Field Name	Field Content	Additional Information
ID	1437	
Component Type	report	
Contact	Eszter PAPP	
Component Description	Use Cases are an integral part of the Human Brain Project, describing workflows in a structured manner, and capturing user requirements towards infrastructure developed for the HBP. The aim of this report is to standardise the specification of Use Cases collected in the Project Lifecycle Application from all Subprojects, so that end-to-end solutions can be implemented to validate the underlying workflows. We approach this goal by performing a systematic review of the status of the current version of Use Cases, identifying common elements, and developing guidelines for a standard representation of Use Case descriptions. The main results of this review include an assessment of the level of completion of Use Cases, a Use Case specification template based on common points and requirements from an infrastructural perspective, and a selection of examples that best fit the template. Based on these results, the aim of the	

	second phase of the review process will be to update, categorise and prioritise Use Cases for SGA2.	
Latest Release	03.11.2017	
TRL	NA	
Location	data hosted by other non-HBP 3rd party	
Format	word doc	
Curation Status	NA	
Validation - QC	NA	
Validation – Users	Yes, Jeff Muller, Martin Telefont.	
Validation – Publications	NA	
Privacy Constraints	NA	
Sharing	NA	
License	NA	
Component Access URL	NA	
Technical documentation URL	NA	
Usage documentation URL	NA	
Component dissemination material URL	https://emdesk.humanbrainproject.eu/shared/5ad494a623e5d-831b5c64bcaa2e2485de702f85c83314	

4.22 Component 1439 (6-1): Support for data upload and download (service): provided by SP7 Components 409 (see Component 1109 above) and 792 (details here)

Field Name	Field Content	Additional Information
ID	792	
Component Type	Service	
Contact	SCHULLER, Bernd	
Component Description	UNICORE is a set of middleware services that work together to provide access to high-performance computing systems as well as file systems and data stores. UNICORE integrates with the existing facilities at a HPC centre as well has external authentication systems (such as the HBP OIDC service), and maps external users to their correct internal UNIX accounts and groups. UNICORE has functions for (batch) job submission and management, file and data access, file upload/download, third party transfer and more.	

	UNICORE provides both SOAP/XML and REST APIs that can be used by a variety of clients including end-user Python code in the HBP Collaboratory.	
Latest Release	7.9.0 14 Nov 2017	
TRL	TRL 8	
Location	Not applicable	Part of HPAC Platform, hosted by HPC sites in HPAC
Format	Not applicable	
Curation Status	Not applicable	
Validation - QC	Pass	SCHULLER, Bernd; Agile quality assurance
Validation – Users	Yes	
Validation – Publications	Not applicable	
Privacy Constraints		
Sharing		
License	BSD license	
Component Access URL	Not applicable	
Technical documentation URL	https://www.unicore.eu/documentation/	
Usage documentation URL	https://sourceforge.net/p/unicore/wiki/REST_API/	
Component dissemination material URL	Not applicable	

4.23 Component 1440 (7-2): Support for data transfers (service): provided by SP7 Components 409 and 792 (see components 1109 and 1439).

4.24 Component 1441 (27-19): Customized versions of Allen mouse brain atlas tailored for different analyses

Field Name	Field Content	Additional Information
ID	1442	
Component Type	Data	
Contact	LEERGAARD, Trygve	
Component Description	The full version of the Allen mouse brain reference atlas contains a very large number of small structures.	

	For many types of analyses this level of granularity is inappropriate. To facilitate semi-quantitative analysis of spatial distributions of labelled markers in images that have been anchored to the Allen mouse brain reference atlas, we have created several custom versions of the atlas with different granularity (i.e. number of structures). These custom versions have been bundled in the QuickNII tool, and have also been made available via the HBP Knowledge Graph as stand-alone versions in NIFTI format.	
Latest Release	31.03.2018	
TRL	NA	
Location	data hosted by Collaboratory storage	
Format	NIFTI	
Curation Status	COMPLETED	
Validation - QC	Unchecked	
Validation – Users	Yes: Maja Puchades; Martyna Checinska; Martin Øvsthus	
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	anonymous - share with anonymous non-consortium members	
License	Attribution ShareAlike	
Component Access URL	https://object.cscs.ch/v1/AUTH_6ebec77683fb472f94d352be92b5a577/Leergaard_SGA1_T5.2.1/list.html	Link not yet open, data not set to public in CSCS storage due to pending ethics clearance from SP12
Technical documentation URL	https://collab.humanbrainproject.eu/#/collab/5484/nav/42798	
Usage documentation URL	https://collab.humanbrainproject.eu/#/collab/5484/nav/42798	
Component dissemination material URL	https://collab.humanbrainproject.eu/#/collab/5484/nav/42798	

4.25 Component 1443 (28-20): Allen mouse brain reference atlas with white matter structures parcellated (data)

Field Name	Field Content	Additional Information
ID	1443	
Component Type	Data	
Contact	LEERGAARD, Trygve	

Component Description	In the Allen mouse brain reference atlas v2, white matter regions were not segmented as individual regions. This was a limitation for several visualisation and analytic purposes. We have therefore shifted to using v3 of the Allen mouse brain reference atlas, in which white matter bundles are delineated. This atlas employs a different template. Data mapped to v2 need to be transformed to fit with the v3 template, this will be done in SGA2. The HBP version of the atlas is a 3D NIFTI format volume which is embedded in the QuickNII tool and also shared as a stand-alone volume via the Knowledge Graph.	
Latest Release	31.03.2018	
TRL	NA	
Location	data hosted by Collaboratory storage	
Format	NIFTI	
Curation Status	COMPLETED	
Validation - QC	Unchecked	
Validation – Users	Yes; Maja Puchades; Martyna Checinska; Martin Øvsthus	
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	anonymous - share with anonymous non-consortium members	
License	Attribution ShareAlike	
Component Access URL	https://object.cscs.ch/v1/AUTH_6ebec77683fb472f94d352be92b5a577/Leergaard_SGA1_T5.2.1/list.html	
Technical documentation URL	https://collab.humanbrainproject.eu/#/collab/5484/nav/42798	
Usage documentation URL	https://collab.humanbrainproject.eu/#/collab/5484/nav/42798	
Component dissemination material URL	https://collab.humanbrainproject.eu/#/collab/5484/nav/42798	

4.26 Component 1446 (31-1): Tutorials, training and supervision in assignment of spatial metadata (service)

Field Name	Field Content	Additional Information
ID	1446	
Component Type	Service	
Contact	LEERGAARD, Trygve	

