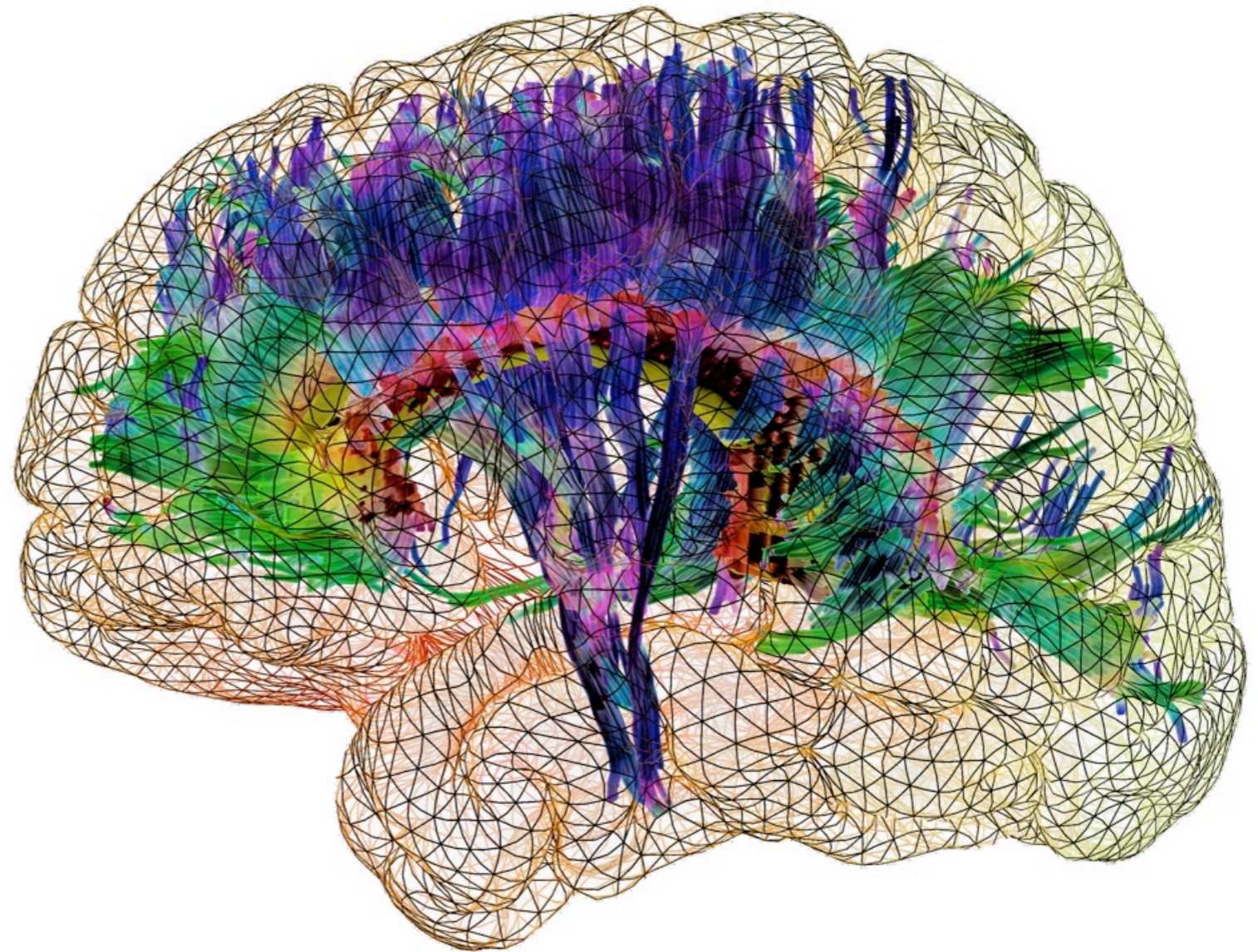
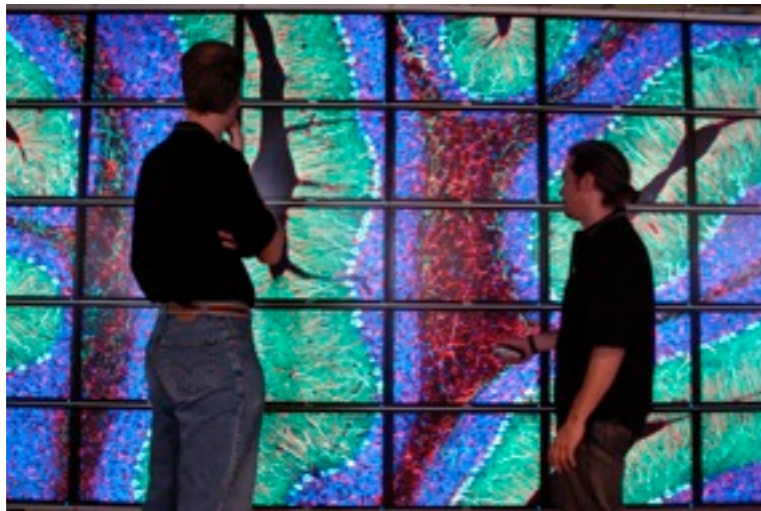


CBRAIN

An International Computing Platform for Neuroimaging
Dr. Alan C. Evans' Laboratory

BIC Lecture, Feb 2012
by Marc-Etienne Rousseau



Summary

- What is CBRAIN?
 - What is it for?
 - Who uses it and how much?
 - A Few Special Projects
- What can it do for you?
- Can I get access? Can I get involved?

Funded by CANARIE

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<http://www.canarie.ca>

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WHAT'S NEW

CANARIE NEWS

- ▶ [ACORN-NS and CANARIE Go Green with Bullfrog Power](#)
- ▶ [Job Opportunity: Policy Analyst](#)
- ▶ [Bill St. Arnaud Steps Down as Chief Research Officer of CANARIE](#)

YouTube **CANARIE Videos**

slideshare **CANARIE Presentations**

Picasa **CANARIE Photos**

PRINT

Canadian Brain Imaging Research Network

2009-2010

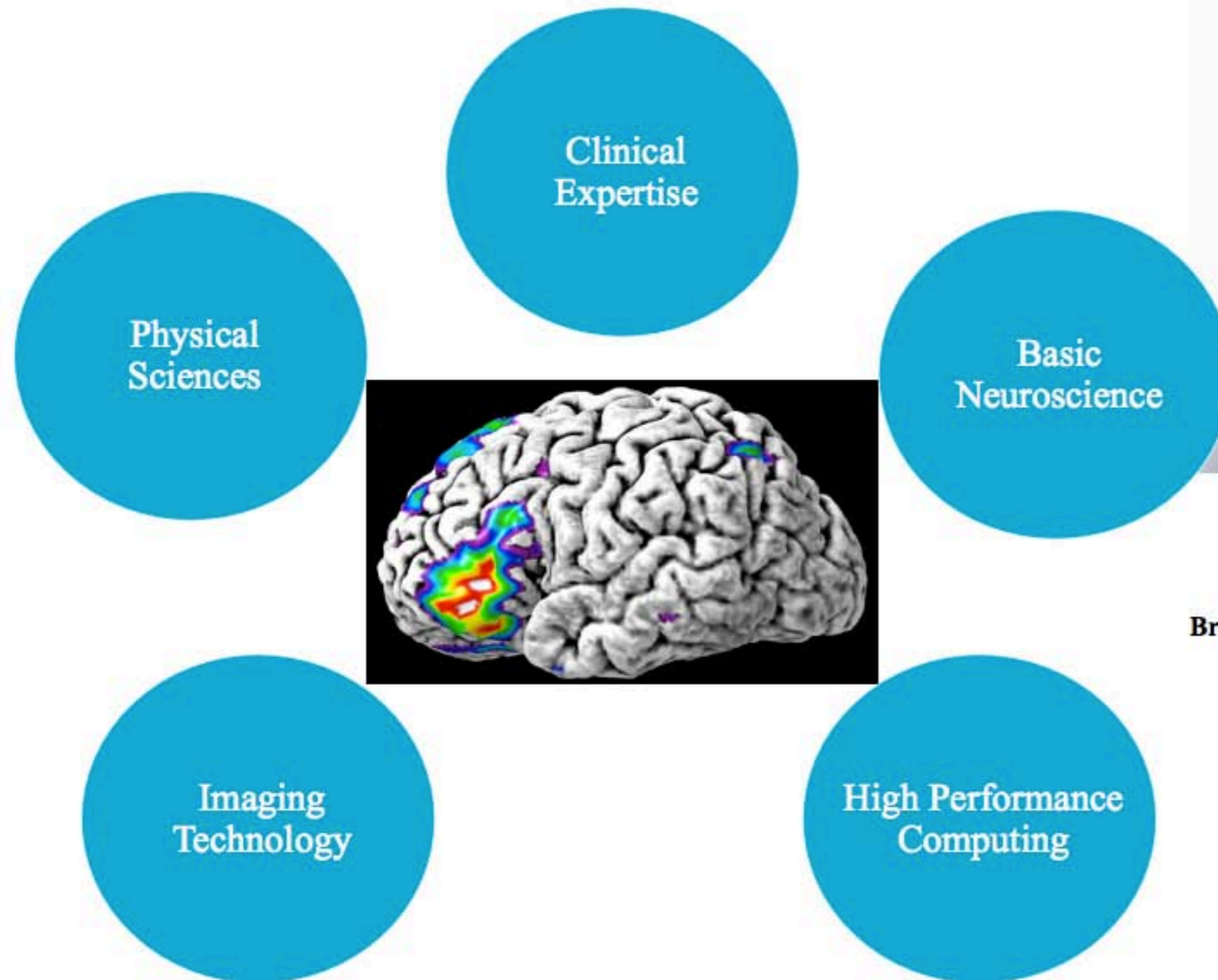
Global Brain Imaging Research Network

2010-2012



What is CBRAIN?

What is Neuro-Imaging?



3 Tesla MRI

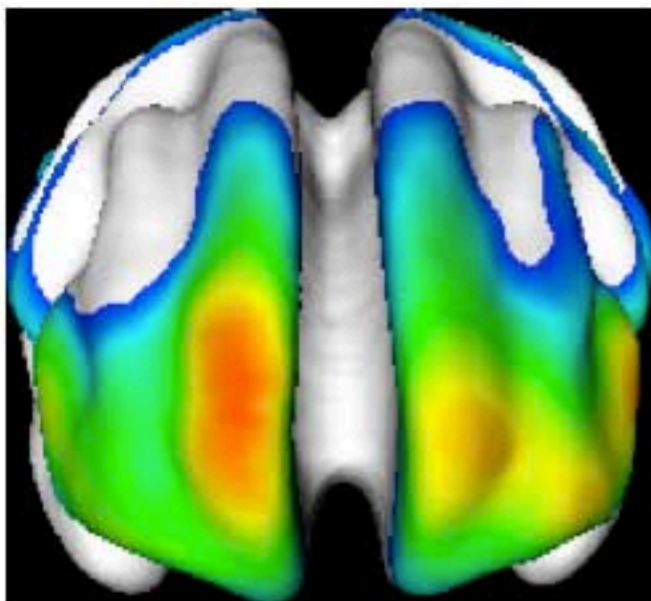
Brain Imaging Techniques:

- Magnetic Resonance Imaging (MRI)
- Functional MRI (fMRI)
- Positron Emission Tomography (PET)
- Magnetoencephalography (MEG)

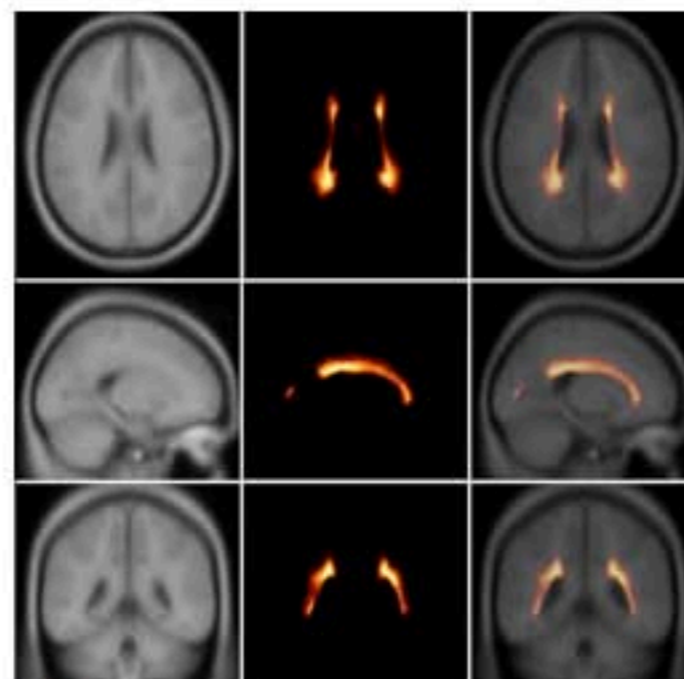
Neuro-Imaging Applications

Population Studies:

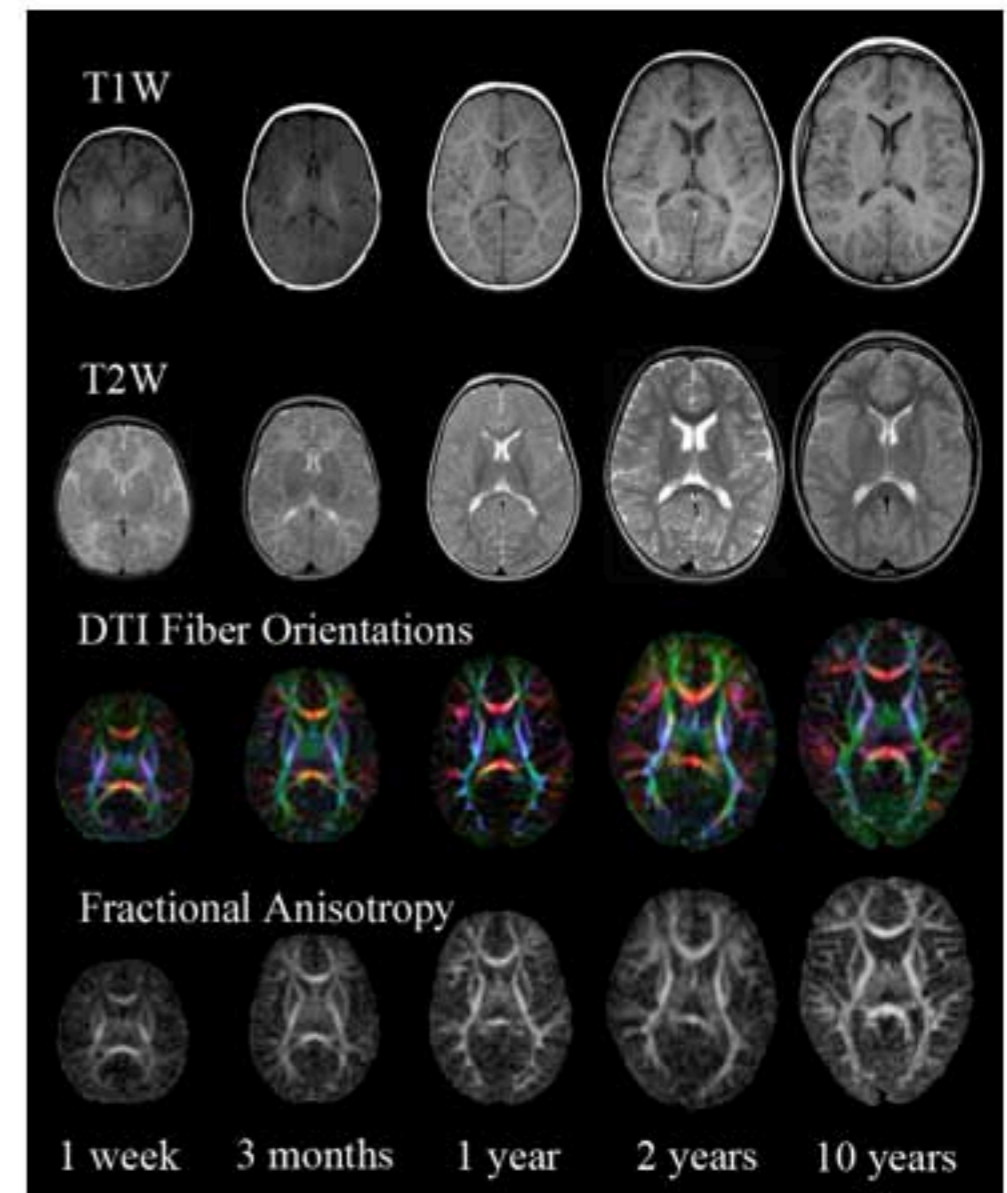
- Alzheimer's Disease
- Multiple Sclerosis
- Autism
- Schizophrenia
- Normal brain development



Alzheimer loss of cortical thickness

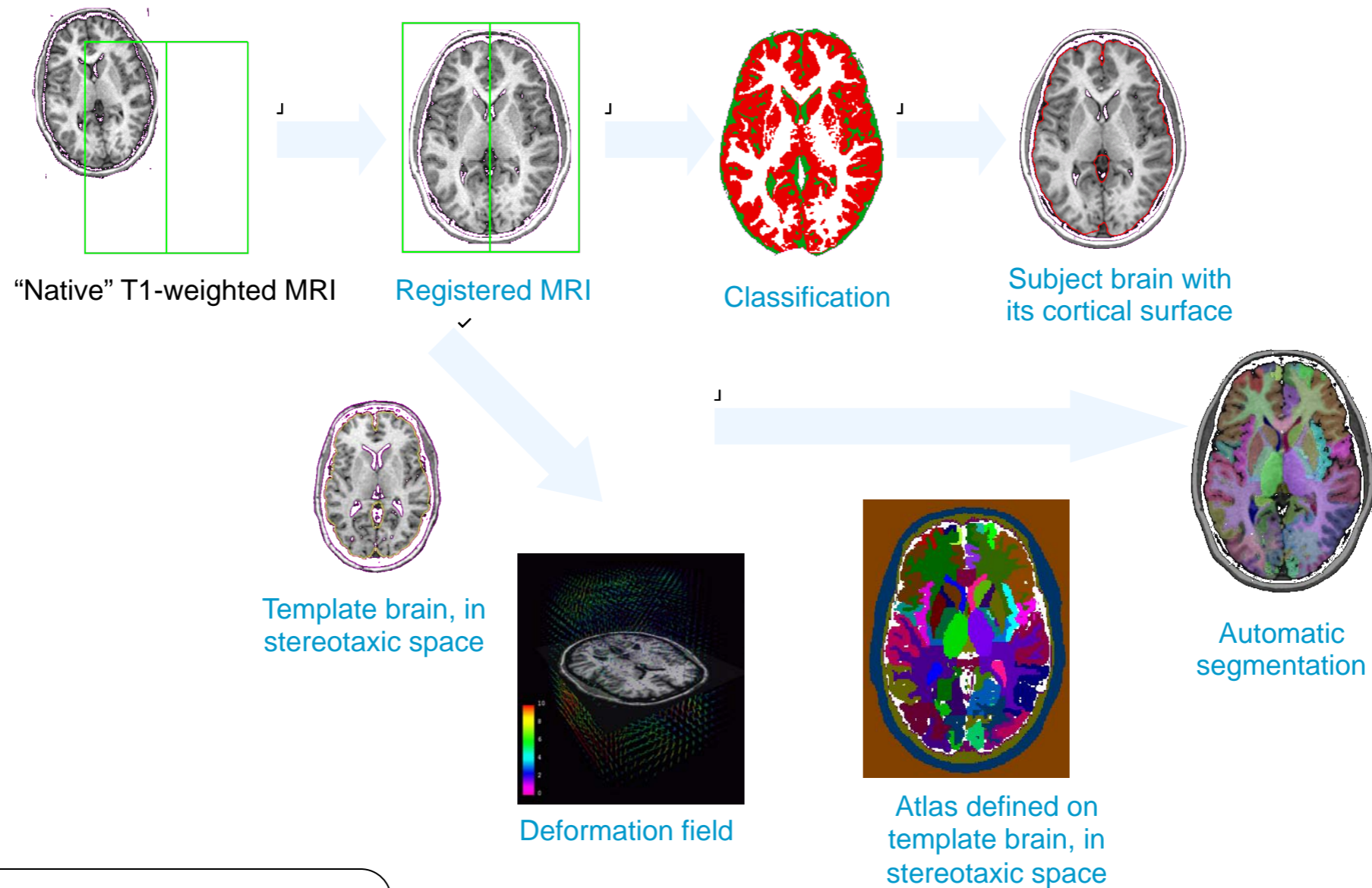


Multiple Sclerosis lesions



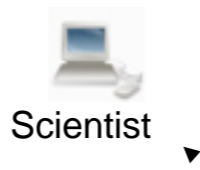
Normal Brain Development in Children

A Processing Pipeline: CIVET

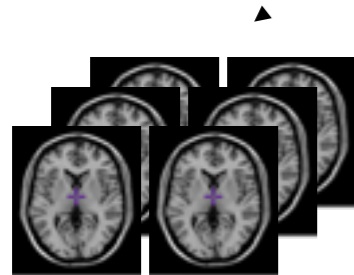


- Hundreds of MRI per study
- GBs of data
- Thousands of CPU hours

Removing Obstacles to Compute

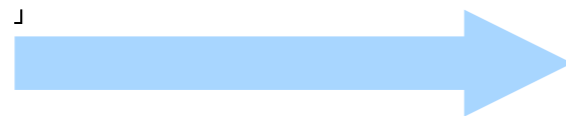


Vancouver
Montreal



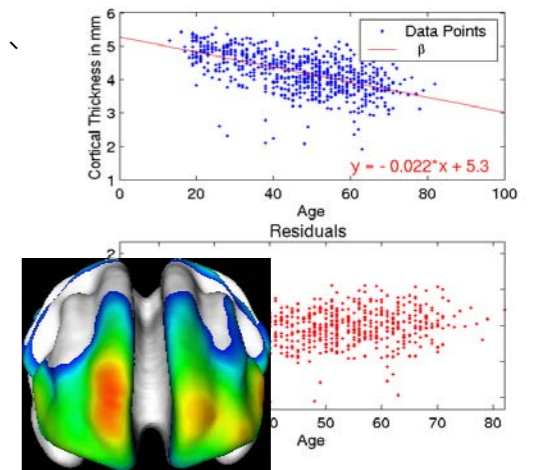
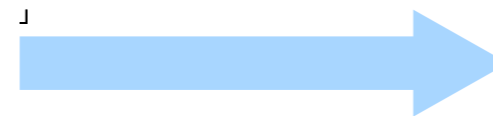
Data

