

The Biomedical Informatics Research Network:

Experiences with Cyberinfrastructure in a Biomedical Research Community

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Scientific Coordinator

BIRN Coordinating Center

University of California San Diego

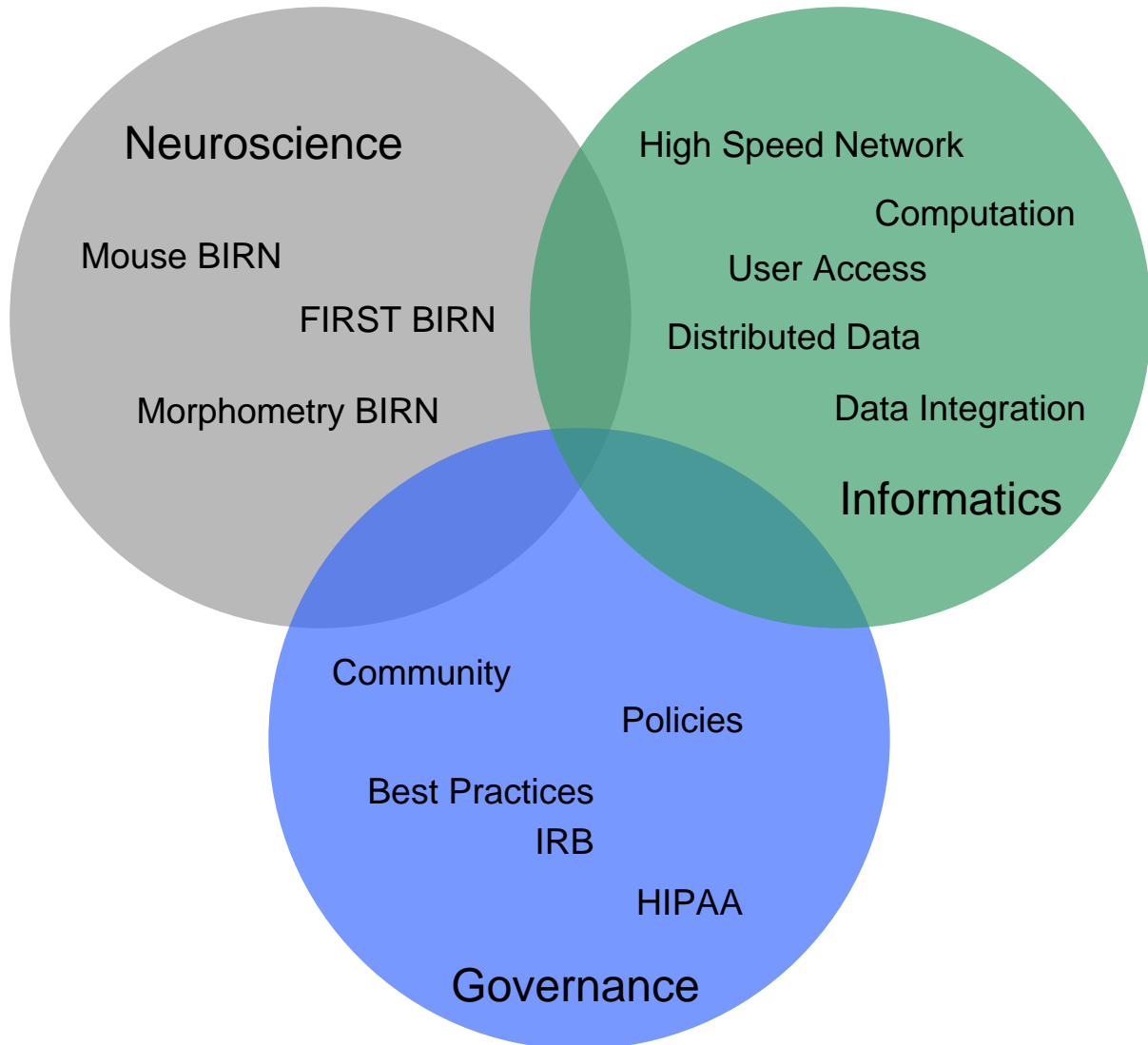
BIRN

BIOMEDICAL INFORMATICS RESEARCH NETWORK

BRIITE - IT SUPPORT FOR MULTI-INSTITUTION
COLLABORATIVE RESEARCH

November 4, 2005

Challenges



- Be the vehicle for bringing advanced cyberinfrastructure to the larger biomedical community
- Deliver and maintain a robust and scalable PRODUCTION Grid for the collaborative sharing, analysis and interrogation of biomedical data
- Provide integrated solutions for core domain science requirements
- Provide a consistent and scalable delivery mechanism