Component Description	The QuickNII tool (see T.5.4.2) is quite mature and a workflow for spatially defining large numbers of serial image data to reference atlas space has been tested and optimised. We will produce a tutorial and course material for providing practical training in the use of the tool and associated procedures. The UiO team will train users in hands-on courses as well as remotely by email and teleconference contact. Data produced in RUP (see T5.2.1) will be used for training purposes. Support will be given to researchers using the tools and procedures at HBP meetings, by phone, email, and teleconference.	
Latest Release	31.03.2018	
TRL	NOT APPLICABLE	
Location	COLLAB: Mapping 2D and 3D image data in reference atlas space: https://collab.humanbrainproject.eu/#/collab/5484/nav/42798	
Format	NA	
Curation Status	NA	
Validation - QC	Unchecked	
Validation – Users	Yi Lu, Arvind E. Wennberg, Joe Luchsinger, Johanne Rinholm, Jan Sigurd Blackstad, Ingvild Bjerke, Heidi Kleven, Lidia Allonso Nanclares, Gherardo Varando, Kristine Sand, Debora Lederberger, Daniel Schmitz, Csaba Erö; Christian von Linstow, Chatherine Kaczorowski, Camilla Hagen, Bruno Monterrotti, Guifen Chen, Michele Gianatti, Yann Leprince, Timo Dickscheid, Sven van der Burg, Sveinung Lillehaug, Simon McMullan, Sharon Yates, Rembrandt Bakker, Nicole Schubert, Julien Fiorilli, Mohit Srivastava, Martyna Chescinka, Ludovico Silvestri, Maria Garcia Amando Sandes, Marian Evangelio, Martin Øvsthus	
Validation – Publications	Determining and documenting the anatomical location of experimental neuroscience data: Best practice recommendations. Bjerke IE, Andersson KA, Øvsthus M, Puchades MA, Bjaalie JG, Leergaard TB. Annual meeting of the Society for Neuroscience, Washington DC, 2017, Abstract #342.19; Navigating the rodent brain: Best practice recommendations for determining and documenting spatial location for neuroscience data. Bjerke IE, Andersson KA, Øvsthus M, Puchades MA, Bjaalie JG, Leergaard TB. The Second Nordic Neuroscience Meeting, Stockholm, 2017, Abstract #D25; QuickNII: Neuroinformatics tool and workflow for anchoring of serial histological images in rodent brain 3D space. Puchades M, Csucs G, Checinska M, Øvsthus M, Bjerke IE, Andersson K, Leergaard TB, Bjaalie JG. Annual meeting of the Society for Neuroscience, Washington DC, 2017, Abstract #532.12; Data integration through digital brain atlasing: Human Brain Project infrastructure. Andersson KA, Øvsthus M, Bjerke IE, Puchades MA, Telefont M, Muller J, Dickscheid T, Leergaard TB, Bjaalie JG. Annual meeting of the Society for	

	Neuroscience, Washington DC, 2017, Abstract #623.13; Data integration through digital brain atlasing: semiautomatic spatial registration of serial histological images to rodent brain 3D reference atlases. Puchades MA, Øvsthus M, Bjerke IE, Andersson KA, Csucs G, Leergaard TB, Bjaalie JG. The Second Nordic Neuroscience Meeting, Stockholm, 2017, Abstract #D27; Data integration through brain atlasing: Human Brain Project tools and strategies. Bjerke IE, Øvsthus M, Papp EA, Yates SC, Silvestri L, Fiorilli J, Pennartz CMA, Pavone F, Puchades MA, Leergaard TB, Bjaalie JG. European Psychiatry, in press, 2018. http://dx.doi.org/10.1016/j.eurpsy.2018.02.004	
Privacy Constraints	No Privacy Constraint	
Sharing	anonymous - share with anonymous non-consortium members	
License	NOT APPLICABLE	
Component Access URL	https://collab.humanbrainproject.eu/#/collab/5484/nav/42798	
Technical documentation URL	https://collab.humanbrainproject.eu/#/collab/5484/nav/42798	
Usage documentation URL	https://collab.humanbrainproject.eu/#/collab/5484/nav/42798	
Component dissemination material URL	http://dx.doi.org/10.1016/j.eurpsy.2018.02.004	

4.27 Component 1447 (32-2): Validation and approval of spatial metadata before final entry in Knowledge Graph (service)

Field Name	Field Content	Additional Information
ID	1447	
Component Type	Service	
Contact	LEERGAARD, Trygve	
Component Description	Spatial metadata assigned to experimental data will be reviewed by a team of expert curators who will evaluate spatial accuracy and completeness, and approve data for ingestion in the Knowledge Graph.	
Latest Release	31.03.2018	
TRL	NOT APPLICABLE	
Location	https://collab.humanbrainproject.eu/#/collab/8911/nav/67417	
Format	NA	
Curation Status	NA	

Validation - QC	Unchecked	
Validation – Users	Camilla Hagen, Martin Øvsthus, Ingvild Bjerke, Sharon Yates, Maja Puchades; Heidi Kleven	
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	anonymous - share with anonymous non-consortium members	
License	NOT APPLICABLE	
Component Access URL	https://collab.humanbrainproject.eu/#/collab/8911/nav/67417	
Technical documentation URL	https://collab.humanbrainproject.eu/#/collab/8911/nav/67417	
Usage documentation URL	https://collab.humanbrainproject.eu/#/collab/8911/nav/67417	
Component dissemination material URL	https://collab.humanbrainproject.eu/#/collab/8911/nav/67417	

4.28 Component 1448 (37-7): Curation of semantic spatial metadata delivered in T5.1.1. (service)

Field Name	Field Content	Additional Information
ID	1448	
Component Type	service	
Contact	LEERGAARD, Trygve	
Component Description	A team of experts in assignment of anatomical location have in SGA1 provided a service for mapping 2D and 3D image data to reference atlas space, and have evaluated the granularity, accuracy and completeness of spatial metadata assigned to experimental data delivered to the Neuroinformatics Platform	
Latest Release	2018-03-31	
TRL	NOT APPLICABLE	
Location	https://collab.humanbrainproject.eu/#/collab/8911/nav/67417	
Format	NA	
Curation Status	NA	
Validation - QC	Unchecked	
Validation – Users	Camilla Hagen, Martin Øvsthus, Ingvild Bjerke, Sharon Yates, Maja Puchades; Heidi Kleven	
Validation – Publications	No	

Privacy Constraints	No Privacy Constraint	
Sharing	consortium - share with any consortium members	
License	NOT APPLICABLE	
Component Access URL	https://collab.humanbrainproject.eu/#/collab/8911/nav/67417	
Technical documentation URL	https://collab.humanbrainproject.eu/#/collab/8911/nav/67417	
Usage documentation URL	https://collab.humanbrainproject.eu/#/collab/8911/nav/67417	
Component dissemination material URL	https://collab.humanbrainproject.eu/#/collab/8911/nav/67417	

4.29 Component 1449 (33-3): Optimised procedure for anchoring of 2D image data to reference atlas (report)

Field Name	Field Content	Additional Information
ID	1449	
Component Type	Report	
Contact	LEERGAARD, Trygve	
Component Description	As optimised versions of the QuickNII tool for spatial registration are released for HBP and public use, data registration procedures and associated tutorials will be updated and optimised, also taking into account accumulated user experiences.	
Latest Release	31.03.2018	
TRL	NA	
Location	data hosted by collaboratory storage	https://collab.humanbrainproject.eu/#/collab/5484/nav/42798
Format	NA	
Curation Status	NA	
Validation - QC	NA	
Validation – Users	Camilla Hagen, Martin Øvsthus, Ingvild Bjerke, Sharon Yates, Maja Puchades; Heidi Kleven	
Validation – Publications	QuickNII: Neuroinformatics tool and workflow for anchoring of serial histological images in rodent brain 3D space. Puchades M, Csucs G, Checinska M, Øvsthus M, Bjerke IE, Andersson K, Leergaard TB, Bjaalie JG. Annual meeting of the Society for Neuroscience, Washington DC, 2017, Abstract #532.12; Manuscript in preparation	
Privacy Constraints	No Privacy Constraint	