Vancouver & Montreal
10 GB



Computing

Sherbrooke
4000 CPU hours



Results

Vancouver & Montreal
100GB

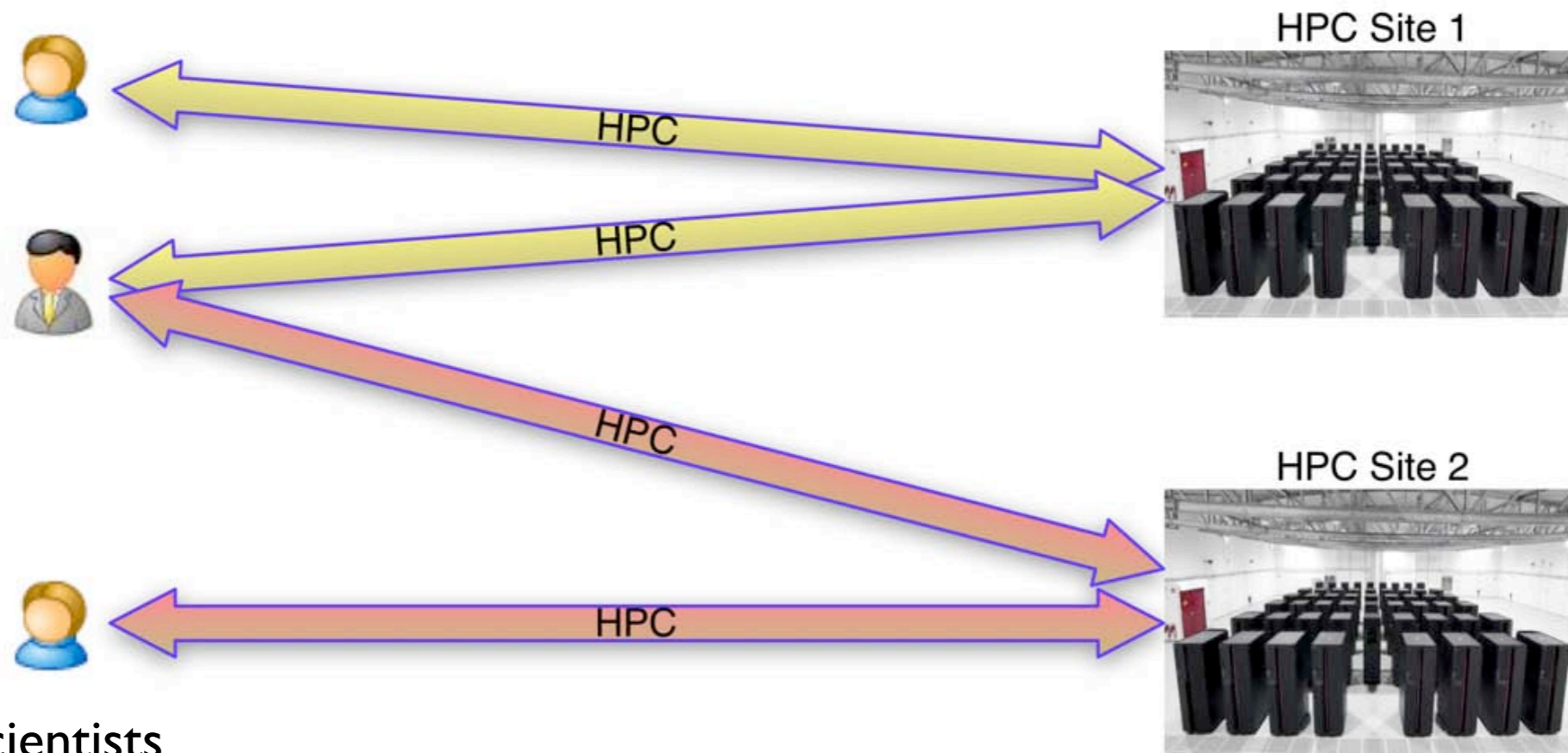
Challenges: Users

Most Neuroscientists are not IT experts

- Don't want to deal with networks, HPC processing, UNIX, etc.
- Just want to use specific tools with their data and get the results.
- They want to share, but they want to control their data.
- Research requirements are unclear and unstable.

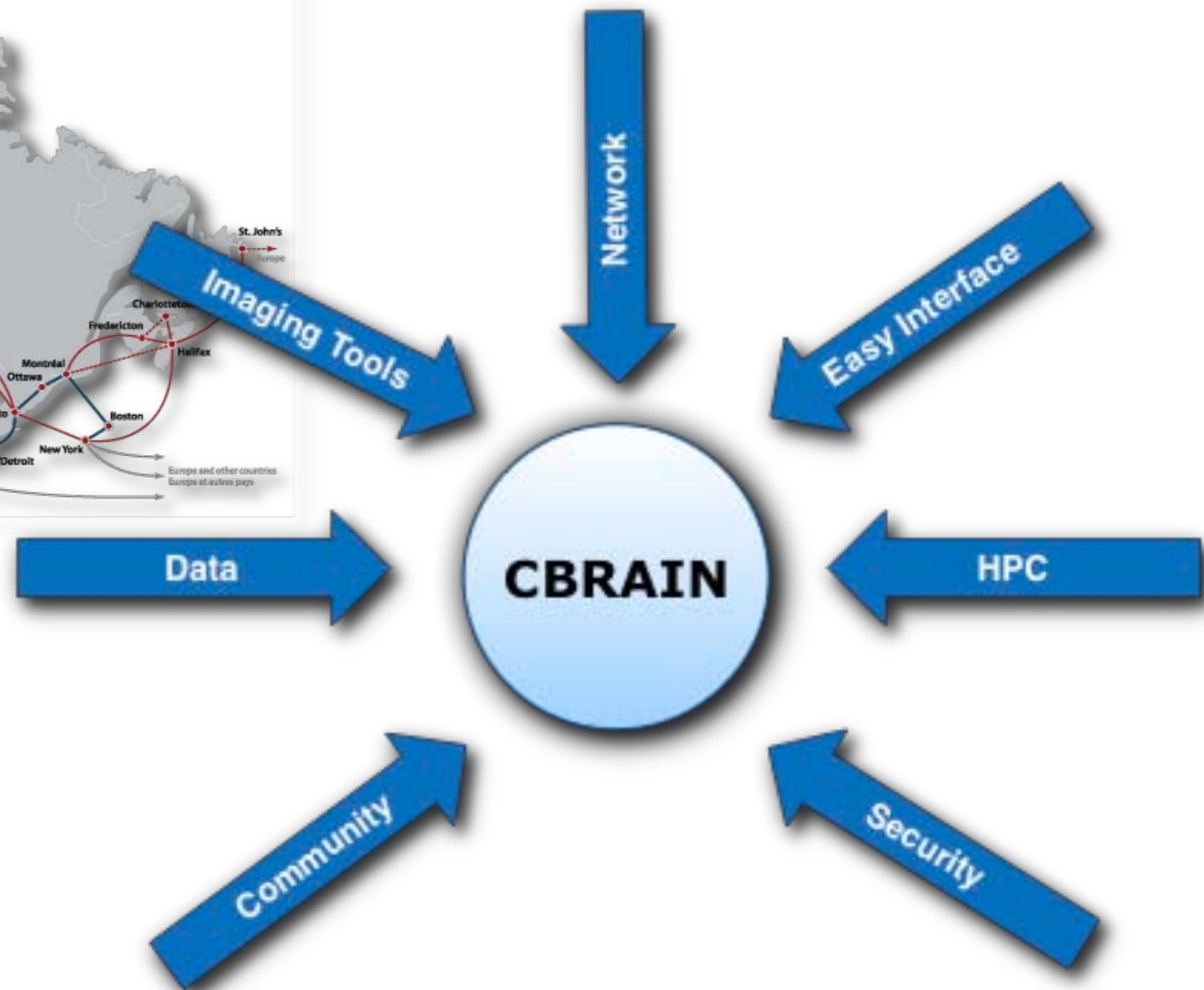


Challenges: Heterogeneous HPC



Scientists
With HPC expertise

CBRAIN: An Integrative Platform



CBRAIN: Simple Web Interface

The image displays the CBRAIN web interface, which is a simple web interface for brain data analysis. The interface is shown in a browser window with the URL <https://brainstorm.cbain.mcgill.ca/home>. The page title is "CBRAIN 1.2.6" and the user is logged in as "John Demo".

The main content area is divided into three sections:

- Account Info:** Shows the user's login name "demouser" and the site "Demosite".
- Tasks:** Displays the status of tasks:
 - Completed tasks: 0
 - Running tasks: 7
 - Failed tasks: 0Each section includes a "Go to Index Page" link.
- Recent Activity:** A table showing the following data:

| | Recent Activity |
|-------|---------------------|
| Civst | 2010-02-23 15:29:48 |
| Civst | 2010-02-23 15:29:48 |
| Civst | 2010-02-23 15:29:48 |
| Civst | 2010-02-23 15:29:48 |
| Civst | 2010-02-23 15:29:48 |

Below the tasks section, there are controls for "Flip Colors" and "Flip Correlation", and a "Second Windows" button. A note at the bottom states: "Use the shiftclick a point on the surface to see correlations at that point".

On the right side of the interface, there is a 3D visualization of a brain with a colorful surface map. Below this, there is a grid of 2D brain slices (axial, sagittal, and coronal views) showing different data channels and color scales.

CBRAIN: Simple Web Interface

File & Project Management (inputs & results)

Home My Account User Manual Feedback Credits Rev: 3.1.0-91 Logged in as Marc-Étienne Rousseau Sign out

StormPortal - Files

Files Tasks Projects Data Providers Servers Messages Tools

Upload File Launch Task Viewers File Management Update Attributes Selected Files Filters View Options

Active Project: **Twins**

← Previous 1 2 3 4 5 6 7 8 9 10 11 ... 119 120 121 122 123 Next → (3053 files) Search by name:

| Filename | File Type | Owner | Creation Date | Size | Tags | Pro |
|--|--------------|---------|---------------|----------------------|------|-----|
| AA_2071574_mprage.-20050926-noflip.mnc ✓✓ Formats JIV | Minc File | mero | 2010-12-20 | 8.2 Mb | | R |
| 2071574-GPC-119276-1 | Civet Output | mero | 2011-10-05 | 163.8 Mb (228 files) | | f |
| AA2071574-Colosse-19695-1 | Civet Output | skarama | 2010-12-20 | 163.1 Mb (228 files) | | f |
| AA2071574-Colosse-20096-1 ✓ | Civet Output | skarama | 2010-12-21 | 163.2 Mb (228 files) | | f |
| AA_2077226_mprage-20051204-noflip.mnc ✓✓ Formats JIV | Minc File | mero | 2010-12-20 | 8.5 Mb | | R |
| 2077226-GPC-119276-1 | Civet Output | mero | 2011-10-05 | 175.4 Mb (228 files) | | 008 |
| AA2077226-Colosse-19702-1 | Civet Output | skarama | 2010-12-20 | 174.8 Mb (228 files) | | 009 |
| AA2077226-Colosse-20103-1 | Civet Output | skarama | 2010-12-21 | 174.8 Mb (228 files) | | 010 |
| ABL_2039584_mprage-20040911-noflip.mnc ✓✓ Formats JIV | Minc File | mero | 2010-12-20 | 8.0 Mb | | 011 |
| 2039584-GPC-119276-1 | Civet Output | mero | 2011-10-05 | 164.0 Mb (228 files) | | 012 |
| ABL2039584-Colosse-19707-1 | Civet Output | skarama | 2010-12-20 | 163.4 Mb (228 files) | | 014 |
| ABL2039584-Colosse-20108-1 | Civet Output | skarama | 2010-12-21 | 163.4 Mb (228 files) | | SYI |

Launch Task Viewers

Select an Operation

- Select an Operation
- Conversion Tools**
- Asipro -> MINC
- DICOM -> MINC
- DICOM -> HRRT
- MINC -> Analyze
- MINC -> JIV
- MINC -> NIFTI**
- NIFTI -> MINC
- Scientific Tools**
- Launch Bedpostx
- Launch Civet QC on CivetStudy
- Launch Civet
- Launch CivetCombiner
- Launch Cw5
- Launch Cw5filter
- Run Cluster Diagnostics
- Launch Mincaverage
- Launch Mincmath
- Launch Mincpik

Launch Tools

CBRAIN: Simple Web Interface

Task Parameters (Help) :

Tool configuration

Pipeline Options

Template:

Model:

CIVET options

Interpolation:

N3 distance:

Degrees of freedom for linear registration:

Do NOT build surfaces:

Thickness method: and kernel size:

Resample surfaces:

Combine surfaces:

VBM Options

Process VBM files:

Blurring kernel size in mm for volume:

Run symmetry tools:

Keep cerebellum in VBM maps:

MINC file input list

| Launch CIVET? | T1 name |
|-------------------------------------|--|
| <input checked="" type="checkbox"/> | AA_2071574_mprage.-20050926-noflip.mnc |

Compute Job status and Management

mcgill.ca https://portal.cbain.mcgill.ca/tasks

Home My Account User Manual Feedback Credits Rev: 3.1.0-91 Logged in as Marc-Étienne Rousseau Sign out

StormPortal - Tasks

Files Tasks Projects Data Providers Servers Messages Tools

For Queued Tasks For Running Tasks For Failed Tasks For Completed Tasks Terminating And Cleaning Up Archiving Filters

View Options

Active Project: **Twins**

Currently in Batch View (1401 tasks)

| Task Type | Description | Owner | Execution Server | Current Status | Run Number | Workdir Size | Time Submitted | Last Upd |
|---|-----------------|---------|------------------|--|-----------------|--------------|-------------------------|---------------|
| <input type="checkbox"/> Civet (Go to Batch) | N3_150mm_Spline | skarama | Colosse | 200 jobs launched at 2010-12-21 21:50:02 EST | 200 x Failed | | | |
| <input type="checkbox"/> Civet | N3=150 | skarama | Colosse | Completed | 1 | ▼ | 2010-12-21 11:56:09 EST | 2012-01-12 16 |
| <input type="checkbox"/> Civet (Go to Batch) | N3=150 | skarama | Colosse | 200 jobs launched at 2010-12-21 11:35:41 EST | 200 x Completed | | | |
| <input type="checkbox"/> Civet (Go to Batch) | N3=150 | skarama | Colosse | 200 jobs launched at 2010-12-21 10:29:13 EST | 200 x Completed | | | |
| <input type="checkbox"/> Civet | N3=200 | skarama | Colosse | Completed | 1 | ▼ | 2010-12-21 09:45:53 EST | 2012-01-12 13 |
| <input type="checkbox"/> Civet (Go to Batch) | N3=200 | skarama | Colosse | 200 jobs launched at 2010-12-21 09:43:52 EST | 200 x Completed | | | |
| <input type="checkbox"/> Civet (Go to Batch) | N3=200 | skarama | Colosse | 199 jobs launched at 2010-12-20 16:12:07 EST | 199 x Completed | | | |
| <input type="checkbox"/> Minc2jiv | | skarama | MindStorm | Completed | 1 | ▼ | 2010-12-20 15:55:53 EST | 2012-01-11 22 |
| <input type="checkbox"/> Minc2jiv (Go to Batch) | | skarama | MindStorm | 200 jobs launched at 2010-12-20 15:54:03 EST | 200 x Completed | | | |
| <input type="checkbox"/> Minc2jiv (Go to Batch) | | skarama | MindStorm | 199 jobs launched at 2010-12-20 15:53:20 EST | 199 x Completed | | | |

Workdir archiving status symbols: ◊: On Cluster ▼: As File

CBRAIN: Simple Web Interface

Results, QC, Provenance and Visualisation

StormPortal - File Info

Info

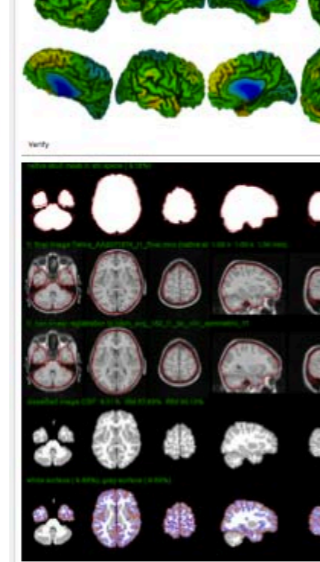
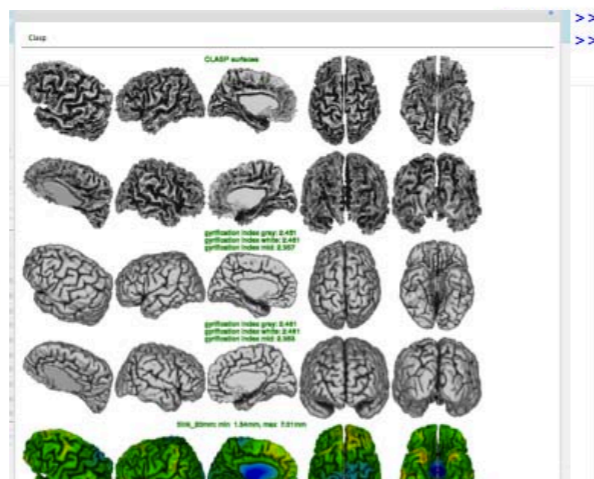
| | |
|---|---|
| Name: AA2071574-Colosse-19695-1 | Created at: 2010-12-20 22:45:02 EST (1 year, 2 months and 1 week ago) |
| Type: Civet Output | Modified at: 2012-01-14 11:23:45 EST (1 month, 1 week and 6 days ago) |
| Size: 163.1 Mb (228 files) = 163137973 bytes | Data Provider: MainStore (EnCbrainSmartDataProvider) Cached: ✓ |
| Owner: skarama | Project: Twins |
| Tags: (Update) | Project permission on file: Read |
| Parent: AA_2071574_mprage.-20050926-noflip.mnc | |
| Children: | |

<< Previous File
<< Previous CivetOutput

Content
Civet Output

Show Displayable Contents
Civet Directories Explained

| <input type="checkbox"/> | File | Size |
|--------------------------|---|--------|
| <input type="checkbox"/> | CBRAIN_Colosse-19695-1.params.yml | 2.7 Kb |
| <input type="checkbox"/> | References.txt | 5.2 Kb |
| <input type="checkbox"/> | classify Expand | |
| <input type="checkbox"/> | final Expand | |
| <input type="checkbox"/> | logs Expand | |
| <input type="checkbox"/> | mask Expand | |
| <input type="checkbox"/> | native Expand | |
| <input type="checkbox"/> | surfaces Expand | |
| <input type="checkbox"/> | temp Expand | |
| <input type="checkbox"/> | thickness Expand | |
| <input type="checkbox"/> | transforms Expand | |



BrainBrowser:Surface Viewer

mcgill.ca https://portal.cbain.mcgill.ca/userfiles/21759/display?viewer=obj_viewer

Files
Surface File: [Twins_AA2071574_mid_surface.j](#)
Thickness File: [Twins_AA2071574_native_rms_tl](#) Color Bar:

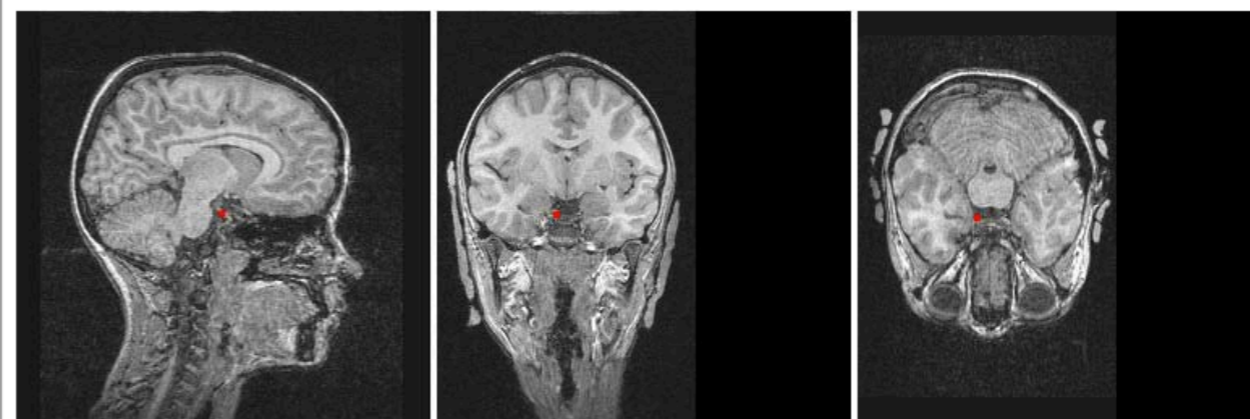
Shape 1
Name: filename
Opacity:

Views
 Left Right
 Superior Inferior
 Medial Lateral
 Anterior Posterior

Coordinates
 X
 Y
 Z
 Index
 Value

Thresholding
Min: 1.34171
Max: 5.44702
Flip Colors

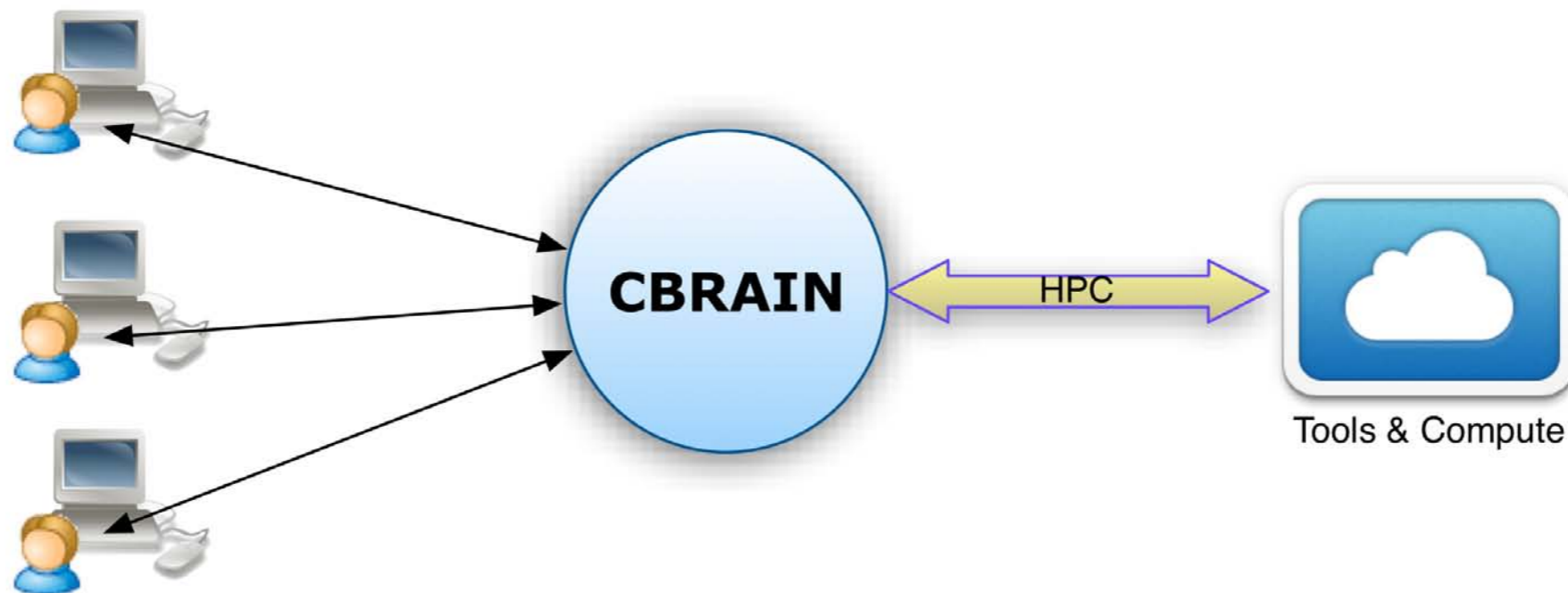
Content
Html5Minc Viewer



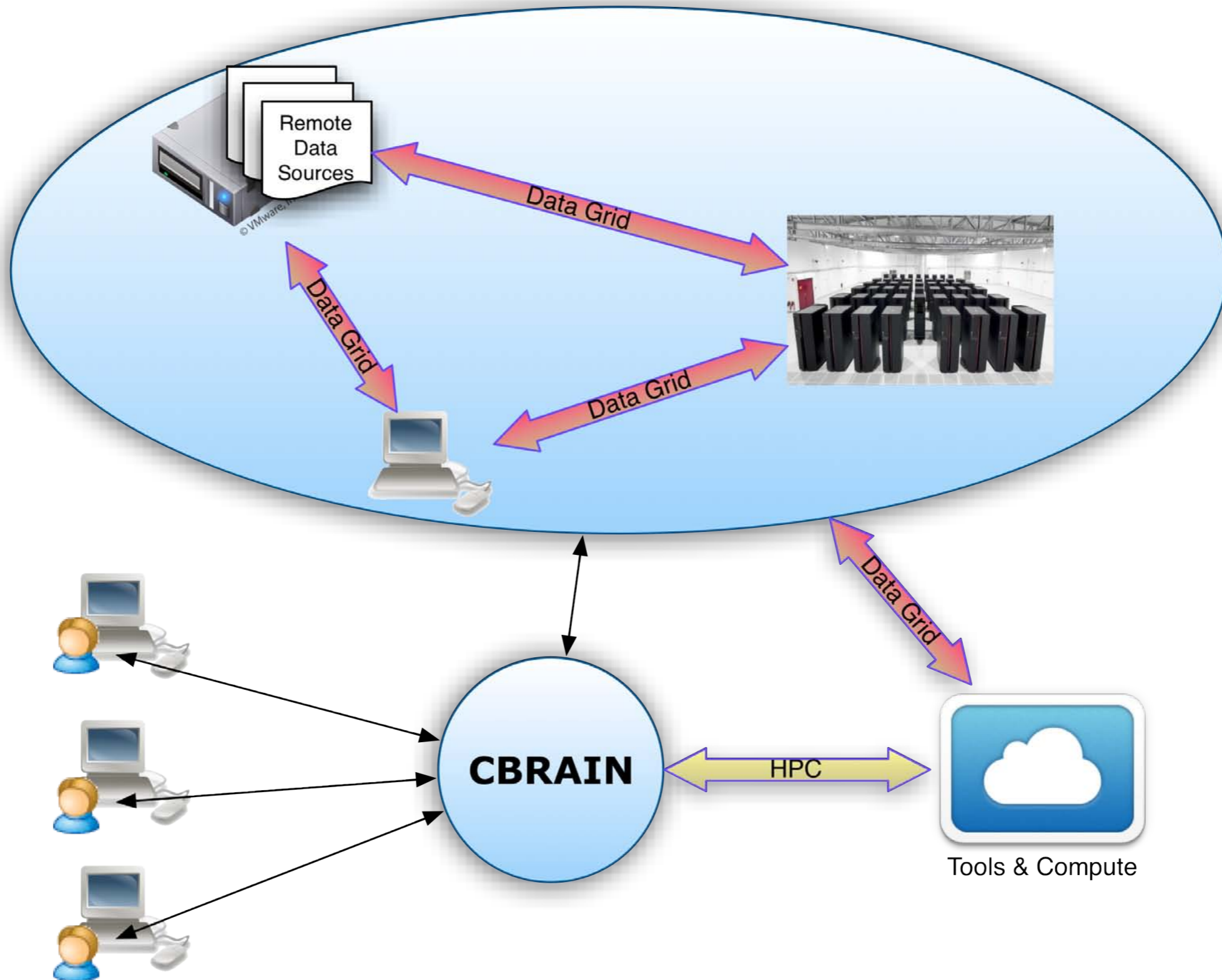
x:-6 y:0 z:2
Brightness: 10%
Contrast: 3.7
Color Scale [Gray Scale](#)

CBRAIN

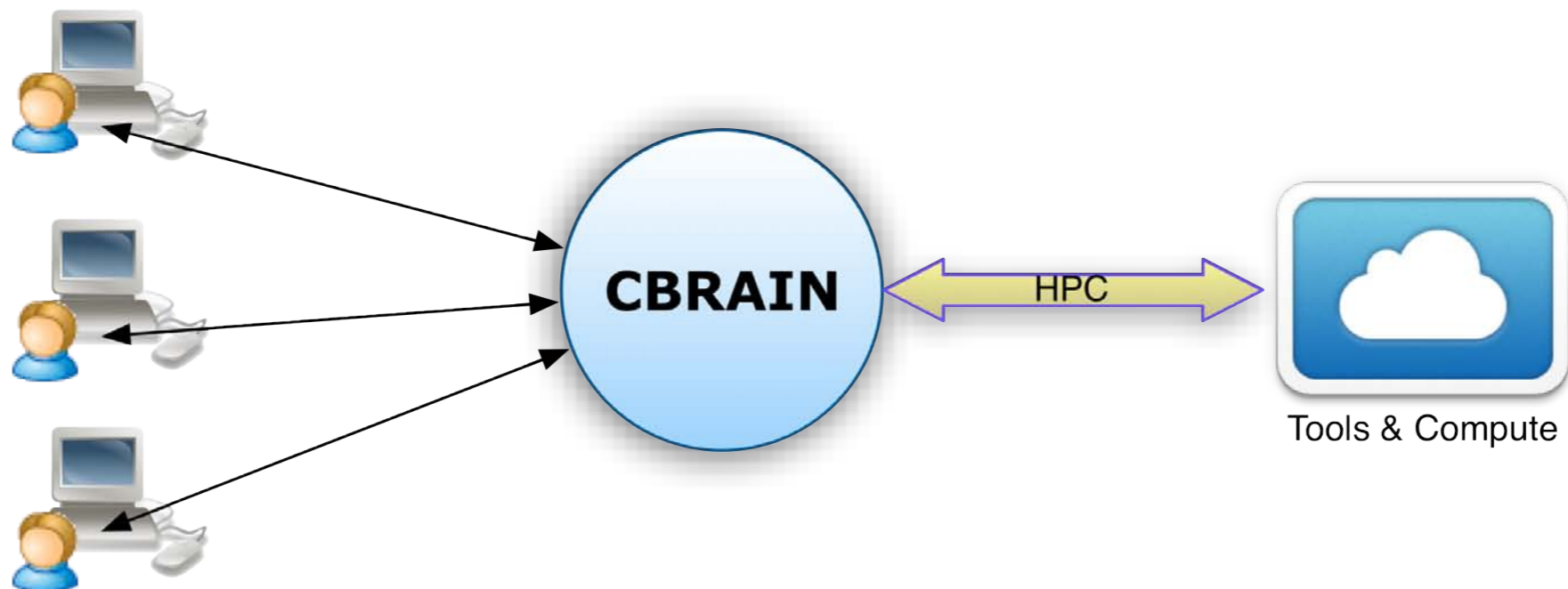
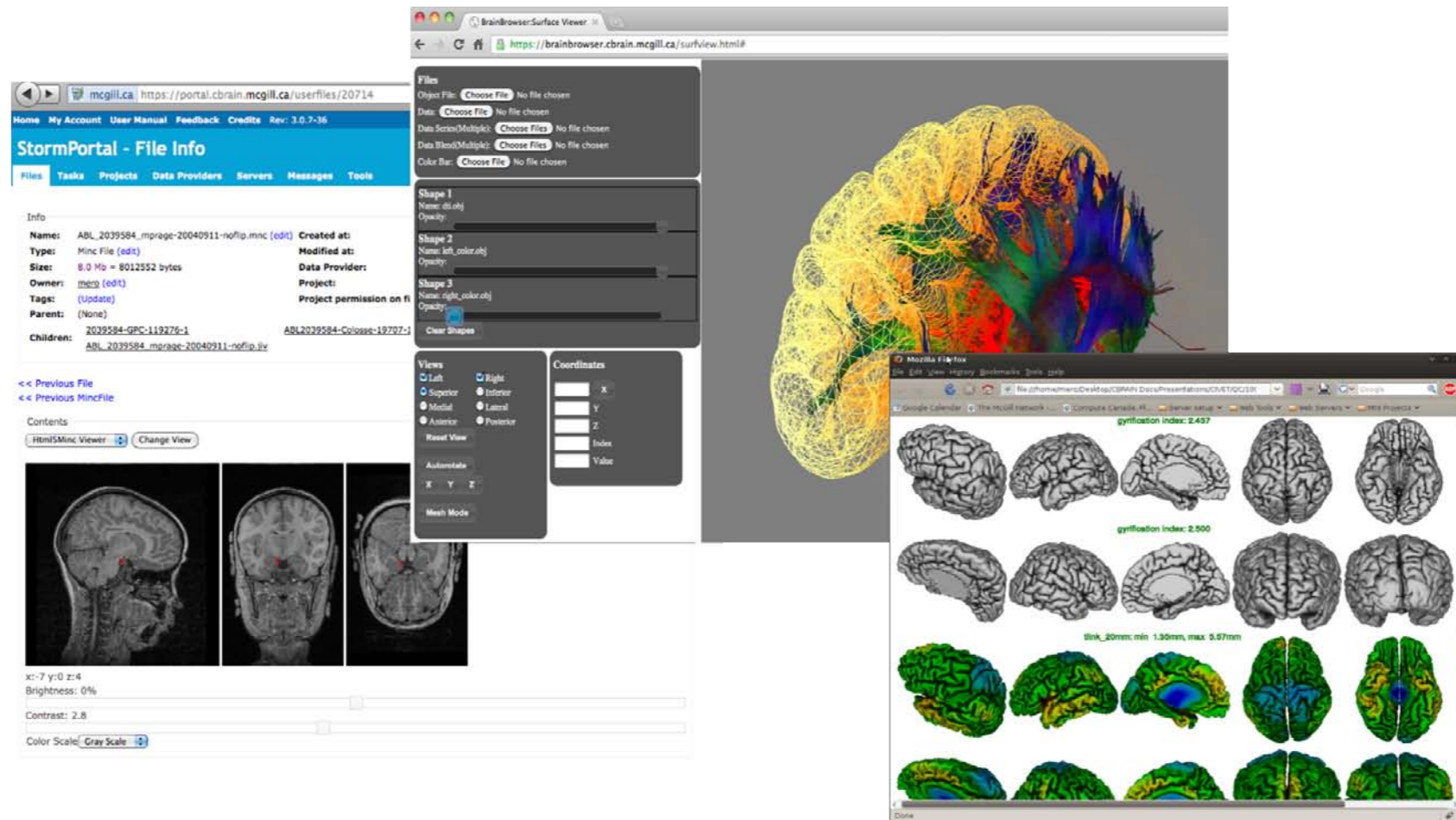
Transparent Compute Access