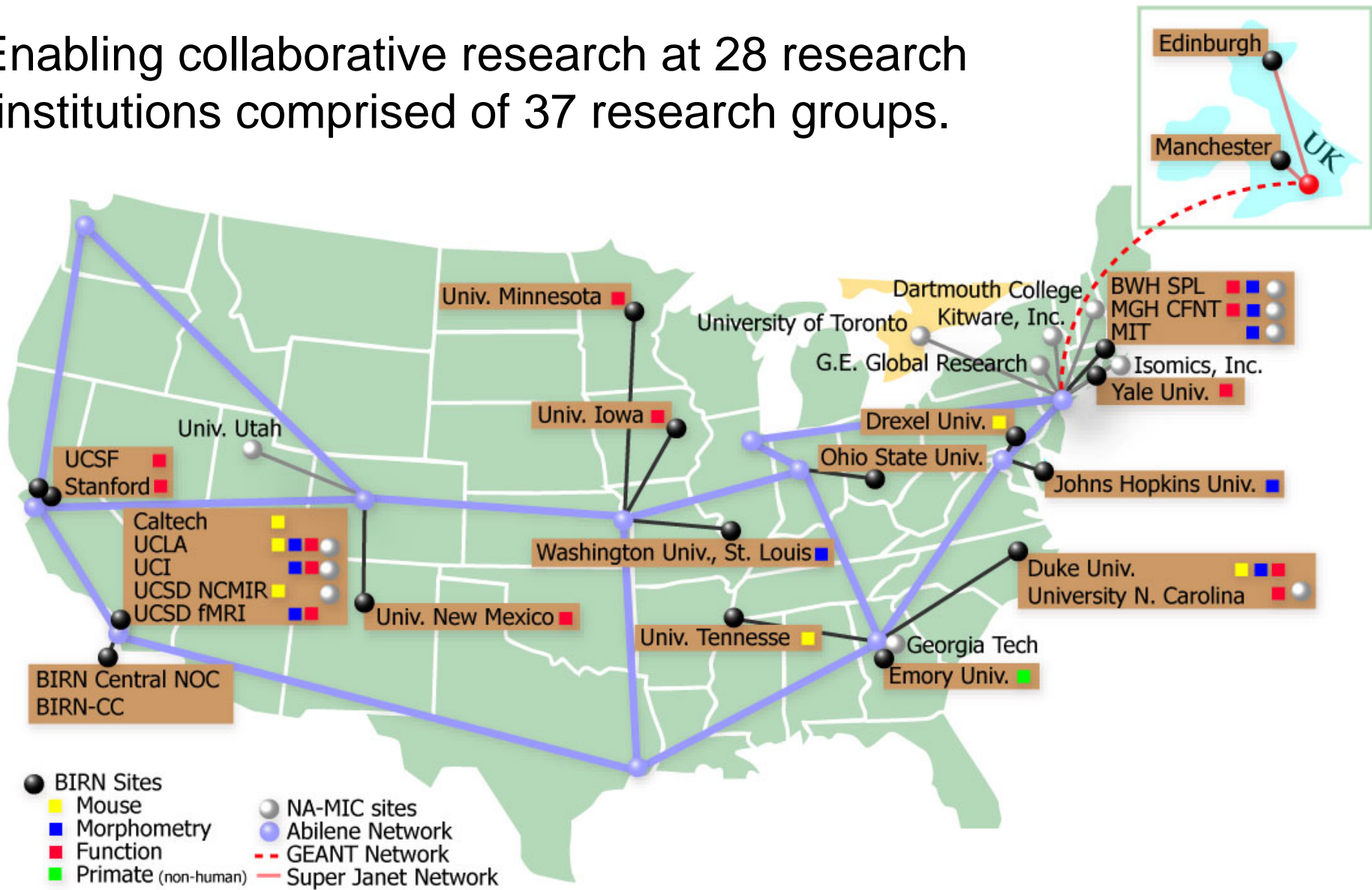
BIRN has developed an “End-to-End” Production Infrastructure in the context of distributed biomedical research projects.