Sharing	anonymous - share with anonymous non-consortium members	
License	NA	
Component Access URL	https://collab.humanbrainproject.eu/#/collab/5484/nav/42798	
Technical documentation URL	https://collab.humanbrainproject.eu/#/collab/5484/nav/42798	
Usage documentation URL	https://collab.humanbrainproject.eu/#/collab/5484/nav/42798	
Component dissemination material URL	https://collab.humanbrainproject.eu/#/collab/5484/nav/42798	

4.30 Component 1450 (34-4): Procedure for anchoring of 3D image data to reference atlas (report)

Field Name	Field Content	Additional Information
ID	1450	
Component Type	Report	
Contact	LEERGAARD, Trygve	
Component Description	This procedure will build on the QuickNII tool and procedures for anchoring 2D data to reference atlas space, and be adapted for handling of volumetric image data as series of pre-aligned 2D images.	
Latest Release	31.03.2018	
TRL	NA	
Location	data hosted by Collaboratory storage	
Format	NA	
Curation Status	NA	
Validation - QC	Unchecked	
Validation – Users	Camilla Hagen, Martin Øvsthus, Ingvild Bjerke, Sharon Yates, Maja Puchades; Heidi Kleven	
Validation – Publications	QuickNII: Neuroinformatics tool and workflow for anchoring of serial histological images in rodent brain 3D space. Puchades M, Csucs G, Checinska M, Øvsthus M, Bjerke IE, Andersson K, Leergaard TB, Bjaalie JG. Annual meeting of the Society for Neuroscience, Washington DC, 2017, Abstract #532.12; Manuscript in preparation	
Privacy Constraints	No Privacy Constraint	
Sharing	anonymous - share with anonymous non-consortium members	
License	NA	

Component Access URL	https://collab.humanbrainproject.eu/#/collab/5484/nav/42798	
Technical documentation URL	https://collab.humanbrainproject.eu/#/collab/5484/nav/42798	
Usage documentation URL	https://collab.humanbrainproject.eu/#/collab/5484/nav/42798	
Component dissemination material URL	https://collab.humanbrainproject.eu/#/collab/5484/nav/42798	

4.31 Component 1461 (101-1): Large-Scale Image Service

Field Name	Field Content	Additional Information
ID	1461	
Component Type	service	
Contact	MULLER, Jeffrey	
Component Description	For the scalable distribution of HBP reference atlases to the interactive, web-based Neuroglancer viewer, the data is served over HTTP from precomputed image volumes processed according to the Neuroglancer specification.	
Latest Release	2018-03-31	
TRL	TRL8	
Location	https://bigbrain.humanbrainproject.org https://jubrain.humanbrainproject.org https://waxholm.humanbrainproject.org https://amba.humanbrainproject.org	
Format	web	
Curation Status	NA	
Validation - QC	Unchecked	Informal QA provided HBP NeHuBa developers
Validation – Users	Yes	See KPIs for KR5.5
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	anonymous - share with anonymous non-consortium members	
License	Closed source - contact software owner	
Component Access URL	https://bigbrain.humanbrainproject.org https://jubrain.humanbrainproject.org https://waxholm.humanbrainproject.org https://amba.humanbrainproject.org	

Technical documentation URL	https://github.com/google/neuroglancer in particular this service distributes files using: https://github.com/google/neuroglancer/tree/master/src/neuroglancer/datasource/precomputed https://github.com/HumanBrainProject/neuroglancer-scripts for precomputed volume generation	
Usage documentation URL	NA – used through the NeHuBa or neuroglancer views.	
Component dissemination material URL	Service component visible via atlas viewers embedded here: https://www.humanbrainproject.eu/en/explore-the-brain/atlases/	

4.32 Component 1469 (72-2): Data Workbench

Field Name	Field Content	Additional Information
ID	1469	
Component Type	service	
Contact	MULLER, Jeffrey	
Component Description	A crucial web UI and REST API used for uploading, reviewing and managing the release workflow of Tier 1 metadata provided by curators into the Knowledge Graph database and subsequently into the KG Search UI.	
Latest Release	2018-03-31	
TRL	TRL 6 - Prototype-to-Real-world Integration	
Location	https://data-workbench.herokuapp.com/	
Format	web	
Curation Status	NA	
Validation - QC	Unchecked	
Validation – Users	Yes	Validated with HBP Internal customers
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	consortium - share with any consortium members	
License	Closed source - contact software owner	
Component Access URL	https://data-workbench.herokuapp.com/	
Technical documentation URL	Not available – early internal product	
Usage documentation URL	Not available – early internal product	

Component dissemination material URL	Not available – early internal product	

4.33 Component 1470 (83-9): QuickNII v 2.0: updated functionality and new procedures for propagation of anchoring information through large series of images (software)

Field Name	Field Content	Additional Information
ID	1470	
Component Type	software	
Contact	BJAALIE, Jan	
Component Description	The next generation of the QuickNII software (v 2.0) will be optimised for faster anchoring of large series of 2D images to the reference atlases. The new version will build on the version from the RUP (product 76-2.) and will include new functionality for propagating spatial transformations across series of sections following anchoring of selected images.	
Latest Release	2018-03-31	
TRL	TRL6	
Location	data hosted by task providing dataset	
Format	NA	
Curation Status	NA	
Validation - QC	Unchecked	
Validation – Users	Yes	UiO (P81) users: 21; HBP non-UIO: 17. Non-HBP: 7.
Validation – Publications	QuickNII: Neuroinformatics tool and workflow for anchoring of serial histological images in rodent brain 3D space. Puchades M, Csucs G, Checinska M, Øvsthus M, Bjerke IE, Andersson K, Leergaard TB, Bjaalie JG. Annual meeting of the Society for Neuroscience, Washington DC, 2017, Abstract #532.12	Data integration through digital brain atlasing: semiautomatic spatial registration of serial histological images to rodent brain 3D reference atlases. Puchades MA, Øvsthus M, Bjerke IE, Andersson KA, Csucs G, Leergaard TB, Bjaalie JG. The Second Nordic Neuroscience Meeting, Stockholm, 2017, Abstract#D27; Data integration through brain

		atlasing: Human Brain Project tools and strategies. Bjerke IE, Øvsthus M, Papp EA, Yates SC, Silvestri L, Fiorilli J, Pennartz CMA, Pavone F, Puchades MA, Leergaard TB, Bjaalie JG. European Psychiatry, 50:70-76 (2018). http://dx.doi.org/10.1016/j.eurpsy.2018.02.004
Privacy Constraints	No Privacy Constraint	
Sharing	consortium - share with any consortium members	
License	Closed source - non-commercial	
Component Access URL	https://collab.humanbrainproject.eu/#/collab/5484/nav/42798	
Technical documentation URL	https://collab.humanbrainproject.eu/#/collab/5484/nav/42798	
Usage documentation URL	https://collab.humanbrainproject.eu/#/collab/5484/nav/42798	
Component dissemination material URL	http://dx.doi.org/10.1016/j.eurpsy.2018.02.004	