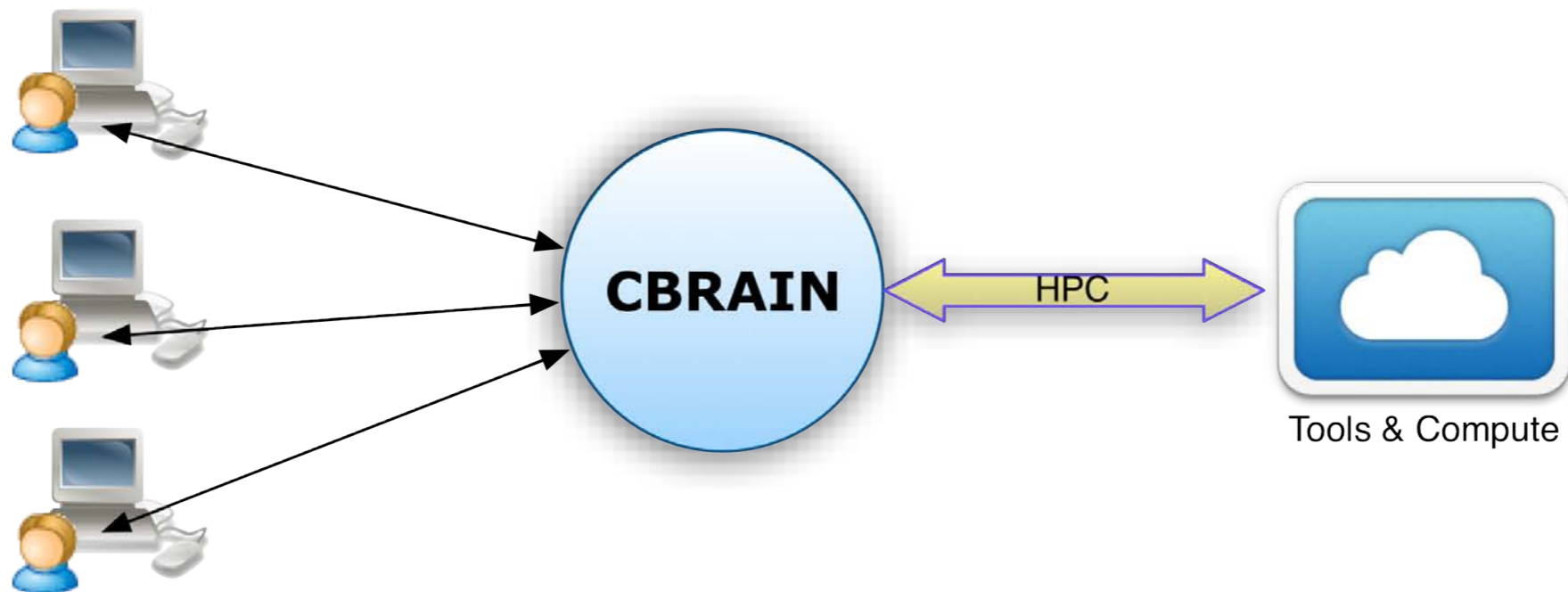
Transparent Data Grid



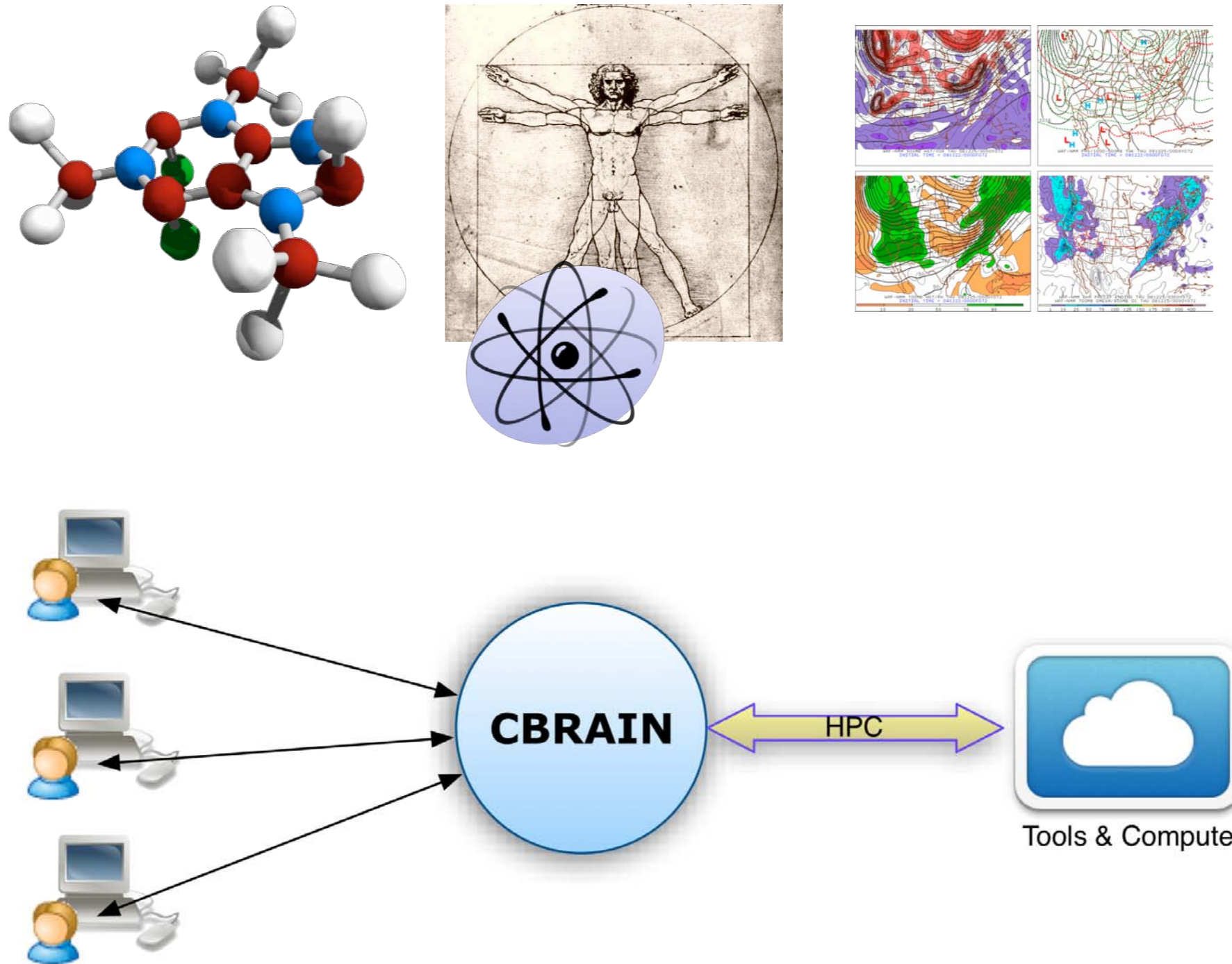
Interactive Scientific Visualisation



Community Portal



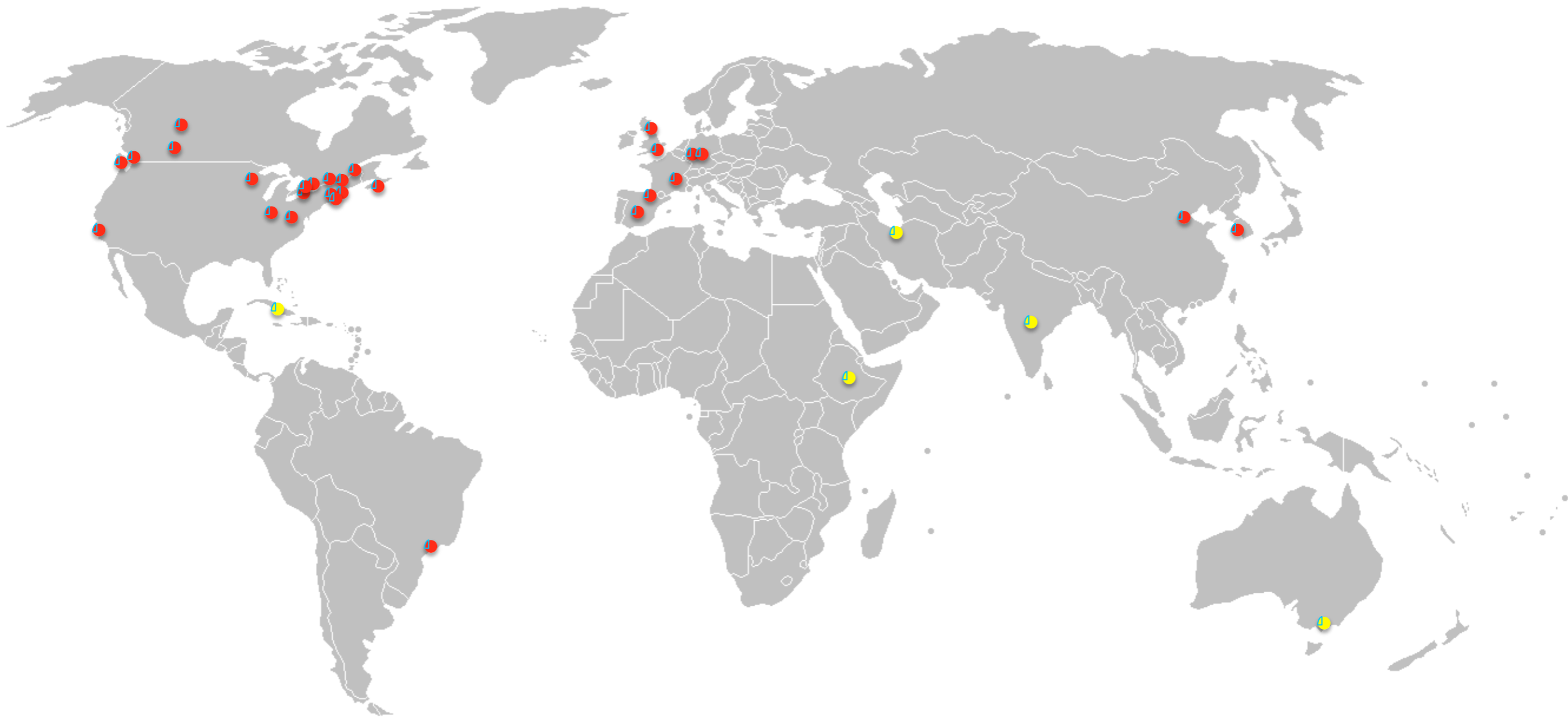
Generic Research Platform



CBRAIN

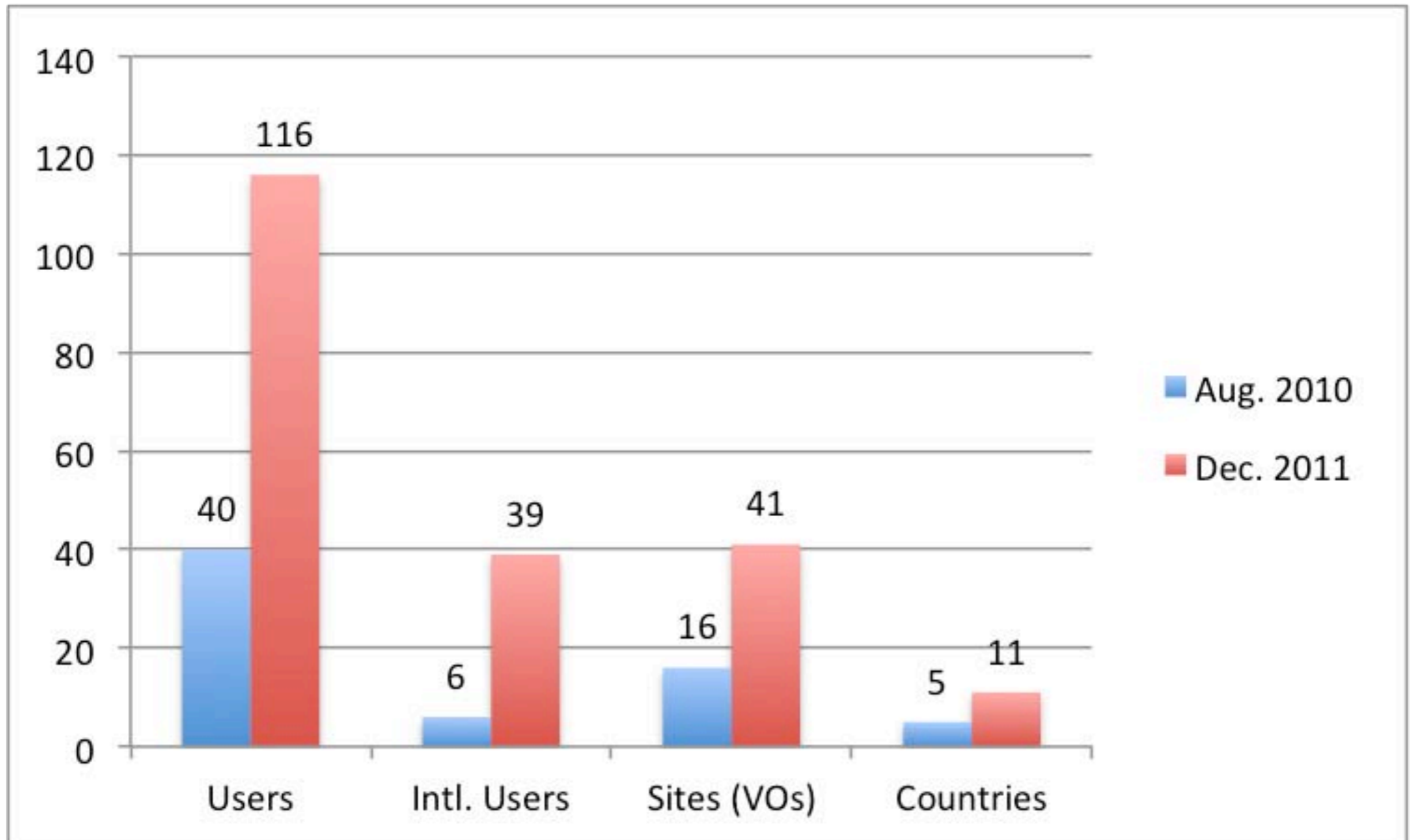
International Platform

Current Worldwide Distribution CBRAIN Users



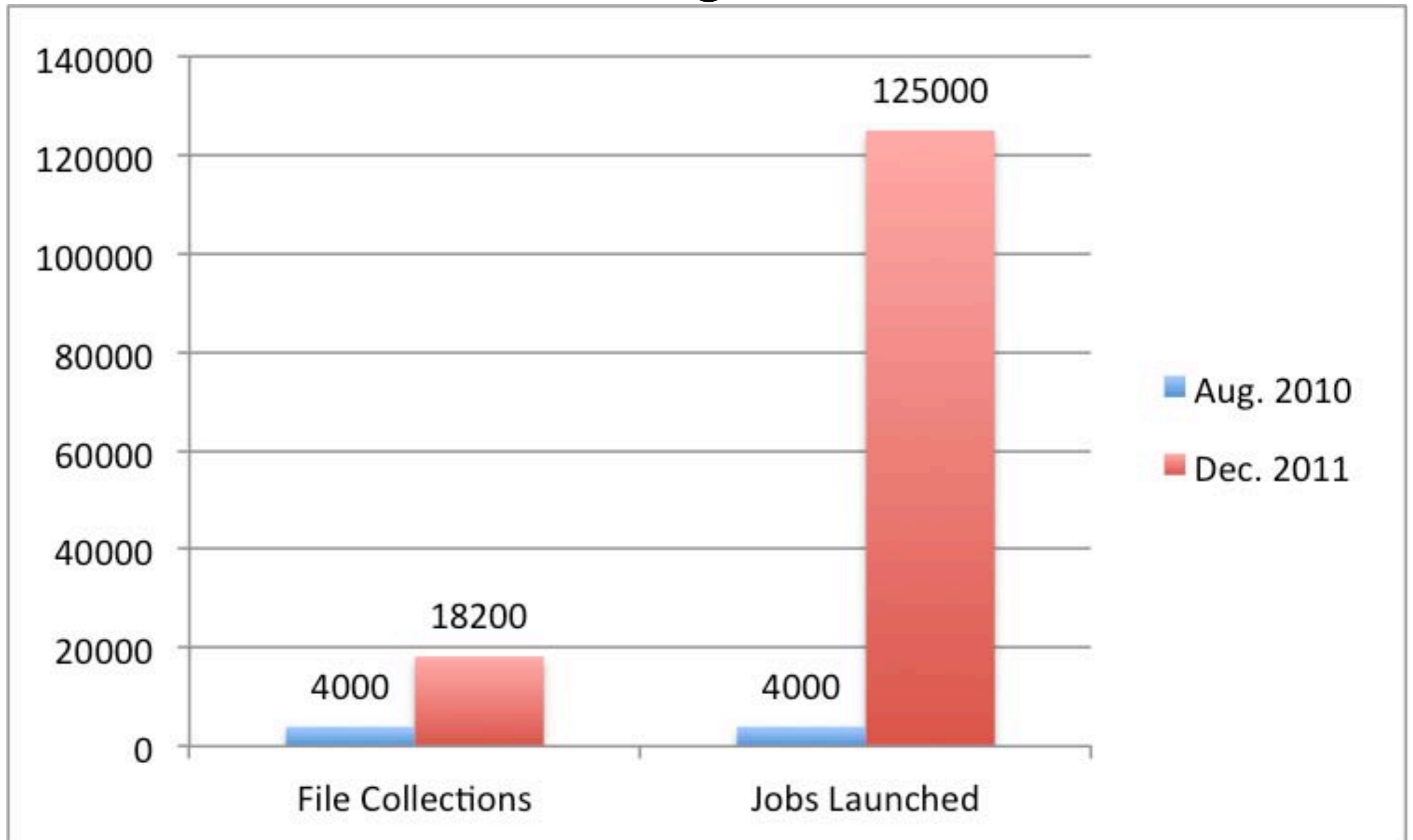
CBRAIN Platform Statistics

Membership



CBRAIN Platform Statistics

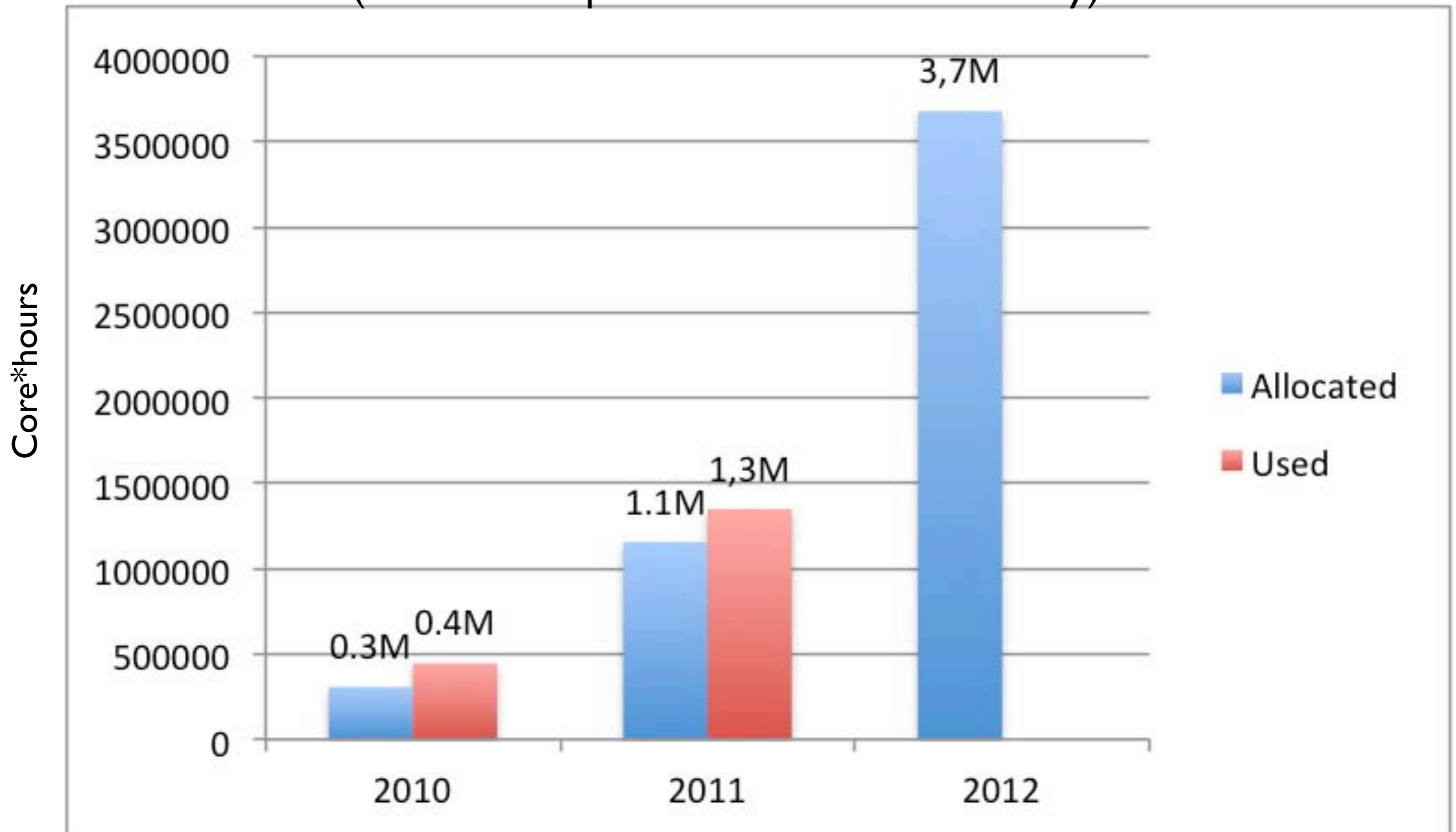
Usage



CBRAIN Platform Statistics

Workload

(Official Compute Canada Resources Only)



HPC Integration 2012

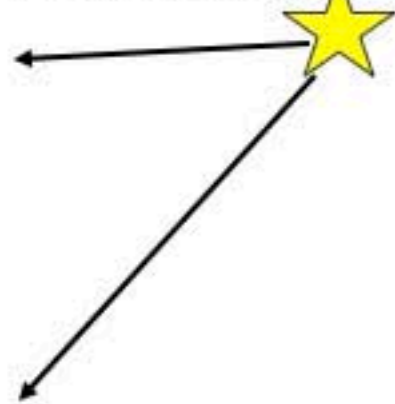
(11 compute installations, 80,000+ core)



canarie



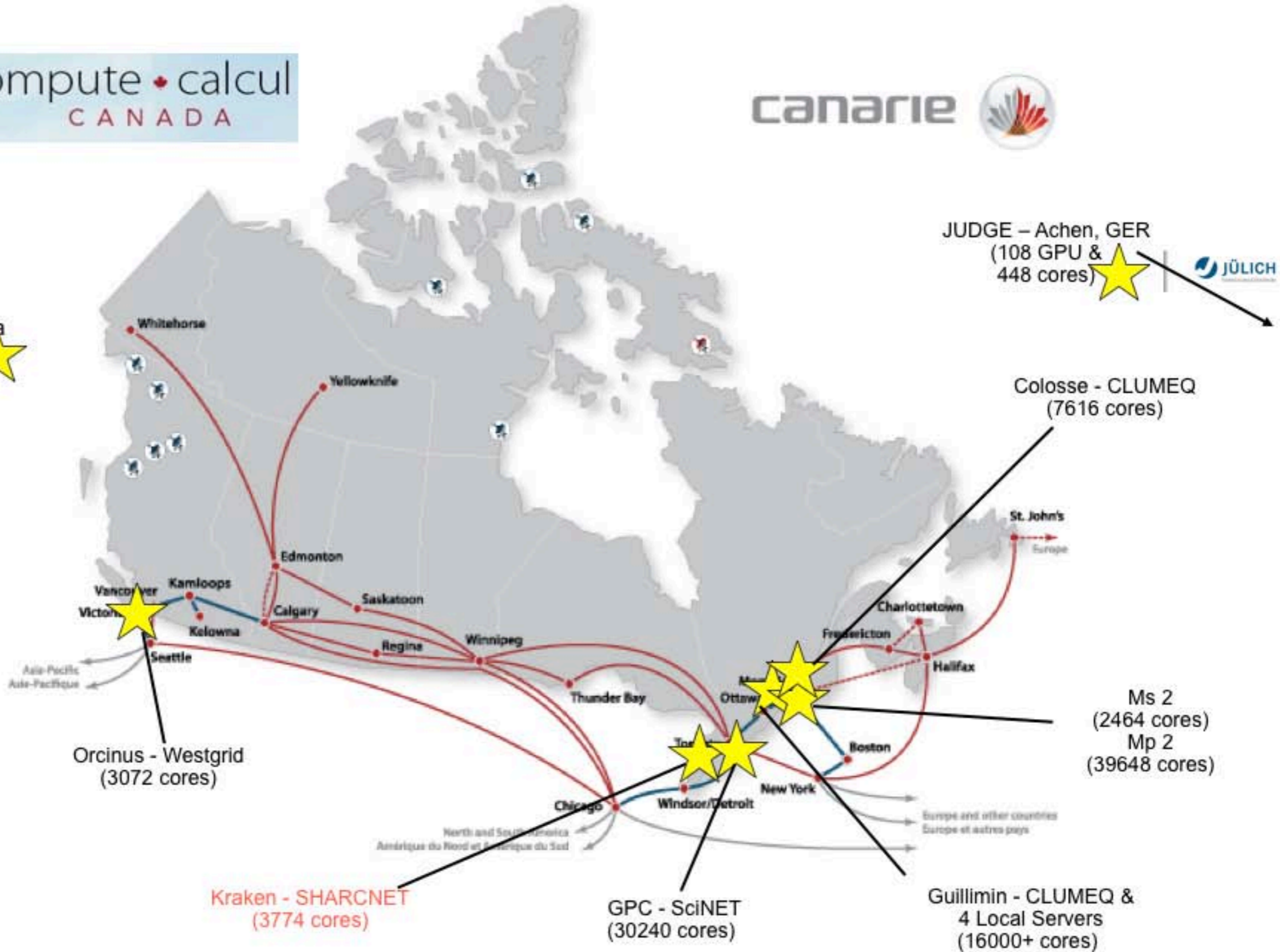
KISTI – Korea
MASSIVE - Australia



JUDGE – Achen, GER
(108 GPU &
448 cores)



Colosse - CLUMEQ
(7616 cores)



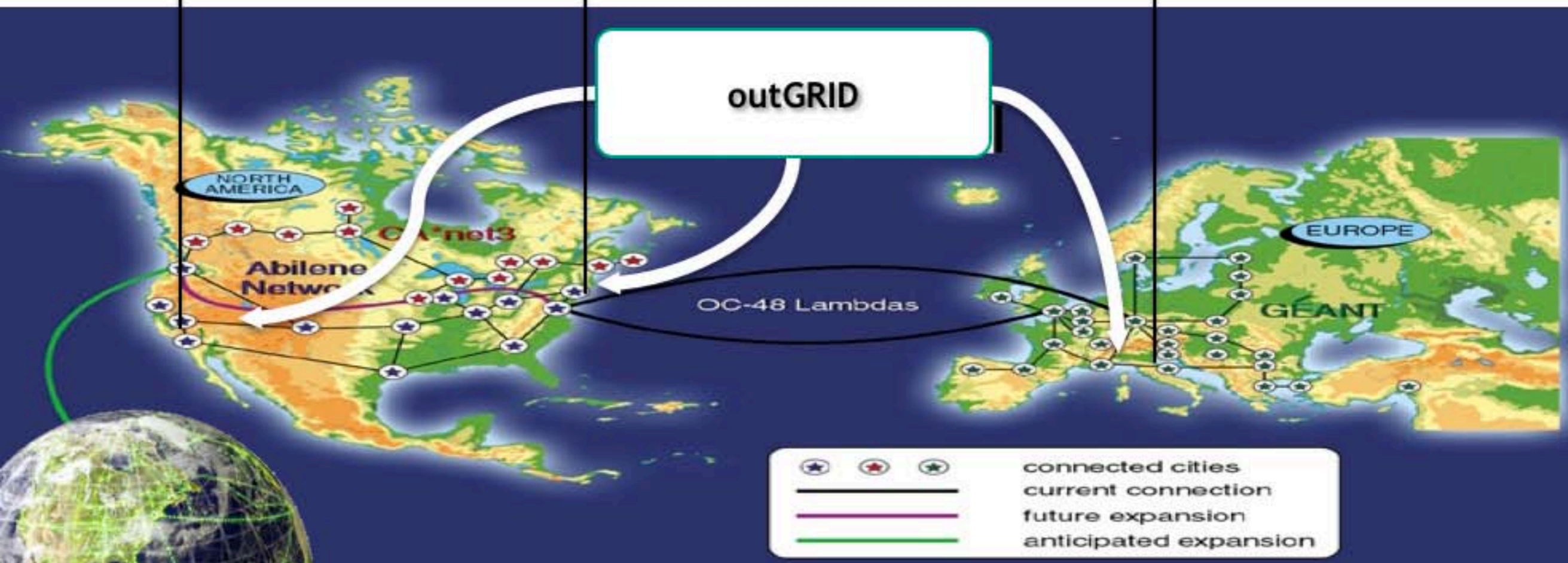
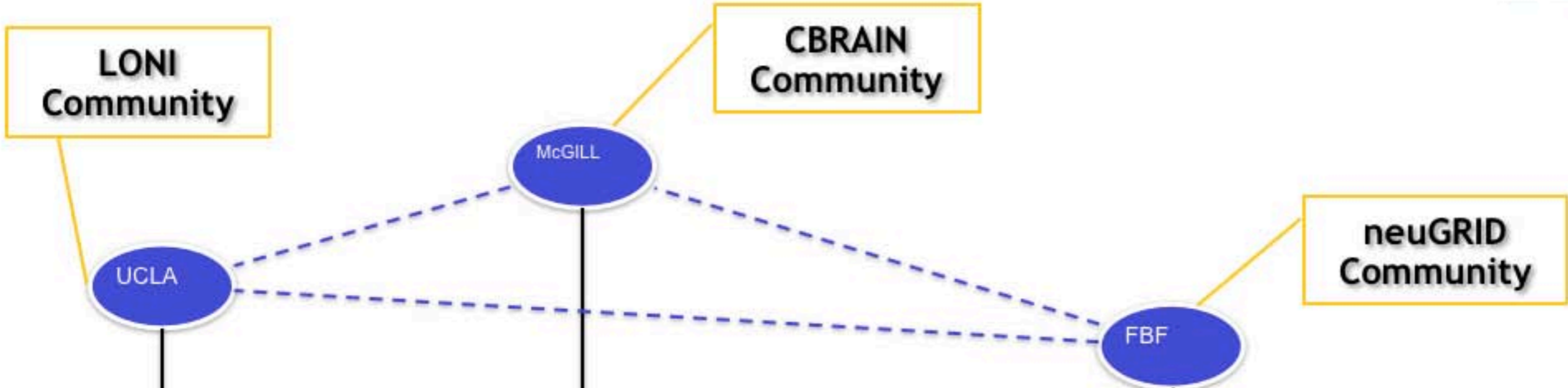
Orcinus - Westgrid
(3072 cores)

Kraken - SHARCNET
(3774 cores)

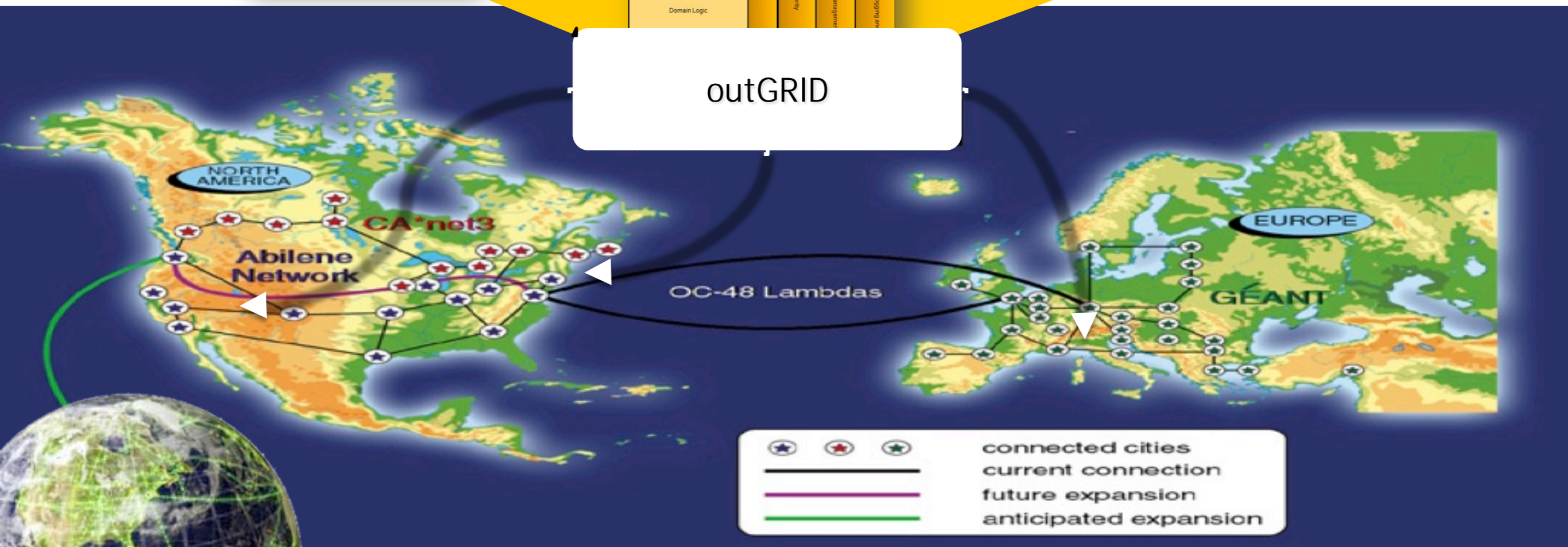
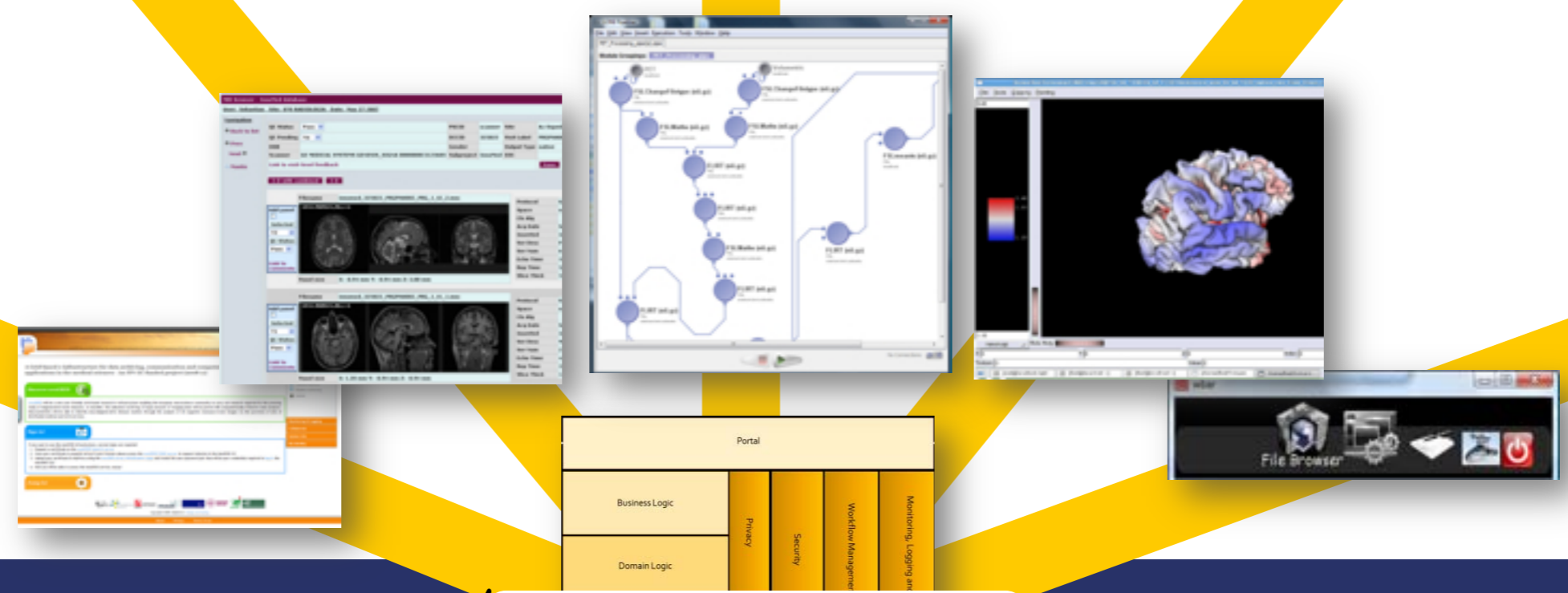
GPC - SciNET
(30240 cores)