- A stable, robust, shared network and distributed database environment
- Extensible tools and IT infrastructure that can be reused.
- Established cyberinfrastructure for data grid and large scale data integration effort
- High performance connectivity between distributed resources (computation and data storage)
- Seamless access to distributed high performance computing resources

Changing the use pattern for research data from the individual laboratory/project to shared use.

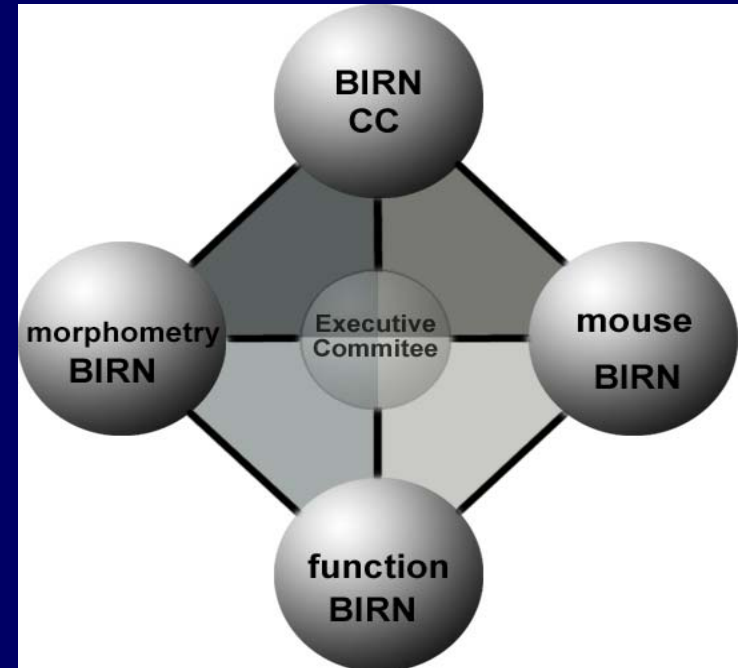
The BIRN Collaboratory Today

Enabling collaborative research at 28 research institutions comprised of 37 research groups.

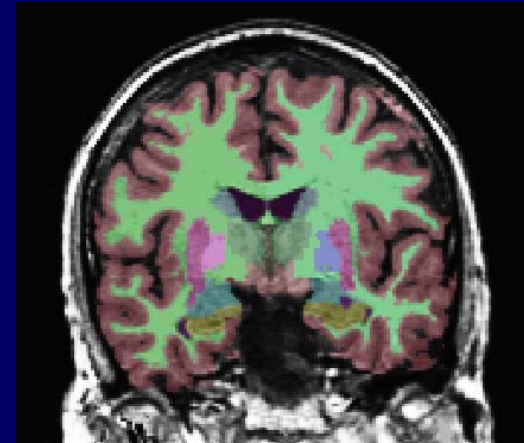


- **Morphometry BIRN**
 - Brain Structure in AD, MCI, Depression
- **Function BIRN**
 - Activation Differences in Schizophrenia
- **Mouse BIRN**
 - High Resolution Imaging and Animal Models of Human Diseases

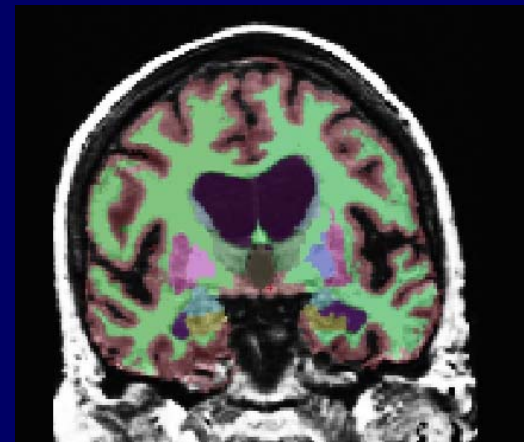
- **BIRN-CC**
 - Coordinating Center for Cyberinfrastructure