4.34 Component 1473 (50-3): Big Brain Release 2015 registered and curated (data)

Field Name	Field Content	Additional Information
ID	1473	
Component Type	data	
Contact	DICKSCHEID, Timo	
Component Description	The 2015 release of the Big Brain will be discoverable in the HBP atlas, have a spatial correspondence to at least one of the accepted template spaces, and all relevant metadata registered in the Knowledge Graph.	
Latest Release	NA	
TRL	NA	
Location	data hosted by the Neuroinformatics Platform	
Format	minc, png, NIfTI, neuroglancer precomputed tile format	
Curation Status	Curation completed	
Validation - QC	Pass	

Validation – Users	Yes	Validated with HBP Internal customers
Validation – Publications	Amunts, K., Lepage, C., Borgeat, L., Mohlberg, H., Dickscheid, T., Rousseau, M., Bludau, S., Bazin, P., Lewis, L., Oros-Peusquens, A., Shah, N., Lippert, T., Zilles, K., Evans, A. (2013) BigBrain - an ultra-high resolution 3D human brain model. Science 340:6139, 1472-1475	
Privacy Constraints	Human Research	
Sharing	anonymous - share with anonymous non-consortium members	
License	Attribution Non-commercial ShareAlike	
Component Access URL	http://bigbrain.humanbrainproject.org/	
Technical documentation URL	NA	
Usage documentation URL	NA	
Component dissemination material URL	NA	

4.35 Component 1474 (93-1): Knowledge Graph Service

Field Name	Field Content	Additional Information
ID	1474	
Component Type	service	
Contact	MULLER, Jeffrey	
Component Description	Provides the database for all metadata stored in the Neuroinformatics Platform	
Latest Release	2018-03-31	
TRL	TRL8	
Location	https://www.humanbrainproject.eu/en/explore-the-brain/search/	
Format	web	
Curation Status	NA	
Validation - QC	Pass	Agile QA, Product Owner Oliver Schmid
Validation – Users	No	Not possible, recently released
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	anonymous - share with anonymous non-consortium members	

License	Apache v2 license	
Component Access URL	https://www.humanbrainproject.eu/en/explore-the-brain/search/	
Technical documentation URL	REST API documentation is based on BBP Nexus and is available here: https://bbp-nexus.epfl.ch/staging/docs/kg/	
Usage documentation URL	Used through the KG Search UI	
Component dissemination material URL	Disseminated through the KG Search UI	

4.36 Component 51-4: Infant atlas and major tracts in infant brains registered and curated

Field Name	Field Content	Additional Information
ID	1476	
Component Type	data	
Contact	ZAFARNIA, Sara	
Component Description		
Latest Release	2018-03-31	
TRL	NA	
Location	data hosted by the Neuroinformatics Platform	
Format	nifti, Brainvisa Mesh, gifti, csv	
Curation Status	Tier 1 curation complete	
Validation - QC	Pass	ZAFARNIA, Sara
Validation – Users	Yes	ZAFARNIA, Sara
Validation – Publications	Kabdebon, C., Leroy, F., Simmonet, H., Perrot, M., Dubois, J., Dehaene-Lambertz, G. (2014) Anatomical correlations of the international 10-20 sensor placement system in infants. Neuroimage. 99, 342-56	
Privacy Constraints	Human Research	
Sharing	public authenticated - share with authenticated non-consortium members e.g. public Collab	
License	Release License Unspecified	
Component Access URL	https://object.cscs.ch/v1/AUTH_227176556f3c4bb38df9feea4b91200c/Infant/infant-template.zip	
Technical documentation URL	NA	
Usage documentation URL	NA	

Component dissemination material URL		

4.37 Component 1477 (94-2): Knowledge Graph Python API

Field Name	Field Content	Additional Information
ID	1477	
Component Type	software	
Contact	MULLER, Jeffrey	
Component Description	Known as the Pyxus API, this is the preferred interface to the the HBP Knowledge Graph for Jupyter notebook users and for those with software development expertise.	
Latest Release	2018-03-31	
TRL	TRL8	
Location	https://github.com/HumanBrainProject/pyxus	
Format	Python software library	
Curation Status	NA	
Validation - QC	Pass	Agile QA, Product Owner Oliver Schmid
Validation – Users	No	Not possible, recently released
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	anonymous - share with anonymous non-consortium members	
License	Apache v2 license	
Component Access URL	https://github.com/HumanBrainProject/pyxus	
Technical documentation URL	https://github.com/HumanBrainProject/pyxus	
Usage documentation URL	https://collab.humanbrainproject.eu/#/collab/5495/nav/42887	
Component dissemination material URL	https://collab.humanbrainproject.eu/#/collab/5495/nav/42887	

4.38 Component 1486 (111-1): Spatial Search API

Field Name	Field Content	Additional Information
ID	1486	

Component Type	service	
Contact	MULLER, Jeffrey	
Component Description	A Proof-of-Concept REST service for spatial search based on Lucene indexes and the Solr clustered search engine.	
Latest Release	2018-03-31	
TRL	TRL7 (monitored but SLA underfined)	
Location	https://collab.humanbrainproject.eu/#/collab/5449/nav/67018	
Format	NA	
Curation Status	NA	
Validation - QC	Unchecked	PoC
Validation – Users	Yes	Validated with HBP Internal customers
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	anonymous - share with anonymous non-consortium members	
License	Closed source - contact software owner	
Component Access URL	https://collab.humanbrainproject.eu/#/collab/5449/nav/67018	
Technical documentation URL	https://collab.humanbrainproject.eu/#/collab/5449/nav/67019	
Usage documentation URL	https://collab.humanbrainproject.eu/#/collab/5449/nav/67020	
Component dissemination material URL		

4.39 Component 1489 (106-1): HBP Standard Deployment service

Field Name	Field Content	Additional Information
ID	1489	
Component Type	service	
Contact	MULLER, Jeffrey	
Component Description	This service ensures that NIP services are deployed and operated in a consistent and efficient manner.	
Latest Release	2018-03-31	
TRL	TRL7 (monitored but SLA undefined)	

Location	https://gitlab.humanbrainproject.org/ (private)	
Format	NA	
Curation Status	NA	
Validation - QC	Unchecked	Users are the service owners
Validation – Users	Yes	Validated with HBP Internal customers
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	consortium - share with any consortium members	
License	Closed source - contact software owner	
Component Access URL	https://gitlab.humanbrainproject.org/(private)	
Technical documentation URL	https://docs.gitlab.com/ee/administration/index.html	
Usage documentation URL	https://docs.gitlab.com/ee/user/index.html	
Component dissemination material URL	NA - Dissemination limited to selected SP5 developer audiences.	