Guillimin - CLUMEQ &
4 Local Servers
(16000+ cores)

Ms 2
(2464 cores)
Mp 2
(39648 cores)



| | | | |
|---|---|---|-----------------------|
|  |  |  | connected cities |
|  | | | current connection |
|  | | | future expansion |
|  | | | anticipated expansion |



outGRID

connected cities

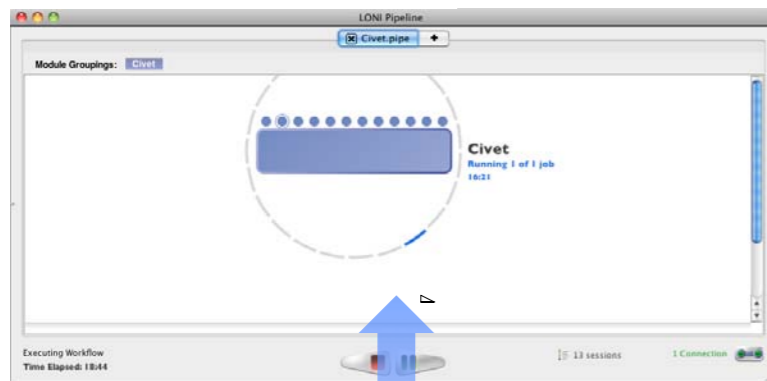
 current connection

 future expansion

 anticipated expansion

outGRID – GBRAIN

(EGI Tech Forums 2011, Lyon: Best live demonstration)



LONI Client:

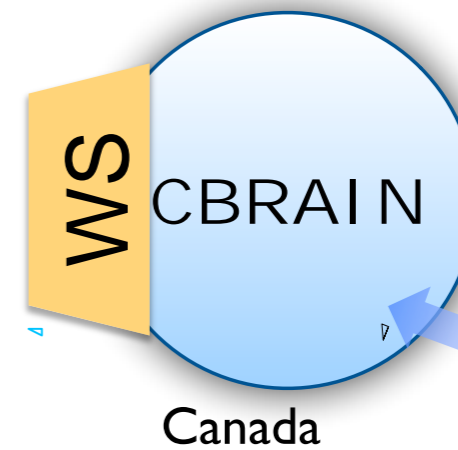
- NeuGrid Module
- CBRAIN Module
- LONI Module



LONI Servers



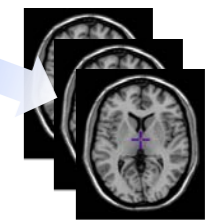
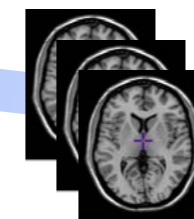
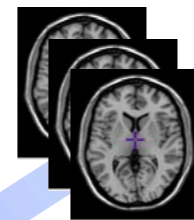
CIVET
One HPC



CIVET – Freesurfer
on CBRAIN Cloud

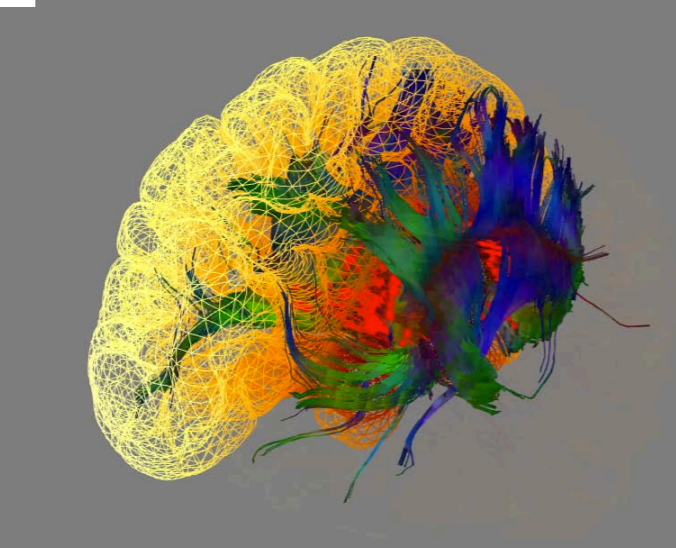
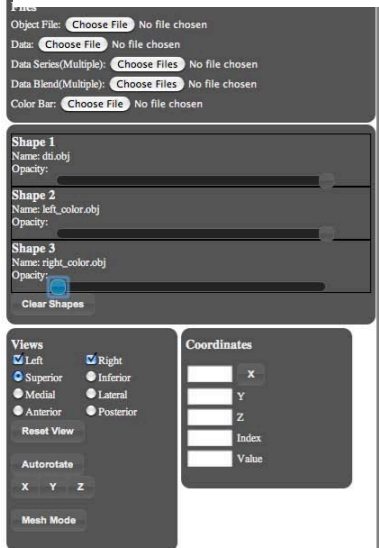
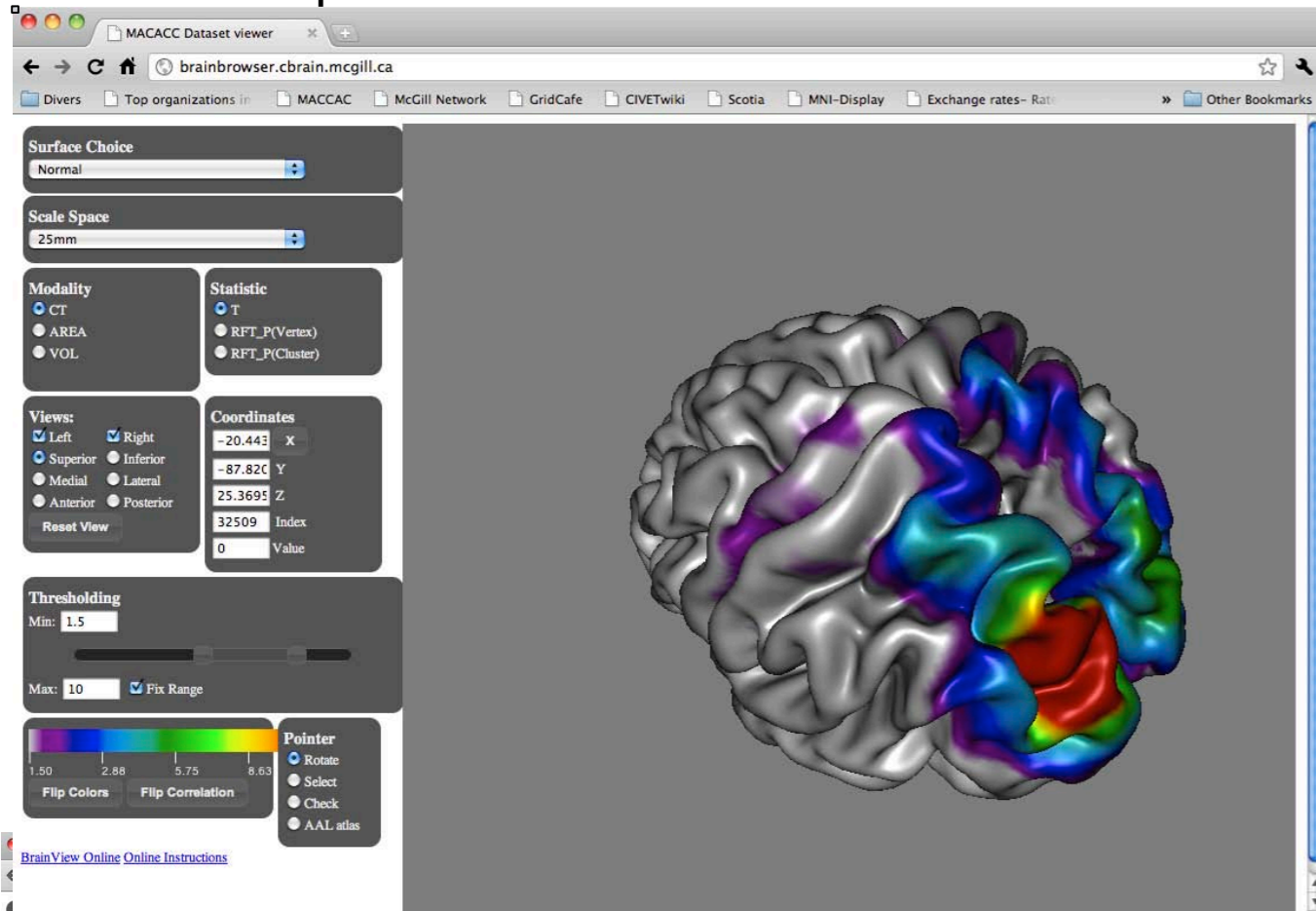