- Anatomical Correlates of Psychiatric Illnesses
 - Unipolar Depression, Alzheimer's Disease (AD) and Mild Cognitive Impairment (MCI)
- Site and Platform Independent Acquisition and Analysis for Pooling Data
 - Multi-Site Clinical Studies
 - Increase Statistical Power for Rare Populations or Subtle Effects
- Advanced Image Analysis and Visualization
- **MGH**, BWH, Duke, UCLA, UC San Diego, Johns Hopkins, UC Irvine, Wash U, MIT

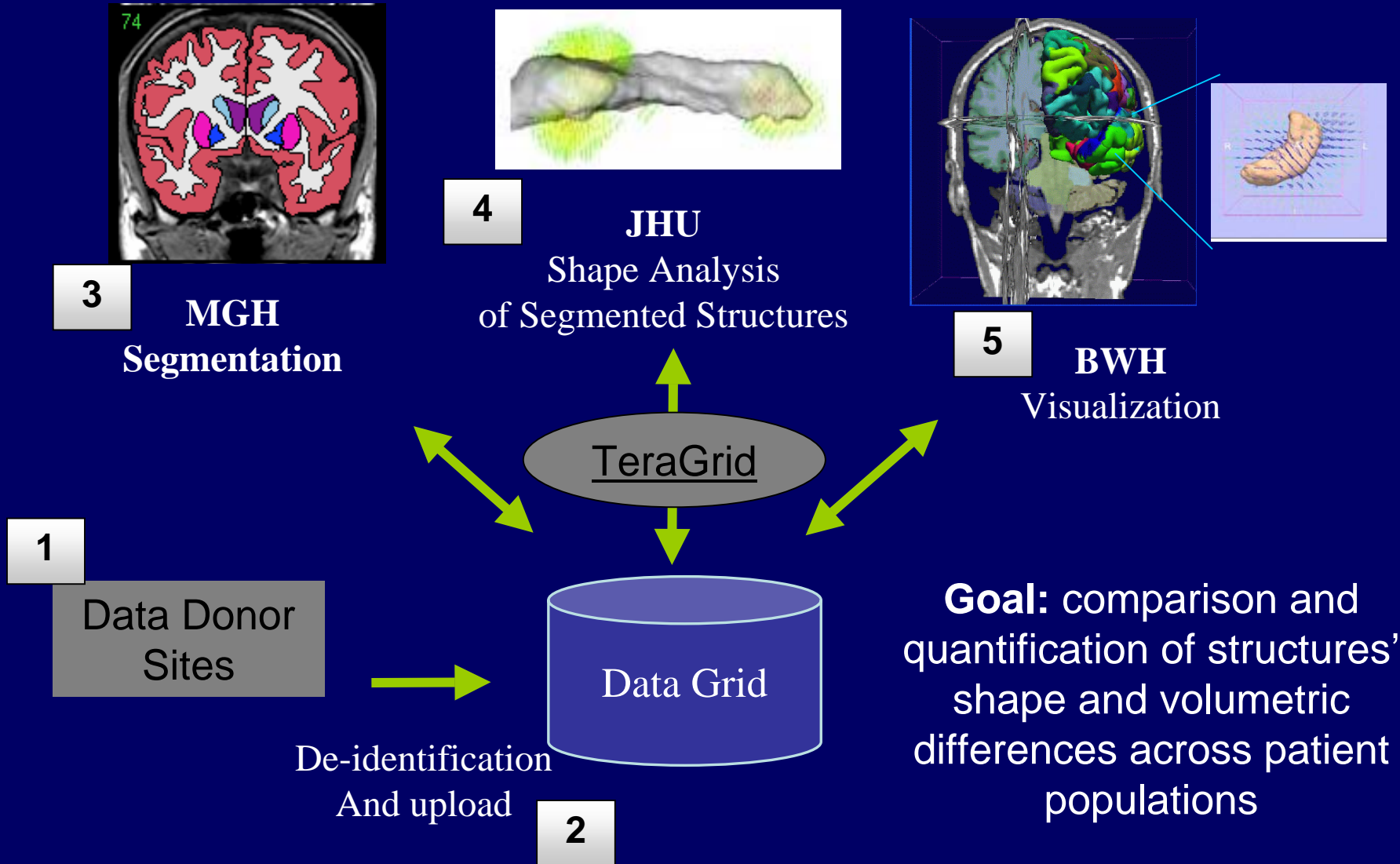


Normal Elderly Control



Alzheimer's Individual

Semi Automatic Shape Analysis (SASHA)