4.40 Component 1492 (56-9): Wistar rat brain fibre orientation model registered and curated (data)

Field Name	Field Content	Additional Information
ID	1492	
Component Type	data	
Contact	Schubert, Nicole	
Component Description	The Wistar rat brain fibre orientation model delivered from SP2 after the RUP, is mapped to the WHS rat brain atlaswith metadata registered in the Knowledge Graph.	
Latest Release	2018-03-31	
TRL	NA	
Location	data hosted by Neuroinformatics Platform	
Format	nifti	
Curation Status	Complete	
Validation - QC	Yes	KLEVEN, Heidi
Validation – Users	Yes	DICKSCHEID, Timo

Validation – Publications	No	
Privacy Constraints	Animal Research	
Sharing	Public	
License	Attribution Non-commercial ShareAlike	
Component Access URL	https://object.cscs.ch/v1/AUTH_6ebec77683fb472f94d352be92b5a577/Dickscheid_SGA1_T5.3.1/list.html	
Technical documentation URL	Information available from Knowledge Graph (query ID = hbp-01492)	
Usage documentation URL	Information available from Knowledge Graph (query ID = hbp-01492)	
Component dissemination material URL	Information available from Knowledge Graph (query ID = hbp-01492)	

4.41 Component 1495: Connection of ilastik to HBP 2D and 3D viewers

Field Name	Field Content	Additional Information
ID	1495	
Component Type	software	
Contact	KRESHUK, Anna	
Component Description	Enables visualisation of ilastik internal image layers inside the HBP viewer running inside a client browser	
Latest Release	V0.1.1a1	
TRL	TRL 4 - Prototype Component	
Location	data hosted by other non-HBP 3rd party	
Format	Included in docker container: ilastik/ilastik-server	
Curation Status	NA	
Validation - QC	Pass	
Validation – Users	Yes	Pavel CHERVAKOV (JUELICH)
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	public authenticated - share with authenticated non-consortium members e.g. public Collab	
License	GPLv2/GPLv3	
Component Access URL	https://hub.docker.com/r/ilastik/ilastik-server/	
Technical documentation URL	https://github.com/k-dominik/ilastik-http	

Usage documentation URL	https://github.com/k-dominik/ilastik-http	
Component dissemination material URL	https://github.com/k-dominik/ilastik-http	

4.42 Component 1496: Connection of ilastik to other HBP services

Field Name	Field Content	Additional Information
ID	1496	
Component Type	software	
Contact	KRESHUK, Anna	
Component Description	Allows accessing HBP computational and storage resources	
Latest Release	V0.0.3a1	
TRL	TRL 4 - Prototype Component	
Location	data hosted by other non-HBP 3rd party	
Format	Included in docker container: ilastik/ilastik-server	
Curation Status	NA	
Validation - QC	Pass	
Validation – Users	Yes	Pavel CHERVAKOV (Juelich)
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	public authenticated - share with authenticated non-consortium members e.g. public Collab	
License	GPLv2/GPLv3	
Component Access URL	https://hub.docker.com/r/ilastik/ilastik-server/	
Technical documentation URL	https://hub.docker.com/r/ilastik/ilastik-server/	
Usage documentation URL	https://hub.docker.com/r/ilastik/ilastik-server/	
Component dissemination material URL	https://hub.docker.com/r/ilastik/ilastik-server/	

4.43 Component 1498 (85-11): LocaliZoom: viewer for series of 2D images with reference atlas superimposed (software)

Field Name	Field Content	Additional Information

ID	1498	
Component Type	software	
Contact	BJAALIE, Jan	
Component Description	Web-viewer tool for viewing of series of 2D images that have been anchored to reference atlases. The tool allows display of the relevant reference atlas cut planes superimposed on the images at a user-defined level of transparency. The tool has additional functions for graphical and semantic annotation functionality and reading of spatial coordinates (Waxholm Space and Bregma coordinates) for points-of-interest in the images. Spatial coordinates can be exported to MeshView v 2.0 (product 86-12).	
Latest Release	2018-03-31	
TRL	TRL6	
Location	data hosted by task providing dataset	
Format	web	
Curation Status	NA	
Validation - QC	Unchecked	
Validation – Users	Yes, Trygve Leergaard, Maja Puchades, Martin Øvsthus, Ingvild Bjerke	UIO (P81): 15; HBP Collab, Data sharing for CrossSeeds project (non-HBP, but EU: http://www.crosssee ds.eu/) with 5 different research institutions, unknown amount of individual users
Validation – Publications	Data integration through brain atlasing: Human Brain Project tools and strategies. Bjerke IE, Øvsthus M, Papp EA, Yates SC, Silvestri L, Fiorilli J, Pennartz CMA, Pavone F, Puchades MA, Leergaard TB, Bjaalie JG. European Psychiatry 50, 70-76 (2018). http://dx.doi.org/10.1016/j.eurpsy.2018.02.004	
Privacy Constraints	No Privacy Constraint	
Sharing	public authenticated - share with authenticated non-consortium members e.g. public Collab	
License	Closed source - non-commercial	
Component Access URL	https://collab.humanbrainproject.eu/#/collab/5484 /nav/42798	
Technical documentation URL	https://collab.humanbrainproject.eu/#/collab/5484 /nav/42798	
Usage documentation URL	https://collab.humanbrainproject.eu/#/collab/5484 /nav/42798	
Component dissemination material URL		

4.44 Component 1503: Web based big data viewer for navigating the Big Brain in three planes at different resolutions

Field Name	Field Content	Additional Information
ID	1503	
Component Type	software	
Contact	CHERVAKOV, Pavel	
Component Description	Web-based viewer for high-resolution Big Brain data with capabilities for interactively panning and zooming the image data in three different planes.	
Latest Release	NA	
TRL	TRL 5 - Prototype Integration	
Location	data hosted by task providing dataset	
Format	NA	
Curation Status	NA	
Validation - QC	Pass	CHERVAKOV, Pavel
Validation – Users	The software is deployed online for different reference atlases: http://bigbrain.humanbrainproject.org, http://jubrain.humanbrainproject.org, http://waxholm.humanbrainproject.org, http://amba.humanbrainproject.org The software has been demonstrated to users inside and outside HBP in the context of the Glasgow Summit and several community events (e.g. as part of Katrin Amunts' pre-conference tutorial session at SfN 2017). A demo is planned for OHBM 2018 in Singapore.	
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	partner - share only with the originating partner	
License	Closed source- contact software owner	
Component Access URL	uploaded to an approved HBP data repository location, see confidential annex 5	
Technical documentation URL	https://collab.humanbrainproject.eu/#/collab/2689/nav/39750	
Usage documentation URL	https://collab.humanbrainproject.eu/#/collab/2689/nav/39750	
Component dissemination material URL		

4.45 Component 2283 (1-1b): Metadata used to enrich SGA1 data and models (data)

Field Name	Field Content	Additional Information
ID	2283	
Component Type	report	
Contact	ANDERSSON, Krister	
Component Description	SGA1 Data and Models will be enriched so as to make them discoverable via the Neuroinformatics Platform (NIP).	
Latest Release	2018-03-31	
TRL	NA	
Location	data hosted by Collaboratory storage	
Format	web	
Curation Status	NA	
Validation - QC	Pass	KLEVEN, Heidi
Validation – Users	Yes	ANDERSON, Krister; KLEVEN, Heidi
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	anonymous - share with anonymous non-consortium members	
License	NA	
Component Access URL	https://collab.humanbrainproject.eu/#/collab/9127/nav/69005	
Technical documentation URL	https://collab.humanbrainproject.eu/#/collab/9127/nav/69005	
Usage documentation URL	https://collab.humanbrainproject.eu/#/collab/9127/nav/69005	
Component dissemination material URL		