Freesurfer
One HPC

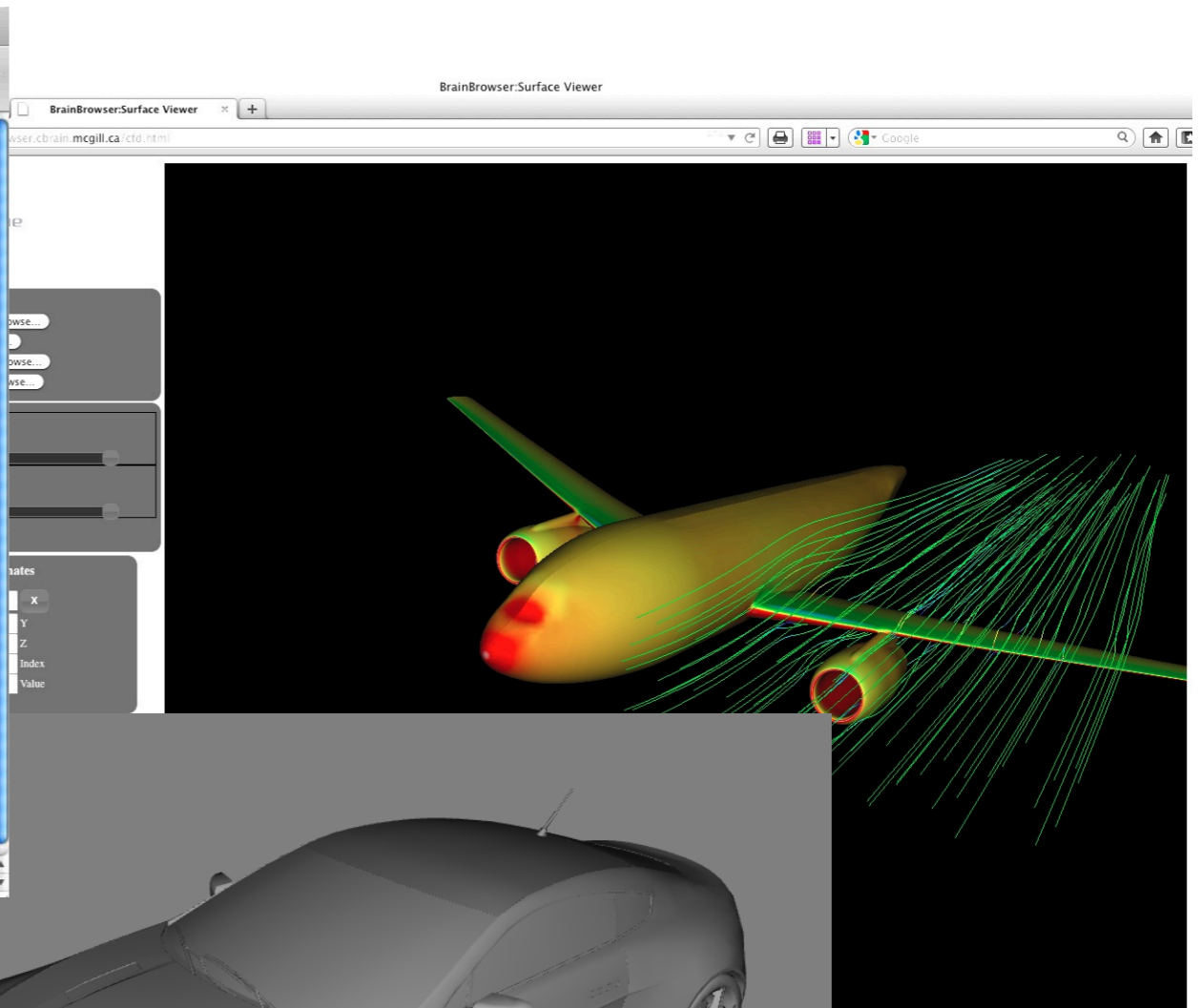


BrainBrowser – Web3D Planes, brains and automobiles

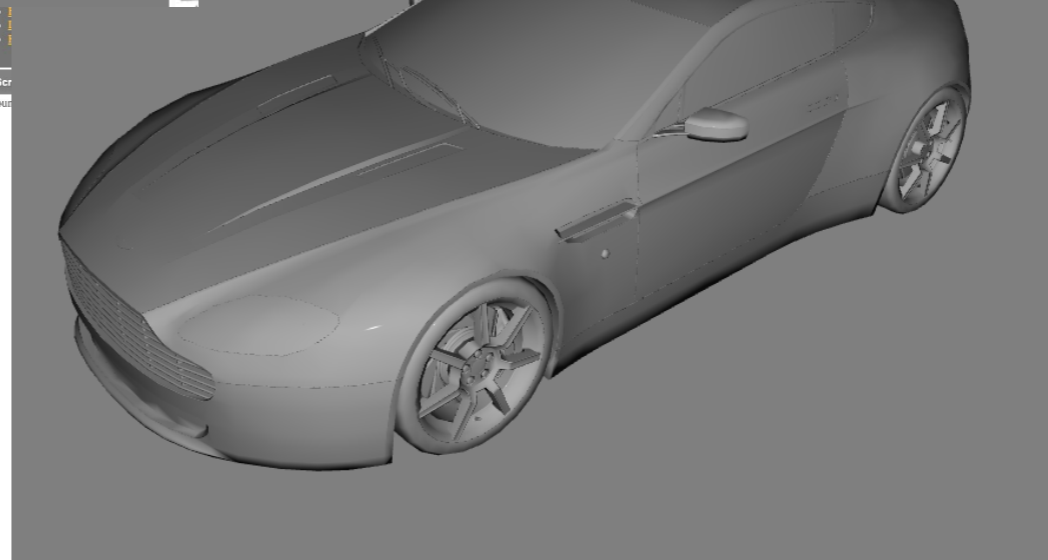
MACCACC Maps



Mesh and Fibertracks



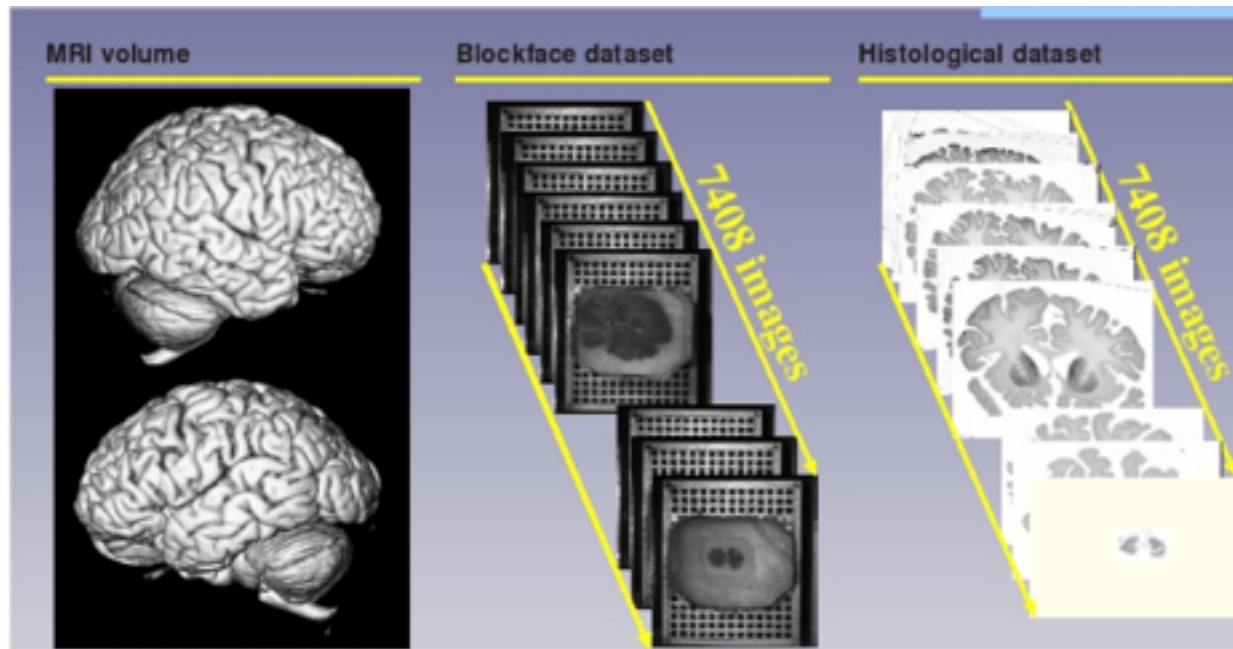
DLR-F6 Model



Aston Martin

Big Brains

- Drs. Zilles & Amunts -
Post-Mortem High-Resolution Histology



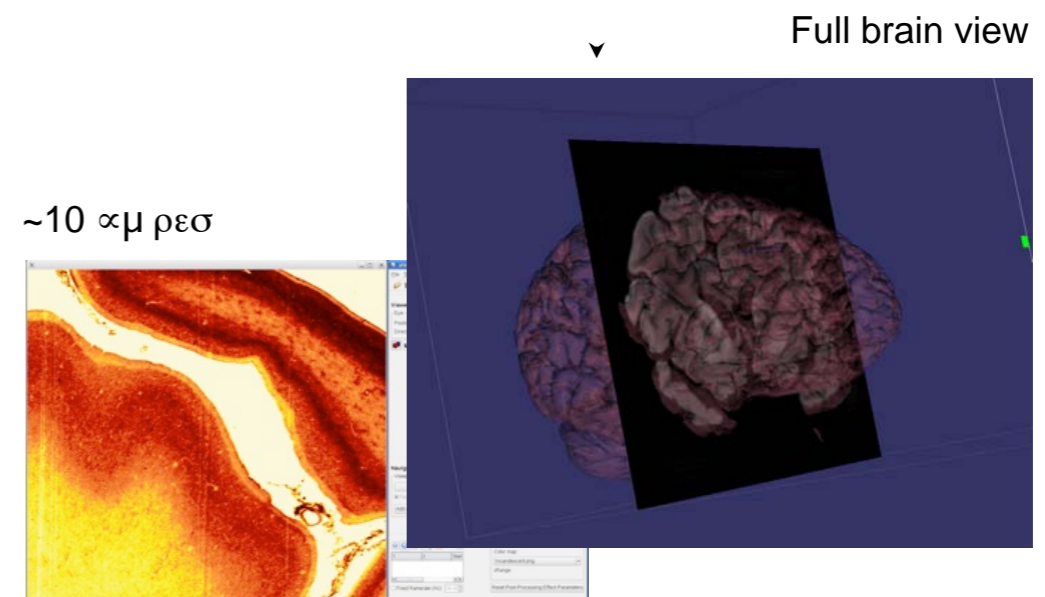
Julich, Germany. Dr. Karl Zilles

Rip & Tear correction
~5000 CPU hours

Non-linear slice alignment, 50 iterations
~370,000 CPU hours

Conversion: 1TB 3D data structure
HPC ~160 CPU hours

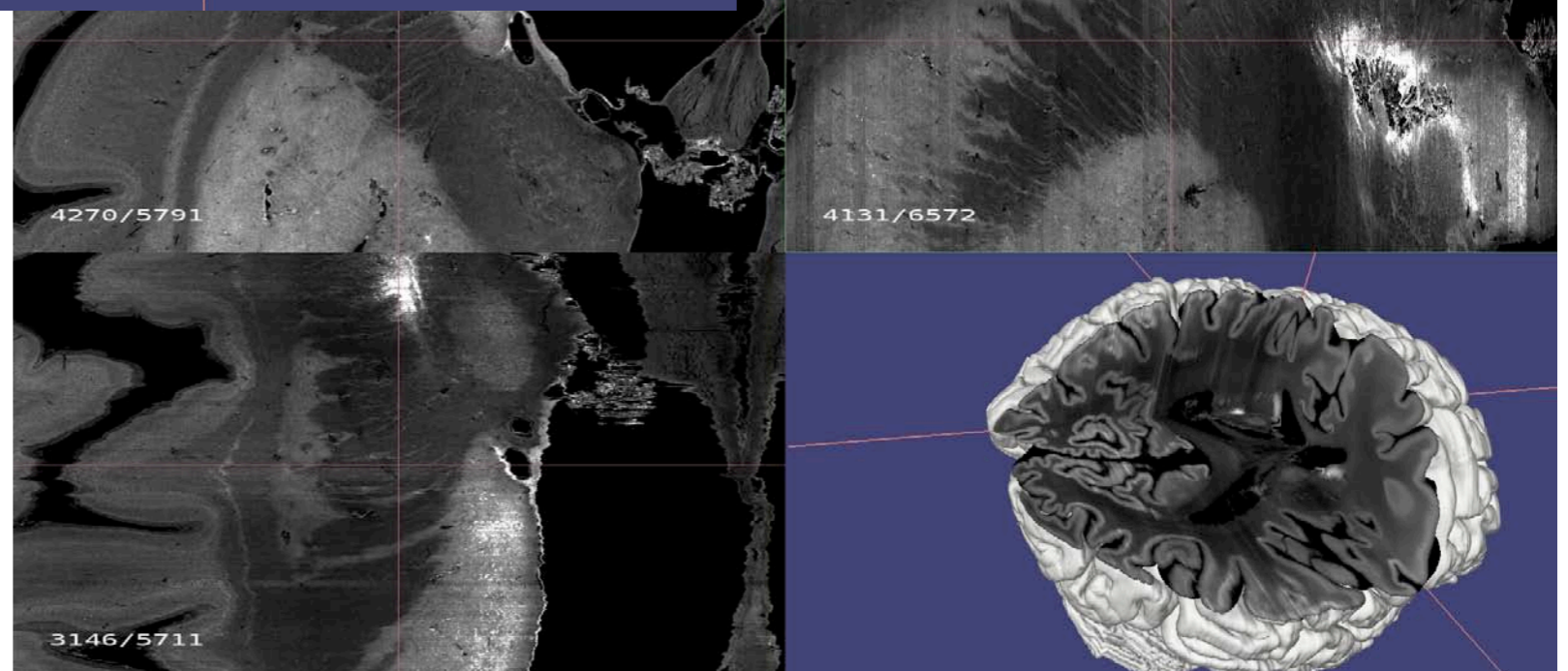
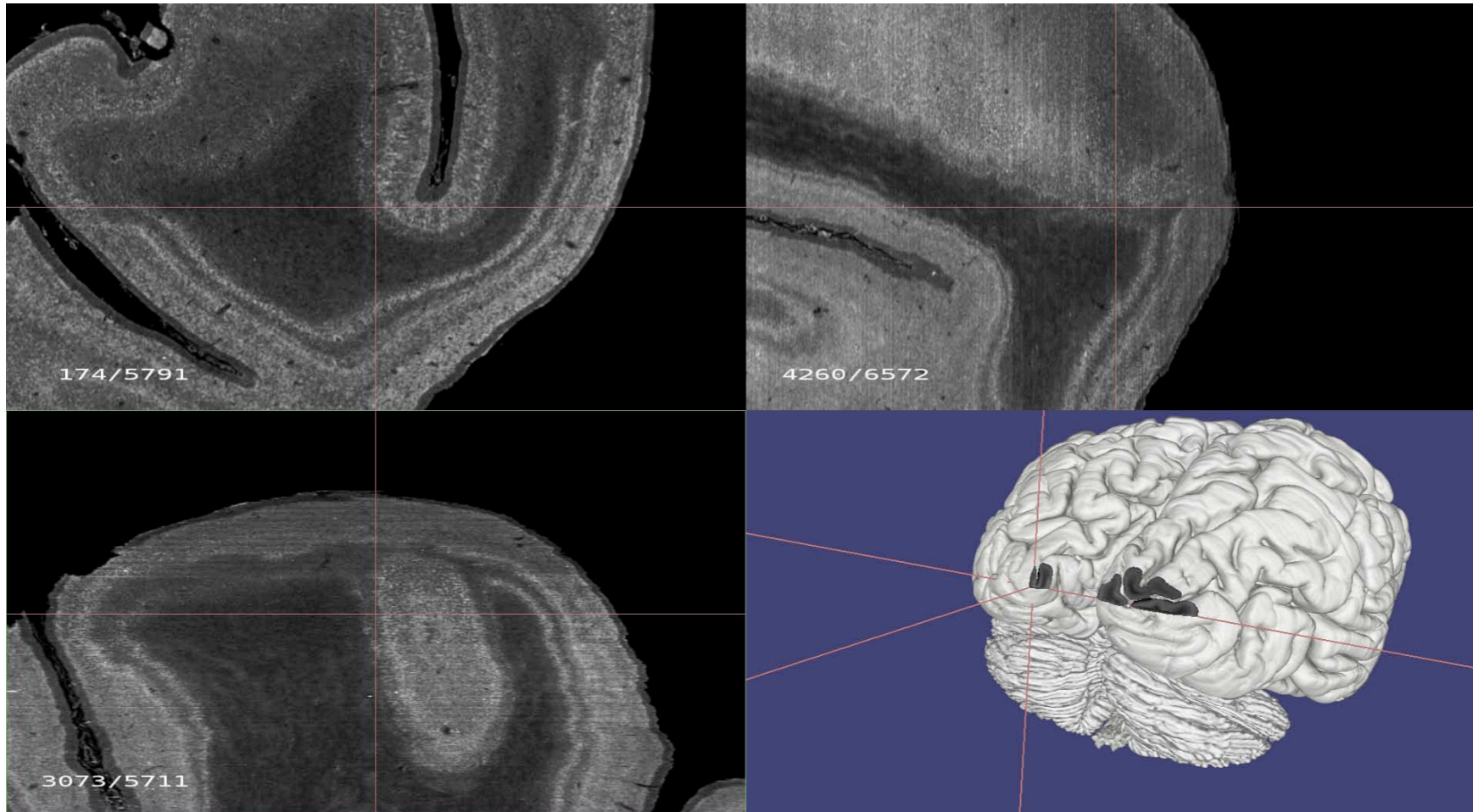
- 1TB of data per brain
- 7408 Slices
- 11500x8800 pixels
- Animal studies will generate a few dozens per year

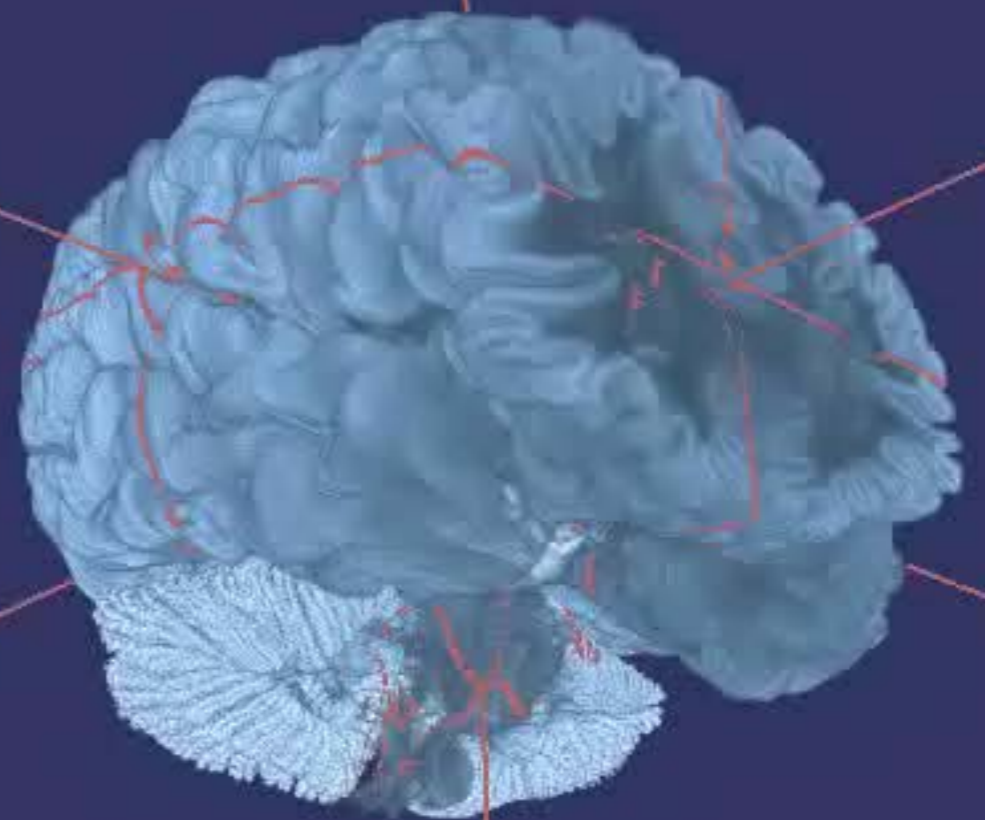
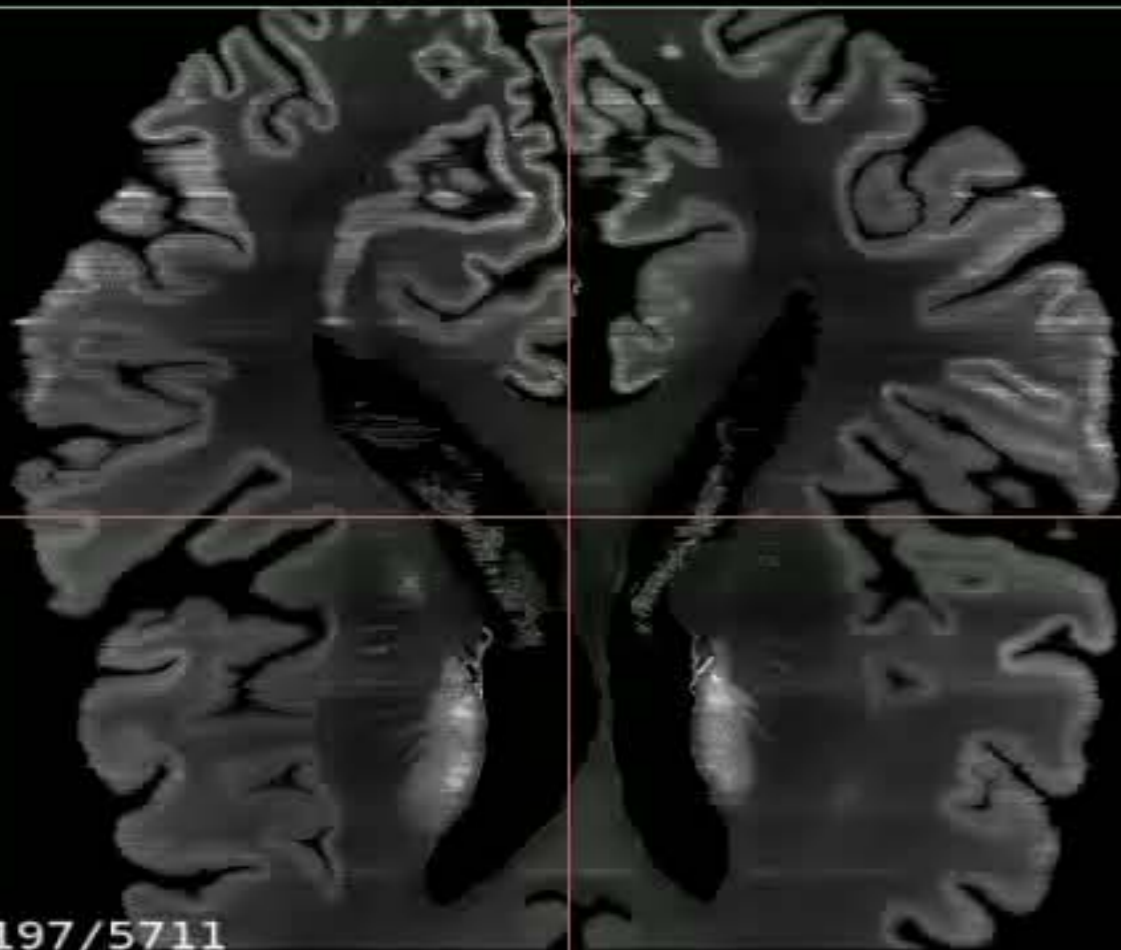
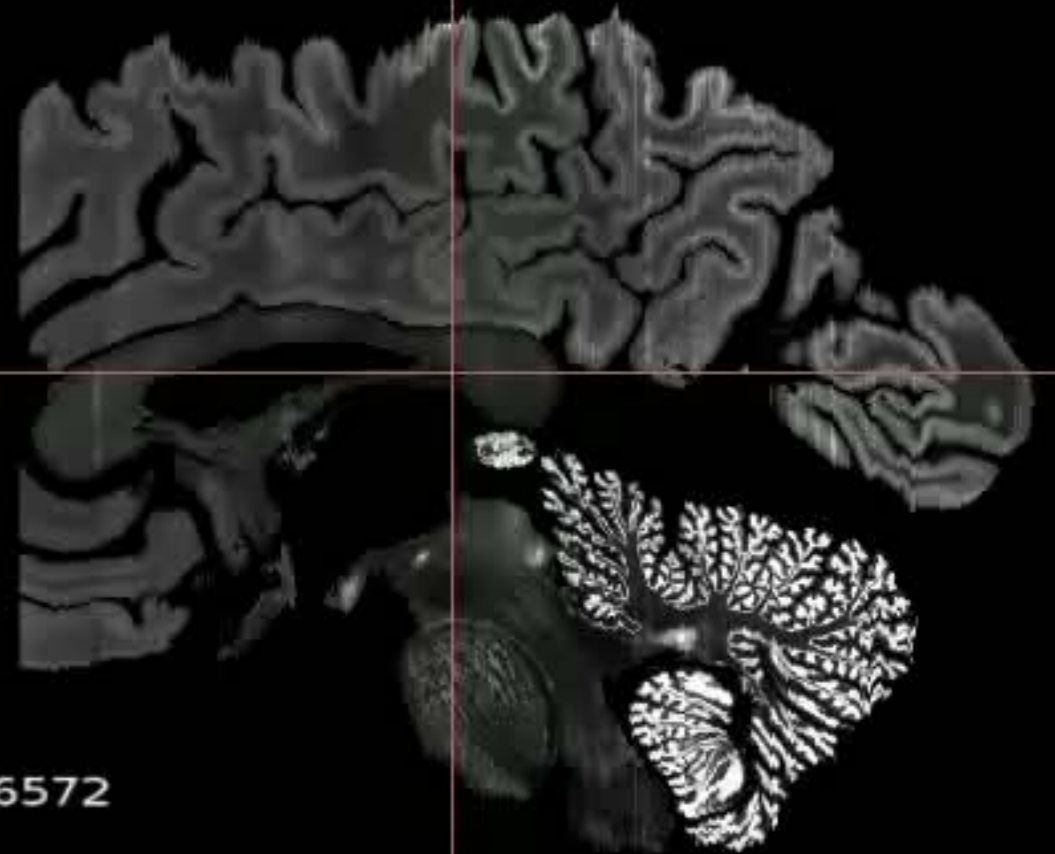
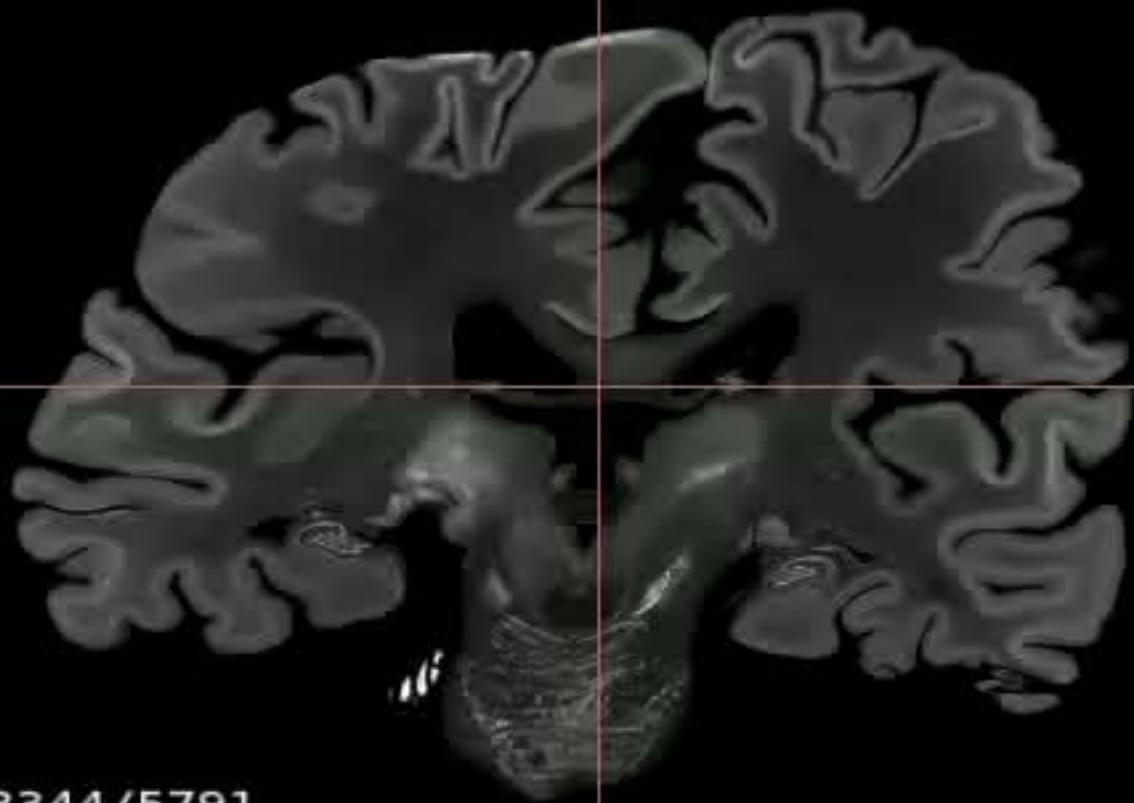


Goal: Collaborative, Real-Time 3D Visualization

Big Brains – Atelier3D

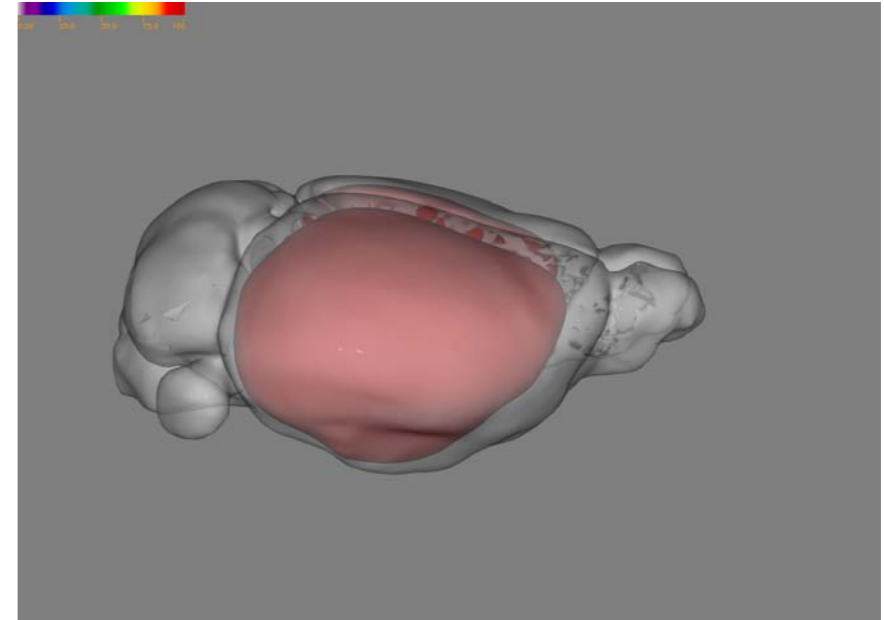
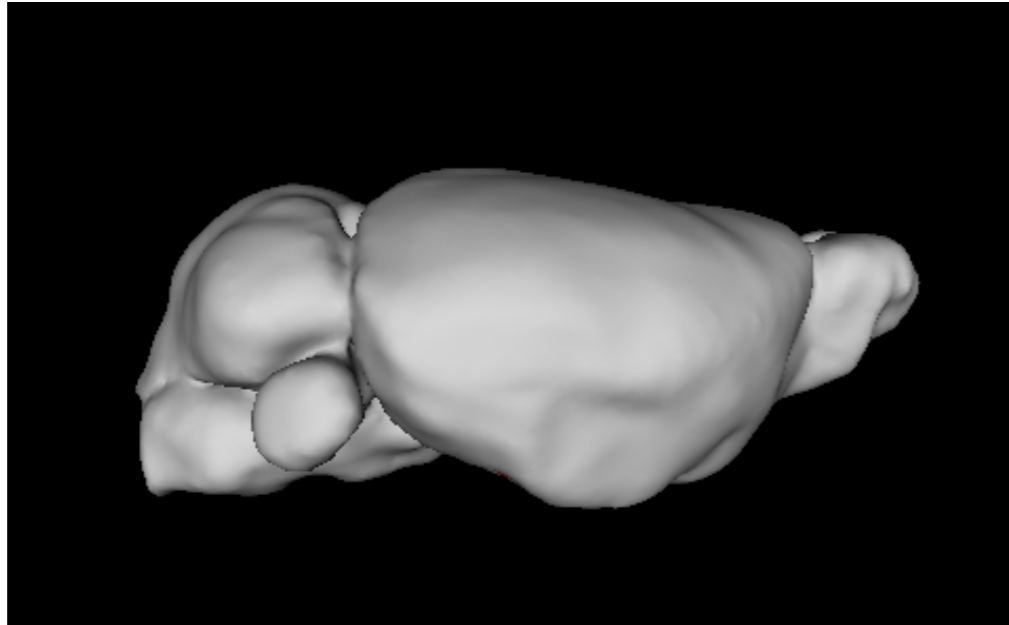
Histology – Neuroimaging – HPC – Modeling/Visualisation