Large Deformation Diffeomorphic Metric Mapping (LDDMM) using the TeraGrid

- Each LDDMM comparison takes about 3 to 8 hours
- Completed analysis of scaled run of 45 subjects
 - Examining hippocampus - clustering and disease detection in senile dementia (control, Alzheimer's, semantic dementia)
 - 30,000 CPU hours, 4 TB data
- Being applied in Mouse BIRN test bed - Fragile X mouse model

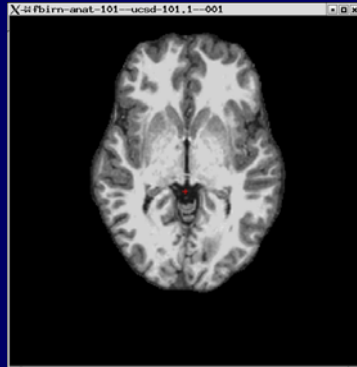
Successful classification of the different subject groups through the utilization of non-invasive imaging methodologies potentially provides clinicians with new tools to assist them in their daily work

- Calibration Methods for Multi-Site fMRI
 - Study Regional Brain Dysfunction and Correlated Morphological Differences
 - Progression and Treatment of Schizophrenia
- Human Phantom Trials
 - Common Consortium Protocol
 - 5 Subjects Scanned at All 11 Sites
 - Add'l 15 Controls, 15 Schizophrenics Per Site Per Year
- Statistical Techniques
 - Identify Cross-Site Differences
 - Develop Corrections to Allow Data Pooling
- Develop Interoperable Post-Processing
- **UC Irvine**, UCLA, UC San Diego, MGH, BWH, Stanford, UMinnesota, Ulowa, UNew Mexico, Duke/UNorth Carolina, MIT

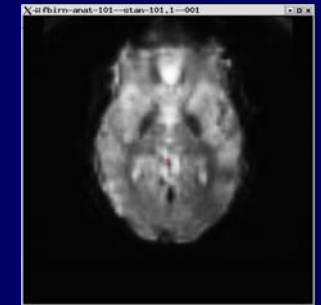
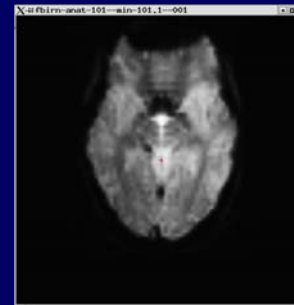
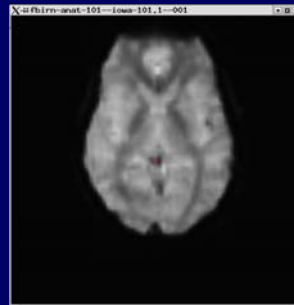
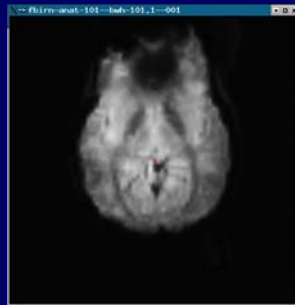
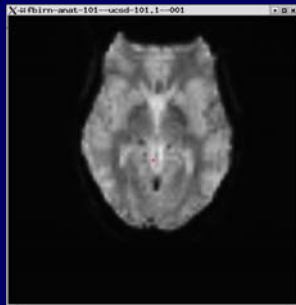
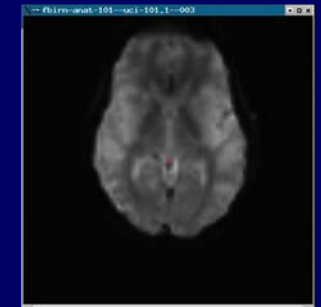
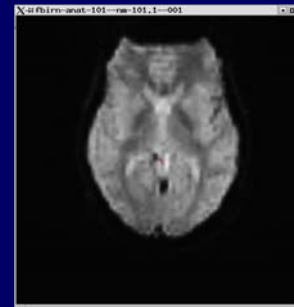
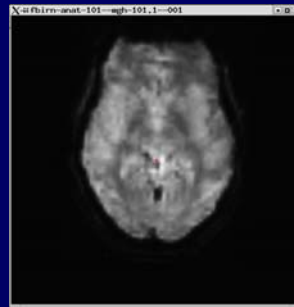
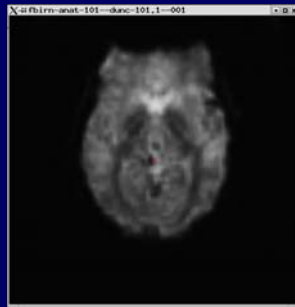
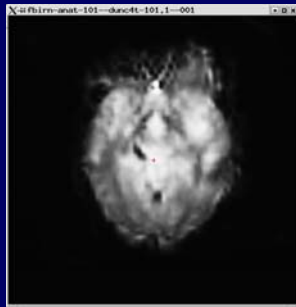