4.46 Component 2285 (4-2): Ontology for data/model discoverability annotation (data)

Field Name	Field Content	Additional Information
ID	2285	

Component Type	report	
Contact	ANDERSSON, Krister	
Component Description	This Task will build necessary ontologies (create new or integrate/adapt existing where applicable) to support the process of curating all RUP/SGA1 data and models. These ontologies will enable HBP users to perform queries on the Knowledge Graph that address their scientific Use Cases.	
Latest Release	2018-03-31	
TRL	NA	
Location	data hosted by Collaboratory storage	
Format	web	
Curation Status	NA	
Validation - QC	Pass	KLEVEN, Heidi
Validation – Users	Yes	ANDERSON, Krister; KLEVEN, Heidi
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	anonymous - share with anonymous non-consortium members	
License	NA	
Component Access URL	https://collab.humanbrainproject.eu/#/collab/7574/nav/57656	
Technical documentation URL	https://collab.humanbrainproject.eu/#/collab/7574/nav/57656	
Usage documentation URL	https://collab.humanbrainproject.eu/#/collab/7574/nav/57656	
Component dissemination material URL		

4.47 Component 2423 (60-1): Web-based multi-resolution three-planar viewer for large image volumes

Field Name	Field Content	Additional Information
ID	2423	
Component Type	software	
Contact	LEPRINCE, Yann	

Component Description	Cross-scale Interactive Spatial Alignment Tool for Partial Volumes: HTTP front end and services to provide semi-automatic spatial registration of partial volumes into existing human brain templates across scales. Such volumes could be block-wise quantitative images natively acquired in 3D, or image stacks with proper spatial coherence such as region-wise reconstructions from histological sections. For example, it should be possible for a user to spatially align an ultra-high resolution ROI from light-microscopy with the BigBrain model to enrich the atlas with more volumetric details.	2423 provides three orthogonal planar views into the incoming and template volumes.
Latest Release	NA	
TRL	TRL 4 - Prototype Component	
Location	data hosted by task providing dataset	
Format	NA	
Curation Status	NA	
Validation - QC	Pass	LEPRINCE, Yann
Validation – Users	The software has been demonstrated to users inside and outside HBP in the context of the Glasgow Summit and several community events (e.g. as part of Katrin Amunts' pre-conference tutorial session at SfN 2017). A demo is planned for OHBM 2018 in Singapore.	
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	partner - share only with the originating partner	
License	Closed source- contact software owner	
Component Access URL	https://www.jubrain.fz-juelich.de/apps/landmark-reg/	
Technical documentation URL	https://www.jubrain.fz-juelich.de/apps/landmark-reg/	
Usage documentation URL	https://www.jubrain.fz-juelich.de/apps/landmark-reg/	
Component dissemination material URL		

4.48 Component 2424 (61-1): Selection, management and navigation of many landmarks

Field Name	Field Content	Additional Information
ID	2424	
Component Type	software	
Contact	LEPRINCE, Yann	

Component Description	Cross-scale Interactive Spatial Alignment Tool for Partial Volumes: HTTP front end and services to provide semi-automatic spatial registration of partial volumes into existing human brain templates across scales. Such volumes could be block-wise quantitative images natively acquired in 3D, or image stacks with proper spatial coherence such as region-wise reconstructions from histological sections. For example, it should be possible for a user to spatially align an ultra-high resolution ROI from light-microscopy with the BigBrain model to enrich the atlas with more volumetric details.	2424: This product will implement a web-based HTML5 interface that allows interactive input and management of many 3D landmarks, i.e. explicit corresponding points in two synchronised views: a view of the incoming partial 3D volume that is being spatially anchored, and a view of the reference template volume. Either volume should be visualised through an image service which supports streaming of multi-resolution data, in order to allow for very large volumes.
Latest Release	NA	
TRL	TRL 4 - Prototype Component	
Location	data hosted by task providing dataset	
Format	NA	
Curation Status	NA	
Validation - QC	Pass	LEPRINCE, Yann
Validation – Users	Yes	
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	partner - share only with the originating partner	
License	Closed source- contact software owner	
Component Access URL	https://www.jubrain.fz-juelich.de/apps/landmark-reg/	
Technical documentation URL	https://www.jubrain.fz-juelich.de/apps/landmark-reg/	
Usage documentation URL	https://www.jubrain.fz-juelich.de/apps/landmark-reg/	
Component dissemination material URL		

4.49 Component 2425 (61-2): Affine transformation estimation from landmarks

Field Name	Field Content	Additional Information
ID	2425	
Component Type	software	
Contact	LEPRINCE, Yann	
Component Description	Cross-scale Interactive Spatial Alignment Tool for Partial Volumes: HTTP front end and services to provide semi-automatic spatial registration of partial volumes into existing human brain templates across scales. Such volumes could be block-wise quantitative images natively acquired in 3D, or image stacks with proper spatial coherence such as region-wise reconstructions from histological sections. For example, it should be possible for a user to spatially align an ultra-high resolution ROI from light-microscopy with the BigBrain model to enrich the atlas with more volumetric details.	2425: This product will implement a back end that can derive an optimal 3D affine transformation from a set of explicit pointwise landmark correspondences, entered using the front end developed in the previous component 2424.
Latest Release	NA	
TRL	TRL 4 - Prototype Component	
Location	data hosted by task providing dataset	
Format	NA	
Curation Status	NA	
Validation - QC	Pass	LEPRINCE, Yann
Validation – Users	The software has been demonstrated to users inside and outside HBP in the context of the Glasgow Summit and several community events (e.g. as part of Katrin Amunts' pre-conference tutorial session at SfN 2017). A demo is planned for OHBM 2018 in Singapore.	
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	partner - share only with the originating partner	
License	Closed source- contact software owner	
Component Access URL	https://www.jubrain.fz-juelich.de/apps/landmark-reg/	
Technical documentation URL	https://www.jubrain.fz-juelich.de/apps/landmark-reg/	
Usage documentation URL	https://www.jubrain.fz-juelich.de/apps/landmark-reg/	
Component dissemination material URL		