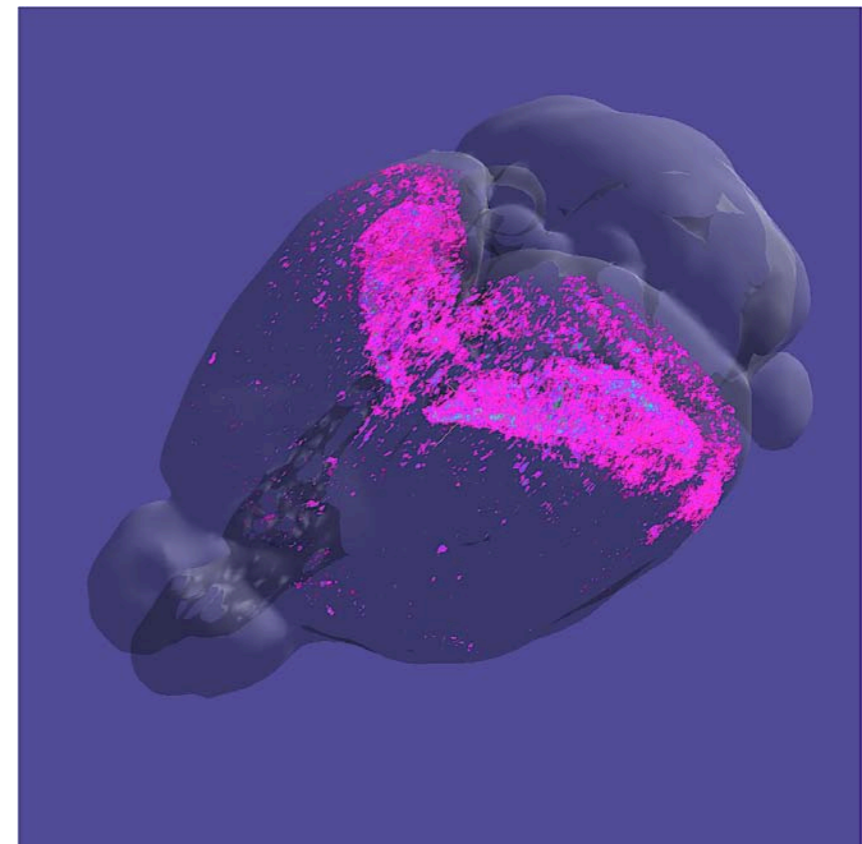
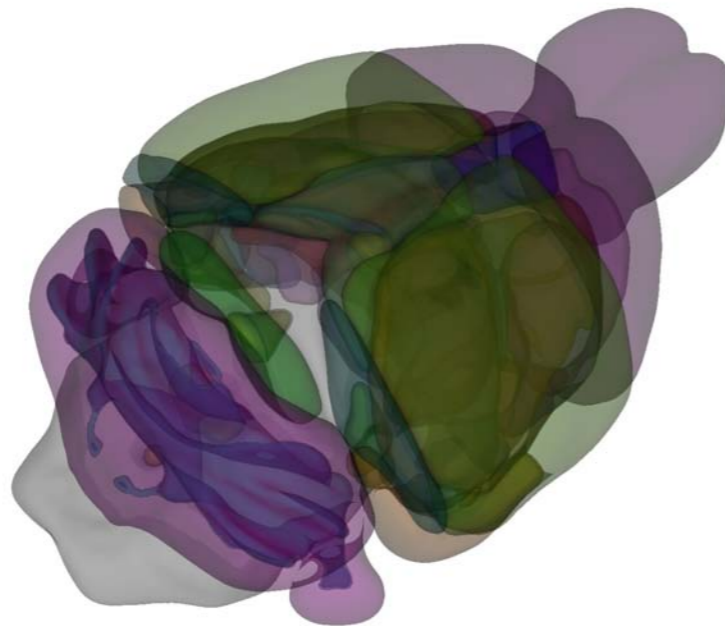


Large Animal Datasets (Dr. Bedell)

CBRAIN
BrainBrowser



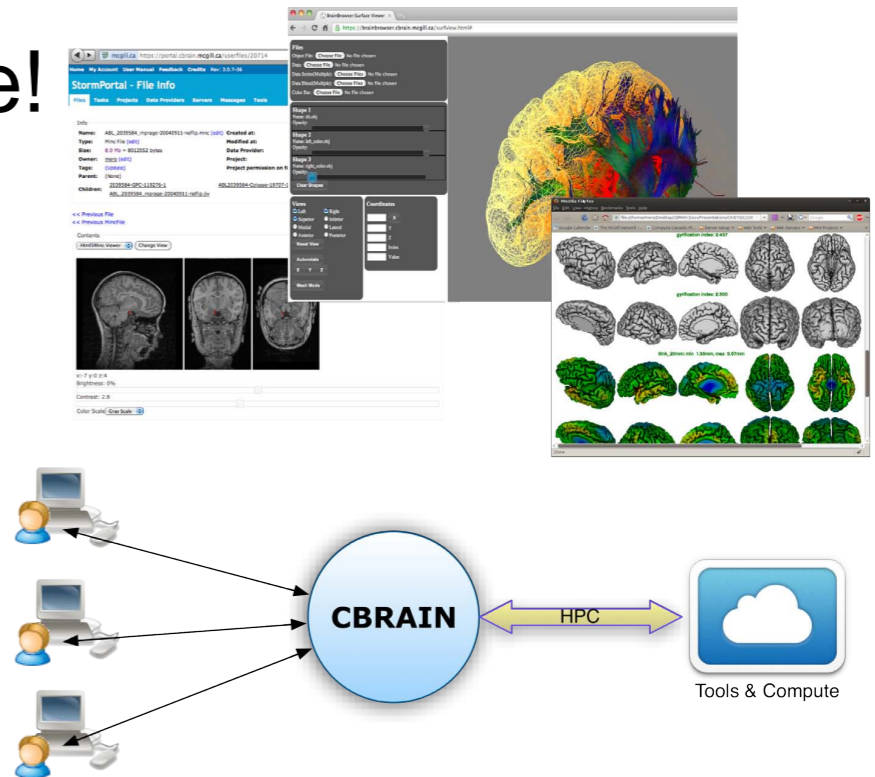
Atelier 3D



What can CBRAIN do for you?

Typical Usage

- Access to pre-installed tools, converters, pipelines.
- Access to large amounts of compute power (project speedup).
- Long distance collaborations / data sharing.
- Web based visualisations.
- Do things you could not easily do before!



Illustrative Performance Comparison

NIH-Pediatric-Obj1: up to 3 visits per subject

866 CIVET pipeline runs to generate cortical thickness maps

Input: 866 x 3 x 5Mb = 15Gb

Output: 866 x 250 Mb = 211Gb

| Cluster | Total CPU-hrs | Maximum Performance | | Typical Performance | |
|------------------------------------|----------------|---------------------|----------------|---------------------|----------------|
| | | # cores | Execution time | # cores | Execution time |
| mammoth-ms2 (RQCHP -Sherbrooke) | 866 x 4 = 3464 | ~500 | 3hr | 176 | 17hr |
| CLUMEQ-Krylov (McGill) | 866 x 6 = 5196 | ~90 | 2.5d | 24 | 9d |
| BIC (MNI) | 866 x 8 = 6928 | ~100 | 3d | 40 | 7d |

In general, studies which use to takes 1 week to 1 month now take 1 day.

Available Tools

Based on Community requests!

Come talk to us, we will see what we can do.

CIVET

NIAK (Dr. Bellec)

FSL (some tools)

Minc tools (some tools)

FreeSurfer recon-all

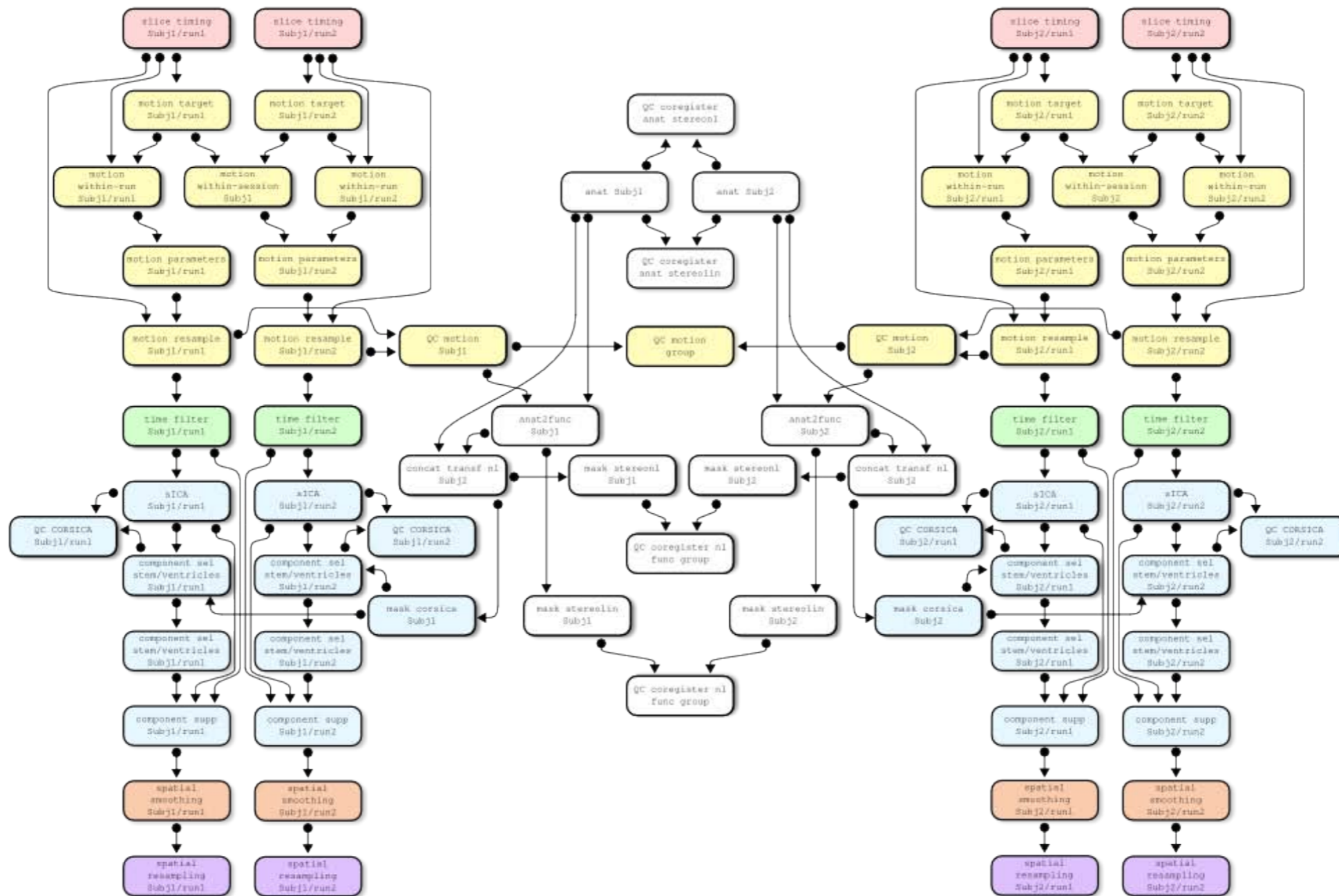
SPM Batch

Format conversion (minc, nifty, dicom, analyze...)

Cw5

Can the tools be complex?

Dynamic Flowchart for fMRI pre-processing (NIAK) – 2 subjects



A Few CBRAIN Related Publications





NeuroImage

Volume 55, Issue 2, 15 March 2011, Pages 462–467



Patterns of cortical thickness and surface area in early Parkinson's disease

Thomas Jubault^{a, b}, Jean-François Gagnon^c,
C. Evans^d, Oury Monchi^{a, b}, , 

^a Unité de Neuroimagerie Fonctionnelle, Institut U
^b Département de Radiologie, Université de Mon
^c Département de Psychologie, Université du Qu
^d McConnell Brain Imaging Centre, McGill Unive
^e Montreal Neurological Institute, McGill Univers
^f Movement Disorders Unit, McGill University He

Received 20 August 2010. Revised 30 November

<http://dx.doi.org/10.1016/j.neuroimage.2010.12.0>

 Permissions & Reprints

Integration of a neuroimaging processing pipeline into a pan-canadian computing grid

S. Lavoie-Courchesne^{1,2,3}, P. Rioux³, F. Cloutier³,
T. Sherif³, M.-E. Rousseau³, S. Das³, R. A. D. C. Craddock^{4,8},
D. Margulies^{5,8}, C. Chu^{6,8}, A. C. Evans³, P. Bellec^{1,2,8}

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² Département d'informatique et de recherche opérationnelle, Montréal, CA
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⁶ Section of Functional Imaging Methods, Laboratory of Psychology and Neuroscience, University of Maryland, Bethesda, USA
⁷ Mind, Brain Imaging and Neuroethics Unit, Institute of Ottawa Health Care Group, University of Ottawa, Ottawa, Canada
⁸ The Neurobureau Research Institute, Chicago, USA

E-mail: {bellecp@iro.umontreal.ca, lavoiec@iro.umontreal.ca}

Abstract. The ethos of the neuroimaging field is quick to adopt new technologies, including both imaging databases and processing pipelines. However, the field is heterogeneous, computationally intensive tools, such as those used in this study, often represent a large volume of datasets and as neuroimaging processing pipelines become more complex, such operational challenges. This motivates the design of novel dedicated interfaces between PSOM, a code-oriented platform for neuroimaging processing, and CRAIN, a web-oriented platform for grid computing. We describe here an interface between PSOM, a code-oriented platform for neuroimaging processing, and CRAIN, a web-oriented platform for grid computing. We also showed the capacity of this database by processing close to 1000 subjects released in the public domain. This pilot experiment demonstrates the feasibility of our computing solution for high-throughput processing in the

1. Introduction

With most modern scientific projects relying heavily on computer research software prototypes is of central importance at the very beginning of a project. The dissemination of published results by independent research groups [1]. In the current era of open access, dissemination raises a number of domain-specific computational

- (i) **Complex multi-stage processing.** Neuroimaging data often require a large number of preprocessing steps before a scientifically meaningful analysis. These steps can include such operations as non-linear real

JPCS 2011 – HPCS 2011

FOCUS ON NEUROINFORMATICS

Virtual imaging laboratories for marker discovery in neurodegenerative diseases

Giovanni B. Frisoni, Alberto Redolfi, David Manset, Marc-Étienne Rousseau, Arthur Toga and Alan C. Evans

Abstract | The unprecedented growth, availability and accessibility of imaging data from people with neurodegenerative conditions has led to the development of computational infrastructures, which offer scientists access to large image databases and e-Science services such as sophisticated image analysis algorithm pipelines and powerful computational resources, as well as three-dimensional visualization and statistical tools. Scientific e-infrastructures have been and are being developed in Europe and North America that offer a suite of services for computational neuroscientists. The convergence of these initiatives represents a worldwide infrastructure that will constitute a global virtual imaging laboratory. This will provide computational neuroscientists with a virtual space that is accessible through an ordinary web browser, image data sets and related clinical variables, algorithm pipelines, computational resources, and statistical and visualization tools will be transparently accessible to users irrespective of their physical location. Such an experimental environment will be instrumental to the success of ambitious scientific initiatives with societal impact, such as the prevention of Alzheimer disease. In this article, we provide an overview of the currently available e-infrastructures and consider how computational neuroscience in neurodegenerative disease might evolve in the future.

Frisoni, G. B. et al. *Nat. Rev. Neurol.* 7, 429–438 (2011); published online 5 July 2011; doi:10.1038/nrn.2011.99

Introduction

Research in neurodegenerative diseases is undergoing a radical transformation brought about by extraordinary growth in the volume, availability and accessibility of clinical and research imaging data, both in the form of public releases and within virtual research organizations. Traditional neuroimaging research typically involved small to mid-sized locally collected data sets ranging from dozens to hundreds of scans. Only a few imaging laboratories have the technical expertise and computational resources required to merge multiple large data sets and explore scientific questions relating to larger populations. Not only do neuroscientists face a steep learning curve to grasp their own particular computing ecosystem, in terms of operating system environment, basic scripting, programming, remote data transfers and remote computing, but also, because of divergence in the basic information technology (IT) setup, the principles of one ecosystem often do not adapt well to other laboratories. The commonplace replication and idiosyncrasies of toolsets and infrastructures among many sites greatly increases the complexity and overheads for neuroimaging projects, leading to issues such as the need to locally support IT-related technical staff, and difficulties in coordinating multisite studies.

Open access to large data sets, pioneered in genetics and physical sciences, has been implemented successfully by various initiatives in the neuroimaging field, such as the

Alzheimer's Disease Neuroimaging Initiative (AHEAD) and the NIH Pediatric Database (NIHPD).² Since all researchers who subscribe to these databases have been able to obtain full access to images and clinical data people with varying degrees of cognitive deterioration were originally collected to identify biomarkers of initiation and progression.^{3,4} Currently, a number of very large data sets can be found in the public domain and freely downloaded, such as the 1000 Funct Connectomes Project,⁵ the Human Imaging Database (HID),⁶ the Open Access Series of Imaging Studies (OASIS),⁷ the Bipolar Disorder Neuroimaging Database (BiND),⁸ Multisite Imaging Research in the Area of Depression (MIRIAD),⁹ and Efficient Longitudinal Study of Depression in the Elderly (ELUDE).¹⁰

The gap between the pace of data generation and the capability to extract clinically or scientifically relevant information is rapidly widening. Sophisticated algorithms are available, and more are being developed, that allow extraction of biologically relevant markers from imaging and clinical data requiring heavy computational resources. For instance, the extraction of the three-dimensional cortical thickness map, a marker of neurodegeneration, from a high-resolution structural MRI scan can take between 30 min and 22 h per scan on a single-core computer. The extraction of functional connectivity networks can take 20–120 min. At present, relatively few imaging laboratories worldwide have the expertise and resources required for such sophisticated high-throughput comput

Competing interests
The authors declare no competing interests.

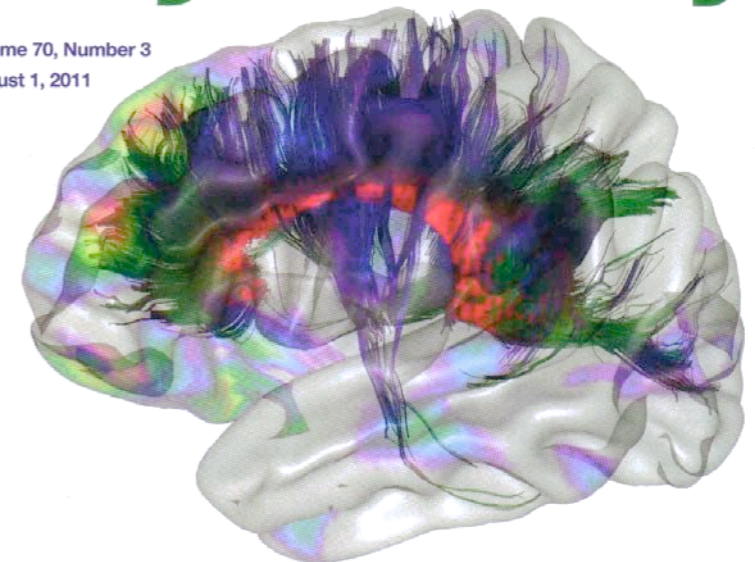
NATURE REVIEWS | NEUROLOGY

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Nature reviews. Neurology, 2011 Jul 07; 7(8):429-38

Biological Psychiatry

Volume 70, Number 3
August 1, 2011



Genotype, Circuits, and Cognition in Autism and Attention-Deficit/Hyperactivity Disorder

Official Journal of the Society of Biological Psychiatry

ISSN 0006-3223
www.sobp.org/journal

Selected Conferences and Press

SIGGRAPH 2011, Vancouver, Canada, Bird of a Feather: WebGL session, Invited Speaker, **BrainBrowser**.

EGI User Forum 2011, Vilnius, Lithuania, Invited Speaker, **GBRAIN Project (a CANARIE NEP Project)**.

MICCAI 2011 Workshop High Performance and Distributed Computing for Medical Imaging, Toronto, Canada, Invited Speaker, The CBRAIN Neuroimaging Platform.

Canadian Research Data Summit 2011, Invited Speaker. Dialogue on developing a common vision. Ottawa, Canada, The CBRAIN Neuroimaging Platform.

HPCS 2011, Montreal, Canada, Invited Speaker, **CBRAIN: Canadian Neuroinformatics Platform**.

Best Poster at HPCS 2011, Montreal, Canada. Sébastien Lavoie-Courchesne, P. Rioux, T. Sherif. S. Das, N. Kassis, J. Doyon, R. Adalat, M.E. Rousseau, A.C. Evans, P. Bellec, Integration of a neuroimaging pipeline prototype into a pan-canadian computing grid.

Best Live Demonstration at EGI Technical Forums 2011, Lyon, France.

<http://gridtalk-project.blogspot.com/2011/09/win-win-win.html> and article <http://www.isgtw.org/visualization/hat-trick-alzheimer%E2%80%99s-grand-challenge>

Rapport Annuel RISQ 2009-2010: Le Project CBRAIN

Colloque RISQ 2009: Highest Satisfaction level (from public vote)

CBRAIN technologies produced a cover page for Ducharme & al in **Biological Psychiatry** (see Publication: Biol Psychiatry. 2011 Aug 1;70(3):283-90. Epub 2011 Apr 30.)

Gigabits on the Brain. Ottawa Citizen, Business Frontpage.

<http://www.ottawacitizen.com/business/Gigabits+brain/3691533/story.html>

CANARIE opens the “ultra-fast lane”. Telemanagement.

http://www.tele-management.ca/content/23481-canarie_opens_the_%E2%80%99Cultra_fast_lane%E2%80%9D

OGF-28 Sessions 2010, Munich GER, Invited Speaker. CBRAIN/GBRAIN Projects.

Selected 2011 Publications

Frisoni G. B., Redolfi A., Manset D., Rousseau M. E., Toga A., Evans A. C. **Virtual imaging laboratories for marker discovery in neurodegenerative diseases.** Nature reviews. Neurology, 2011 Jul 07; 7(8):429-38

Ducharme S, Hudziak JJ, Botteron KN, Ganjavi H, Lepage C, Collins DL, Albaugh MD, Evans AC, Karama S; Brain Development Cooperative Group. **Right anterior cingulate cortical thickness and bilateral striatal volume correlate with child behavior checklist aggressive behavior scores in healthy children.** Biol Psychiatry. 2011 Aug 1;70(3):283-90. Epub 2011 Apr 30.

Lavoie-Courchesne, S. Rioux P., Chouinard-Decorte P., Sherif T., Rousseau M.-E., Das S., Adalat R., Doyon J., Craddock C., Margulies D., Chu C., Lyttelton C., Evans A.C., Bellec P. **Integration of a neuroimaging processing pipeline into a pan-canadian computing grid.** Journal of Physics: Conference Series HPCS 2011, **accepted.**

Gong G, He Y, Chen ZJ, Evans AC. **Convergence and divergence of thickness correlations with diffusion connections across the human cerebral cortex.** Neuroimage. 2011 Aug 22. [Epub ahead of print]

Gong G, He Y, Evans AC. **Brain connectivity: gender makes a difference.** Neuroscientist. 2011 Oct;17(5):575-91. Epub 2011 Apr 28.

Ganjavi H, Lewis JD, Bellec P, MacDonald PA, Waber DP, Evans AC, Karama S; Brain Development Cooperative Group. **Negative associations between corpus callosum midsagittal area and IQ in a representative sample of healthy children and adolescents.** PLoS One. 2011;6(5):e19698. Epub 2011 May 19.

Operation and Support

- Compute Canada Support (3.7M hours for 2012)
- Creation of a Center for Neuroinformatics
- CFI Application
 - 5 PB Datacenter, part of Compute Canada environment
 - Obtained Server Room support for 5 years from McGill
 - Obtained Compute Canada and CLUMEQ-ETS support
- Partner Projects
 - Small contracts to support specific CBRAIN projects (Julich, outGRID...)
- CANARIE & Compute Canada next round (in 2012)
 - National Research Platform Initiative.