fBIRN Multi-Site Data Example

- Reference Anatomical Scan
- fMRI Scans from 10 Different Sites
 - Same Subject, Registered, Same Slice



→ **Calibration**



Tue Oct 12 11:24:31 2004

User: *dkeator*

Preferences

Logout

Data Management | Analysis and Visualization | Collaboratory Tools | Advanced Data Integration | Test Bed

Style | Help

MRI-Stability

Institution	Scanner	FS	mean	stdDev	SNR	SFNR	%-Fluct	drift	count	csv
		20000		20	300	225	.30	3		
duke-unc	GE mr5c	4.0	1607.92	3.92	351.62	258.73	0.24	-0.53	46	csv
duke-unc	GE MR6C	1.5	655.39	0.55	87.92	87.69	0.08	-0.39	126	csv
harvard-bwh	GE LMRC	3.0	19066.82	15.22	178.57	176.98	0.09	-0.46	6	csv
harvard-mgh	SIEMENS bay40c	2.9	984.45	0.95	183.85	182.20	0.10	0.38	2	csv
minnesota-cnmr	SIEMENS trio	2.9	780.69	1.15	221.67	211.07	0.14	0.53	30	csv
newmexico-hsc	SIEMENS MRC21262	1.5	666.63	1.06	74.75	74.10	0.16	0.47	191	csv
stanford-lucas	GE LMR3	3.0	819.52	0.92	223.60	223.38	0.11	-0.67	13	csv
uci-bic	PICKER ba187_ws	1.5	4174.62	8.20	126.66	120.22	0.19	-0.76	30	csv
ucsd-fmri	SIEMENS MRC14109	1.5	677.10	0.93	79.30	76.70	0.14	2.33	1	csv
ui-mhcr	GE MRCV	1.5	2007.02	1.62	201.07	189.40	0.08	-0.29	6	csv

Mean Trimming Percent: %

[csv](#) MRItotal.csv [csv](#) QA_Pivot.xlt

[back to QA Protocols](#)

QA Analysis Description

Sampling Region: The sampling region is a 20x20 voxel region centered in the volume's central slice (slice #18).

Mean: Simple mean calculated from the average of each sampling region over 198 volumes. The first 2 volumes are skipped to allow for signal instabilities during ramping of the gradient electronics.

Standard Deviation (stdDev): Calculated in the same fashion as the mean.

Signal-to-noise ratio (SNR): The noise measurement is calculated by subtracting the average of the even numbered volumes from the odd numbered volumes using the sampling region. The signal measurement is calculated from the sampling region applied to the mean image. The SNR is calculated from the ratio of these.

Signal-to-noise fluctuation ratio (SFNR): The SFNR measurement is calculated by dividing the sampling region from the mean image by the sampling region of the standard deviation image.

Percent fluctuation (% fluct): Percent fluctuation or root mean square stability is calculated from the sampling region after applying a second order detrending fit.