4.50 Component 61-3: Iterative workflow loop for landmark adjustment

Field Name	Field Content	Additional Information
ID	2426	
Component Type	software	
Contact	LEPRINCE, Yann	
Component Description	Cross-scale Interactive Spatial Alignment Tool for Partial Volumes: HTTP front end and services to provide semi-automatic spatial registration of partial volumes into existing human brain templates across scales. Such volumes could be block-wise quantitative images natively acquired in 3D, or image stacks with proper spatial coherence such as region-wise reconstructions from histological sections. For example, it should be possible for a user to spatially align an ultra-high resolution ROI from light-microscopy with the BigBrain model to enrich the atlas with more volumetric details.	2426: This product will implement a controlled interactive loop, during which corresponding landmarks can be updated, added, or deleted in order to refine the registration. The effect on the registration made visible after each update, and the option is given to the user to re-slice the incoming partial volume in order to align its axes with the axes of the template volume.
Latest Release	NA	
TRL	TRL 4 - Prototype Component	
Location	data hosted by task providing dataset	
Format	NA	
Curation Status	NA	
Validation - QC	Pass	LEPRINCE, Yann
Validation – Users	The software has been demonstrated to users inside and outside HBP in the context of the Glasgow Summit and several community events (e.g. as part of Katrin Amunts' pre-conference tutorial session at SfN 2017). A demo is planned for OHBM 2018 in Singapore.	
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	partner - share only with the originating partner	
License	Closed source- contact software owner	
Component Access URL	https://www.jubrain.fz-juelich.de/apps/landmark-reg/	
Technical documentation URL	https://www.jubrain.fz-juelich.de/apps/landmark-reg/	

Usage documentation URL	https://www.jubrain.fz-juelich.de/apps/landmark-reg/	
Component dissemination material URL		

4.51 Component 2432 (86-12): MeshView v2.0: updated functionality, viewing of annotations from LocaliZoom (software)

Field Name	Field Content	Additional Information
ID	2432	
Component Type	software	
Contact	BJAALIE, Jan	
Component Description	The next generation of the MeshView web-viewer for interactive viewing of volumetric vector-based meshes from reference atlases and cutting of the reference atlas volumes in arbitrary, user-defined planes, providing customised atlas plates. The new version will provide functionality for viewing of annotations from LocaliZoom (product 85-11). MeshView v2.0 thus delivers results aggregated from series of 2D images, anchored to reference atlas using QuickNII and annotated in LocaliZoom.	
Latest Release	2018-03-31	
TRL	TRL7	
Location	data hosted by task providing dataset	
Format	Web	
Curation Status	NA	
Validation - QC	Unchecked	
Validation – Users	Yes	UIO(P81): 17 users; HBP Collab – unknown amount of users.
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	anonymous - share with anonymous non-consortium members	
License	Closed source - non-commercial	
Component Access URL	https://www.nitrc.org/projects/meshgen	
Technical documentation URL	https://www.nitrc.org/projects/meshgen	
Usage documentation URL	https://www.nitrc.org/projects/meshgen	

Component dissemination material URL	https://www.nitrc.org/projects/meshgen	

4.52 Component 2482 (105-1): Collaboratory

Field Name	Field Content	Additional Information
ID	2482	
Component Type	service	
Contact	MULLER, Jeffrey	
Component Description	Used for dissemination of key Use Cases in the form of documentation or sample usage through Jupyter notebooks.	
Latest Release	2018-03-31	
TRL	TRL8	
Location	https://collab.humanbrainproject.eu	
Format	NA	
Curation Status	NA	
Validation - QC	Pass	Agile QA, Product Owner Allan Francani
Validation – Users	466 unique users, 4,029 sessions, 1h47m avg session time (Feb 21-Mar 21, 2018)	
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	public authenticated - share with authenticated non-consortium members e.g. public Collab	
License	Closed source - contact software owner	
Component Access URL	https://collab.humanbrainproject.eu	
Technical documentation URL	https://collab.humanbrainproject.eu/#/collab/54/nav/368	
Usage documentation URL	https://collab.humanbrainproject.eu/#/collab/3/nav/8193	
Component dissemination material URL	https://collab.humanbrainproject.eu	

4.53 HBP Knowledge Graph Indexer

Field Name	Field Content	Additional Information
ID	2620	
Component Type	service	
Contact	MULLER, Jeffrey	
Component Description	The Knowledge Graph alone does not offer sufficient performance for a number of use cases, notably interactive search and the KG Analytics UI. For this reason, custom daemonized indexers have been written to continually translate data into an efficient form for these additional use cases.	
Latest Release	2018-03-31	
TRL	TRL8	
Location	Visible through https://www.humanbrainproject.eu/en/explore-the-brain/search/	
Format	web	
Curation Status	NA	
Validation - QC	Pass	Agile QA, Product Owner Oliver Schmid
Validation – Users	No	Not possible, recently released
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	partner - share only with the originating partner	
License	Apache v2 license	
Component Access URL	https://www.humanbrainproject.eu/en/explore-the-brain/search/	
Technical documentation URL		
Usage documentation URL		
Component dissemination material URL		

4.54 Component 2909: Extension of web-based 3D viewer for selecting and displaying a parcellation as a semi-transparent overlay

Field Name	Field Content	Additional Information
ID	2909	
Component Type	software	
Contact	GUI, Xiaoyun	
Component Description	In this extended version, the user will be able to choose a parcellation from a list, which is then displayed as a semi-transparent overlay on top of the original contrast. We assume the parecellation to be given as a labelled (integer) volume dataset	
Latest Release	NA	
TRL	TRL 4 - Prototype Component	
Location	data hosted by task providing dataset	
Format	NA	
Curation Status	NA	
Validation - QC	Pass	GUI, Xiayun
Validation – Users	The software is deployed as a test installation for initial verification by selected HBP researchers. The software has been demonstrated to users inside and outside HBP in the context of the Glasgow Summit and several community events (e.g. as part of Katrin Amunts' pre-conference tutorial session at SfN 2017). A demo is planned for OHBM 2018 in Singapore.	
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	partner - share only with the originating partner	
License	Closed source- contact software owner	
Component Access URL	uploaded to an approved HBP data repository location, see confidential annex	
Technical documentation URL		
Usage documentation URL		
Component dissemination material URL		

4.55 Component 2911 (93-2): Knowledge Graph Elastic Search Index Service

Field Name	Field Content	Additional Information
ID	2911	
Component Type	service	
Contact	MULLER, Jeffrey	
Component Description	The NIP search interface uses a standardised, full-featured javascript library known as Searchkit. For this interface to function, it needs to have a specially prepared Elastic Search schema which is represented in the Knowledge Graph Elastic Search Index component.	
Latest Release	2018-03-31	
TRL	TRL8	
Location	https://www.humanbrainproject.eu/en/explore-the-brain/search	
Format	web	
Curation Status	NA	
Validation - QC	Pass	Agile QA, Product Owner Oliver Schmid
Validation – Users	No	Not possible, recently released
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	anonymous - share with anonymous non-consortium members	
License	Apache v2 license	
Component Access URL	https://www.humanbrainproject.eu/en/explore-the-brain/search	
Technical documentation URL	Not available	
Usage documentation URL	Not available – designed to function without user documentation according to standard faceted search conventions.	
Component dissemination material URL	https://www.humanbrainproject.eu/en/explore-the-brain/search	