Can I get access?
Can I get involved?

cbrain.mcgill.ca

The screenshot shows a web browser window with the address bar displaying "cbrain.mcgill.ca". The website header features the "CBRAIN" logo on the left and navigation buttons for "Home", "Contact Us", and "CBRAIN Portal" on the right. Below the header is a green navigation bar with the following menu items: "RESEARCH", "COLLABORATIVE PLATFORM", "TOOLS", "NATIONAL AND INTERNATIONAL REACH", "MEDIA CENTER", and "ABOUT CBRAIN".

The main content area is dominated by a large banner for "ACElab Neuroimaging software". The banner includes the text "ACElab Neuroimaging software" in large blue and white font, "MONTREAL NEUROLOGICAL INSTITUTE - MCGILL UNIVERSITY" and "DR. ALAN C. EVANS" in smaller white font, and a green "Learn more" button with a right-pointing arrow.

To the right of the banner is a "Highlights" section with three items, each featuring a small image and a "Read more" link:

-  BrainBrowser available online. [Read more >](#)
-  LORIS: multisite study data and workflow manager. [Read more >](#)
-  A Collaborative Cloud with the CBRAINengine. [Read more >](#)

Below the highlights is a "News" section with the date "21 SEPTEMBER 2011" and the headline "Best Demo Award @EGI 2011". It includes a "Read more" link and a green "All News" button with a right-pointing arrow.

Contact Our Team

CBRAIN contacts:

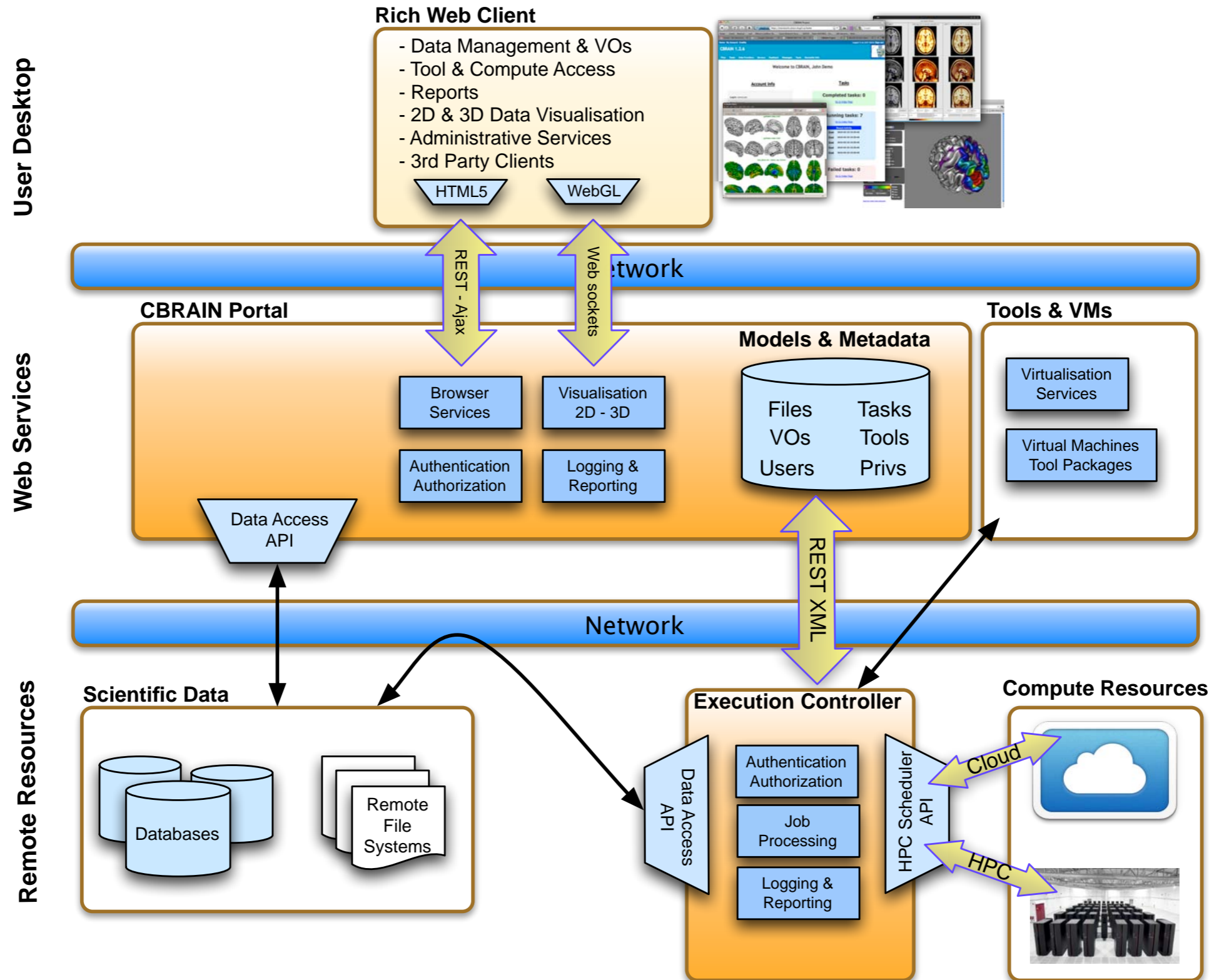
Technical Manager:

Marc Rousseau – marc.rousseau@mcgill.ca

Project Manager:

Reza Adalat – reza.adalat@mcgill.ca

CBRAIN Architecture



CBRAIN Project Team & Partners

Alan Evans

Reza Adalat

Pierre Rioux

Tarek Sherif

Nicolas Kassis

Natacha Beck

Tien Duc Nguyen

Claude Lepage

Louis Borgeat (NRC)

Lindsay Lewis

Hartmut Molhberg, Timo Dickscheid (Drs. Zilles – Amunts)

All ACE Lab members

Mathieu Desrosiers (UdeM)

Pierre Bellec (UdeM)

Sébastien Courchenes-Lavoie (UdeM)

Participating Research Centers

Montreal Neurological Institute, McGill University (Lead)

Principal Investigator: Alan Evans

Program Manager: Reza Adalat

System Architect: Marc Rousseau

Developers: Pierre Rioux, Tarek Sherif, Angela McCloskey, Samir Das, David Brownlee

McGill Office of Technology Transfer (OTT):

Francoys Labonte

Canada National Research Council: Louis Borgeat

Consultants: Rosanne Aleong, Claude Lepage, Pierre Bellec, Andrew Janki, Robert Vincent

Rotman Research Institute, University of Toronto

Principal Investigators: Stephen Strother and Randy MacIntosh

Developers: Anda Pacurar, Anita Oder, Jacques Waller

Robarts Research Institute, University of Western Ontario

Principal Investigators: Ravi Menon and Mel Goodale

Developers: Martyn Klassen, Ronghai Tu

Unité de Neuroimagerie Fonctionnelle, Université de Montréal

Principal Investigators: Julien Doyon and Rick Hoge

Developer: Mathieu Desrosiers

Division of Neurology, University of British Columbia

Principal Investigators: Jon Stoessl and Max Cynader

Developers: Ryan Thomson, Nasim Vafai

CBRAIN acknowledges the contributions of IBM Canada
Jonathan Harlap and Sebastian Muehlboeck.



canarie

Contact Our Team

CBRAIN contacts:

Technical Manager:

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Project Manager:

Reza Adalat – reza.adalat@mcgill.ca

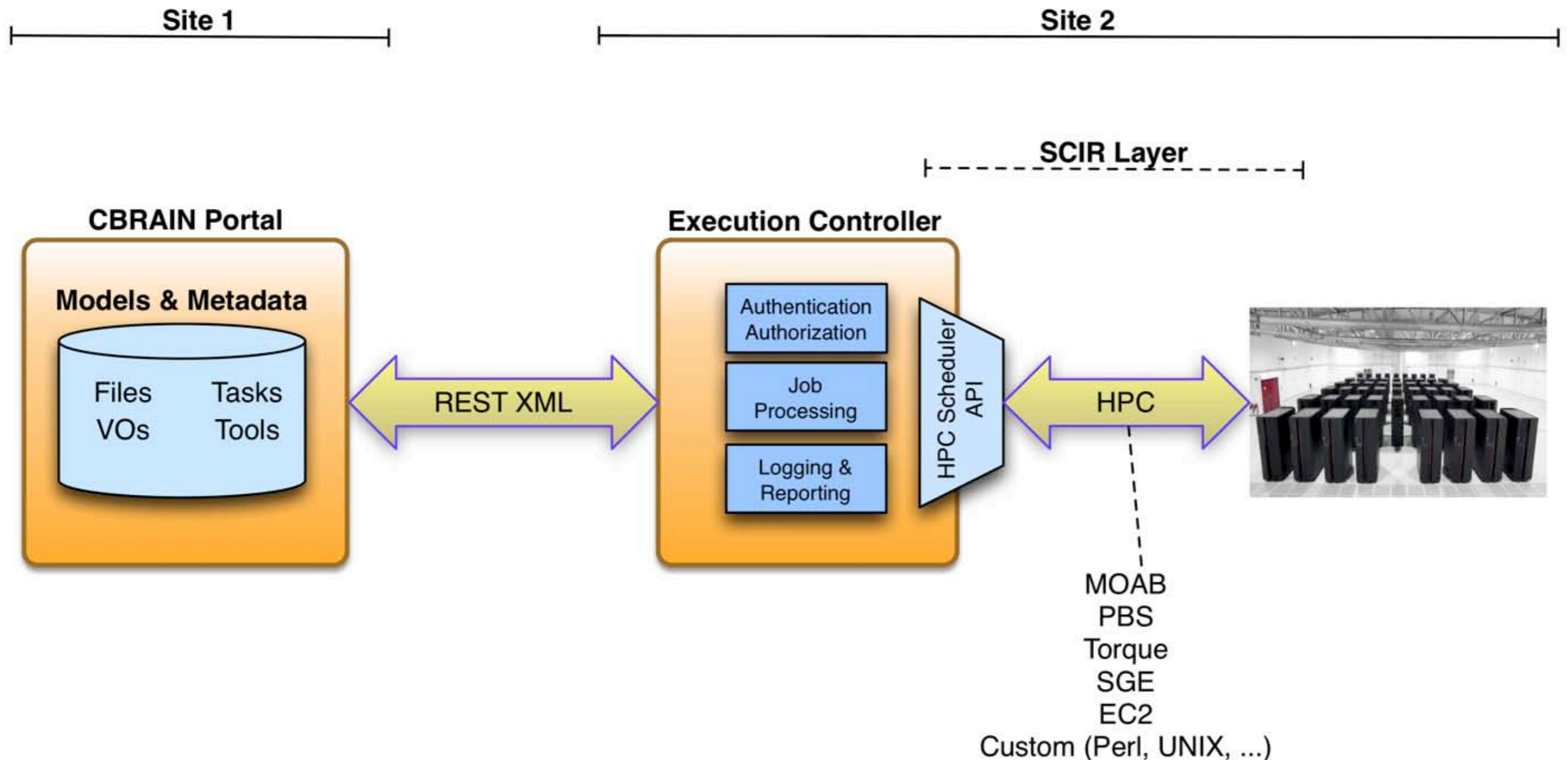
CBRAIN

Technical Overview

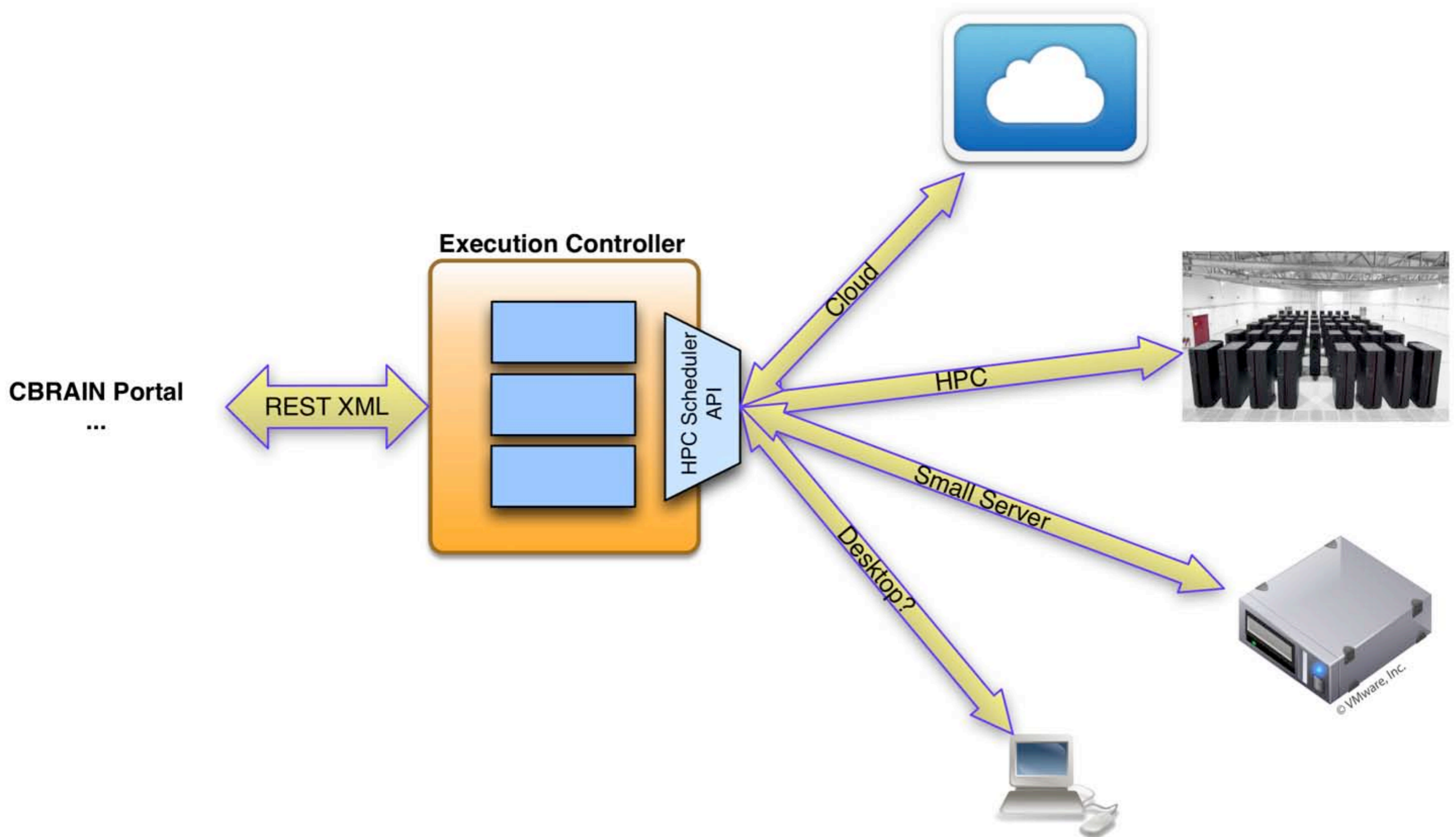


HPC Scheduling

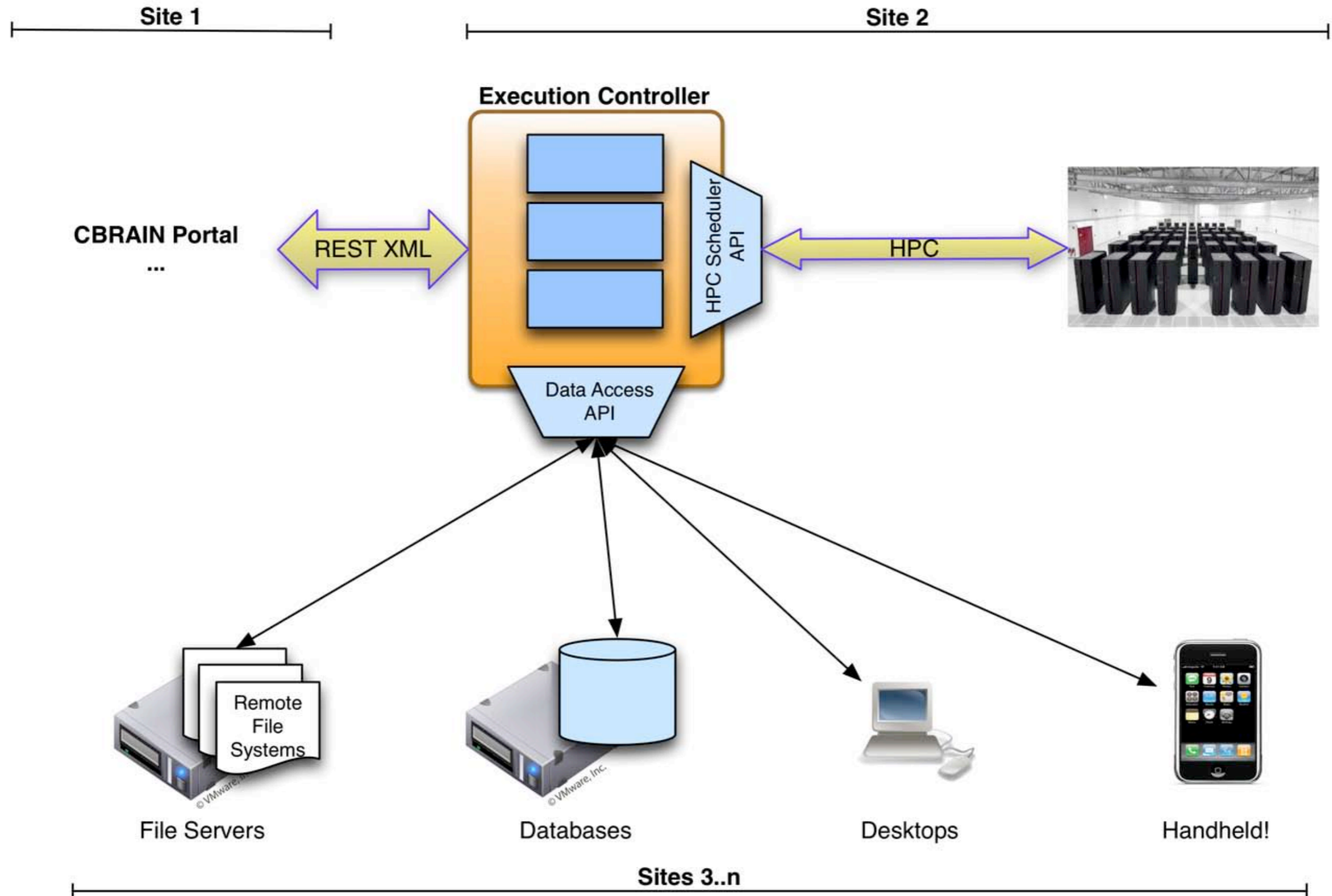
(SCIR: Simple Cluster Interface in Ruby)



Flexible Resource Access



Flexible Data Access

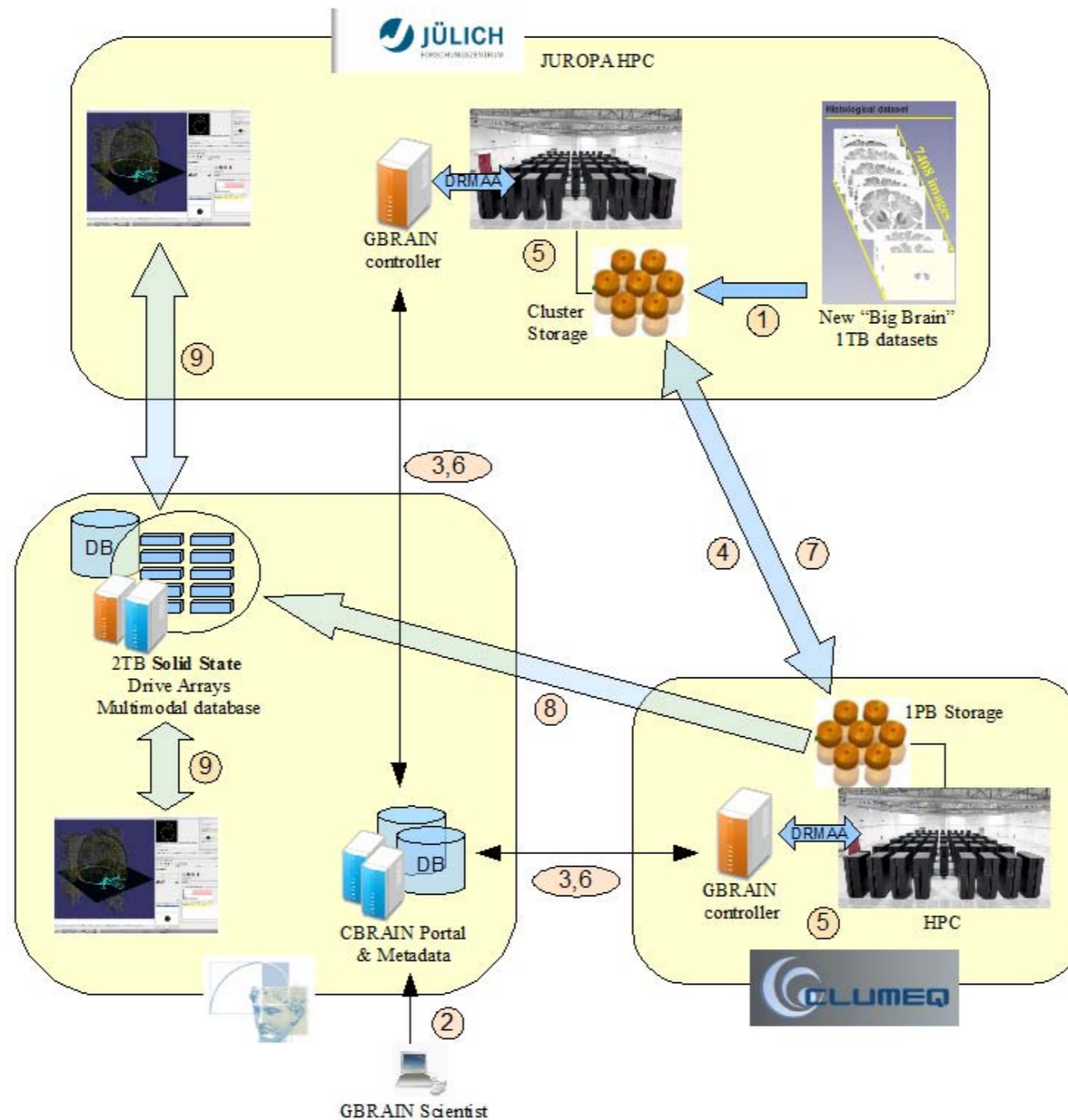


Julich Forschungszentrum, Germany

Large dataset assembly pipeline (current and future Big Brains)

Remote visualization of Big Brains (A3D)

MRI study



Operations in 2012