4.56 Component 2914 (111-2): Spatial Index for Knowledge Graph

Field Name	Field Content	Additional Information
ID	2914	
Component Type	service	
Contact	MULLER, Jeffrey	
Component Description	A customised Lucene spatial index allowing for efficient 3d range queries over large spatial datasets. This component is the basis for the Spatial Search API.	
Latest Release	2018-03-31	
TRL	TRL7 (monitored butSLA undefined)	
Location	https://collab.humanbrainproject.eu/#/collab/5449/nav/67018	
Format	NA	
Curation Status	NA	
Validation - QC	Unchecked	PoC
Validation – Users	Yes	Validated with HBP Internal customers
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	anonymous - share with anonymous non-consortium members	
License	Closed source - contact software owner	
Component Access URL	https://collab.humanbrainproject.eu/#/collab/5449/nav/67018	
Technical documentation URL	https://collab.humanbrainproject.eu/#/collab/5449/nav/67019	
Usage documentation URL	https://collab.humanbrainproject.eu/#/collab/5449/nav/67020	
Component dissemination material URL	NA	

4.57 Component 3004: NARCI: Ontology for calcium imaging experiments

Field Name	Field Content	Additional Information
ID	3004	
Component Type	data	

Contact	DAVISON, Andrew	
Component Description	An ontology for calcium imaging experiments.	
Latest Release	2017-11-27	
TRL	TRL 4 - Prototype Component	
Location	data hosted by other non-HBP 3rd party	
Format	RDF	
Curation Status	NA	
Validation - QC	Pass	Agile Quality Assurance
Validation – Users	Yes	Development with internal data producer
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	anonymous - share with anonymous non-consortium members	
License	Attribution	
Component Access URL	https://github.com/INM-6/narci	
Technical documentation URL	https://github.com/INM-6/narci	
Usage documentation URL	https://github.com/INM-6/narci	
Component dissemination material URL	https://github.com/INM-6/narci	

4.58 Component 3005: Metadata schemas for neural activity data

Field Name	Field Content	Additional Information
ID	3005	
Component Type	data	
Contact	DAVISON, Andrew	
Component Description	SHACL schemas for neural activity data. Currently included experiment types: patch clamp, intracellular sharp electrode, tetrode, multi-electrode-array electrophysiology recordings and calcium imaging recordings. All schemas will be entered into the HBP Knowledge Graph by the end of SGA1.	
Latest Release	0.1.0	2018-02-23
TRL	TRL 4 - Prototype Component	

Location	data hosted by neuroinformatics platform	
Format	SHACL (JSON-LD)	
Curation Status	NA	
Validation - QC	Pass	Agile Quality Assurance
Validation – Users	Yes	Used for Tier 3 curation of 10 datasets.
Validation – Publications	No	
Privacy Constraints	No Privacy Constraint	
Sharing	anonymous - share with anonymous non-consortium members	
License	Attribution	
Component Access URL	https://github.com/INCF/neuroshapes	
Technical documentation URL	https://github.com/INCF/neuroshapes	
Usage documentation URL	https://github.com/INCF/neuroshapes	
Component dissemination material URL	https://github.com/INCF/neuroshapes	

4.59 Component 3006: Neural activity resource browser

Field Name	Field Content	Additional Information
ID	3006	
Component Type	service	
Contact	DAVISON, Andrew	
Component Description	A Collaboratory app for browsing and visualising activity datasets stored in the Nexus Knowledge Graph. May in future be integrated as a component within other apps.	
Latest Release	0.1.0	
TRL	TRL 4 - Prototype Component	
Location	data hosted by Neuroinformatics Platform	
Format	Collaboratory app	
Curation Status	NA	
Validation - QC	Pass	Agile Quality Assurance

Validation – Users	No	
Validation – Publications	No	
Privacy Constraints	Animal Research	
Sharing	public authenticated - share with authenticated non-consortium members e.g. public Collab	
License	Apache v2 license	
Component Access URL	https://collab.humanbrainproject.eu/#/collab/19/nav/2108?state=software,nar-browser	
Technical documentation URL	https://github.com/HumanBrainProject/neural-activity-resource	
Usage documentation URL	https://github.com/HumanBrainProject/neural-activity-resource	
Component dissemination material URL	https://github.com/HumanBrainProject/neural-activity-resource	

4.60 Component 3007: Viewer for time-series data

Field Name	Field Content	Additional Information
ID	3007	
Component Type	service	
Contact	DAVISON, Andrew	
Component Description	A web service and Javascript library for interactive visualisation of electrophysiology recordings. The web service reads the selected data file and provides access to it through a REST API. The Javascript library displays the recorded signals in the web browser.	
Latest Release	none	
TRL	TRL 3 - Proof of Concept Implementation	
Location	data hosted by Neuroinformatics Platform	
Format	web service and Javascript library	
Curation Status	NA	
Validation - QC	Pass	Agile Quality Assurance
Validation – Users	No	
Validation – Publications	No	
Privacy Constraints	Animal Research	
Sharing	public authenticated - share with authenticated non-consortium members e.g. public collab	
License	Apache v2 license	

Component Access URL	https://timeseries.brainsimulation.eu	
Technical documentation URL	https://github.com/HumanBrainProject/neural-activity-resource	
Usage documentation URL	https://github.com/HumanBrainProject/neural-activity-resource	
Component dissemination material URL	https://github.com/HumanBrainProject/neural-activity-resource	

4.61 Component 3008: Neural activity metadata editor

Field Name	Field Content	Additional Information
ID	3008	
Component Type	service	
Contact	DAVISON, Andrew	
Component Description	A Collaboratory app for NAR curators, to facilitate metadata entry.	
Latest Release	NA	
TRL	TRL 3 - Proof of Concept Implementation	
Location	data hosted by Neuroinformatics Platform	
Format	Collaboratory app	
Curation Status	NA	
Validation - QC	Pass	Agile Quality Assurance
Validation – Users	Yes	Used for Tier 3 curation of 10 datasets.
Validation – Publications	No	
Privacy Constraints	Animal Research	
Sharing	public authenticated - share with authenticated non-consortium members e.g. public Collab	
License	Apache v2 license	
Component Access URL	https://collab.humanbrainproject.eu/#/collab/19/nav/2108?state=software,nar-curation	
Technical documentation URL	https://github.com/HumanBrainProject/neural-activity-resource	
Usage documentation URL	https://github.com/HumanBrainProject/neural-activity-resource	
Component dissemination material URL	https://github.com/HumanBrainProject/neural-activity-resource	

4.62 Component 3009: Python client for the NAR

Field Name	Field Content	Additional Information
ID	3009	
Component Type	software	
Contact	DAVISON, Andrew	
Component Description	A Python client to facilitate access to activity data (stored in the Pollux-SWIFT archive storage at CSCS) and metadata (stored in the Knowledge Graph) from within Jupyter notebooks	
Latest Release	0.1.0	
TRL	TRL 4 - Prototype Component	
Location	data hosted by Neuroinformatics Platform	
Format	NA	
Curation Status	NA	
Validation - QC	Pass	Agile Quality Assurance
Validation – Users	No	
Validation – Publications	No	
Privacy Constraints	Animal Research	
Sharing	public authenticated - share with authenticated non-consortium members e.g. public Collab	
License	Apache v2 license	
Component Access URL	https://collab.humanbrainproject.eu/#/collab/19/nav/2108?state=software,nar-python	
Technical documentation URL	https://github.com/HumanBrainProject/neural-activity-resource	
Usage documentation URL	https://github.com/HumanBrainProject/neural-activity-resource	
Component dissemination material URL	https://github.com/HumanBrainProject/neural-activity-resource	