Color Thr

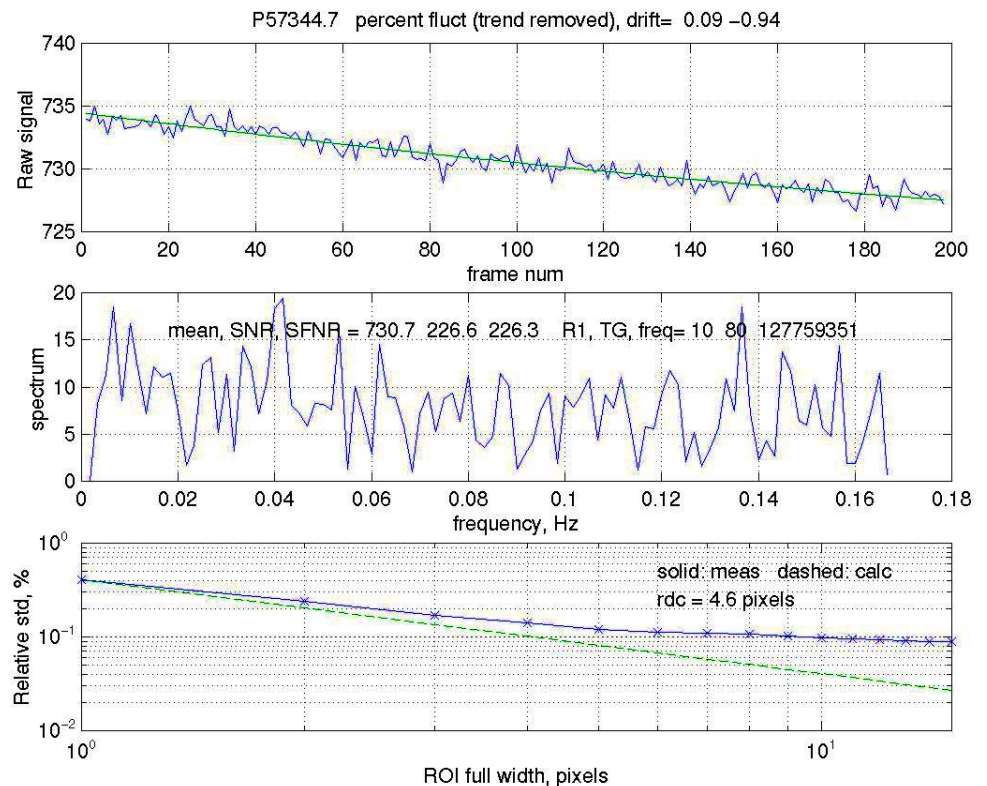
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BIRN
BIOMEDICAL INFORMATICS RESEARCH NETWORK

Welcome **guest** to the Morphometric BIRN Public Alzheimer

The site currently provides the following features;

- building a fairly generic assessment query and navigating multi-site queries
- exporting the full set of search results in comma separated format
- viewing visits (both scan and clinical) of a selected subject
- downloading the structural MRI image series for the selected subject
- Univariate and Bivariate statistics via BIRN Portal interface

To build an assessment query please click Query Assessment

Stats: Univariate Analysis **Statistics**
Export CSV

Results 1-20 of 20

Subject ID	Site ID	MMSE	Demographics	Diagnosis	CVLT	VFT	Left Hippocampus	Right Hippocampus
		MMSE Score	Age Gender	Years of Education	Diagnosis	Discriminability raw score "Animals" correct responses	Volume	Volume
009007669326								
Visit: 2 Seq: 1	SITE1	25				.66	13	
Visit: 1 Seq: 1	SITE1		75 F	14	Alzheimer		2377.0	2480.0
						.93	3760.0	3650.0
						.41	3565.0	3435.0
						.93	4774.0	4495.0
						.8	2852.0	2979.0
						1	3313.0	3466.0
						.39	2932.0	2907.0
						.75	2961.0	3335.0
						1	3754.0	4260.0
						.93	3990.0	4152.0
						.84	3267.0	3386.0
009122959847						.59	5	
Visit: 2 Seq: 1	SITE2	11						

Subject: 009007669326 [Show Detail](#)

Clinical Visits

Visit ID	Visit Date
2	08/26/1996

Segments

Segment ID	Protocol	Protocol Version
1	AD_BATTERY	1

MRI Scan Visits

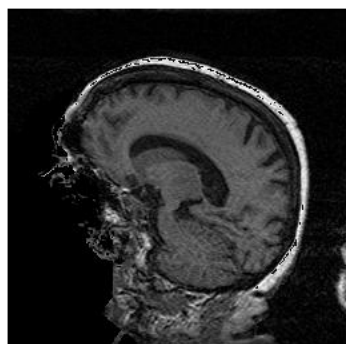
Visit ID	Visit Date
1	01/11/1997

Segments

Segment ID	Protocol	Protocol Version
1	SPGR	1

Scanner Info

Make: GENERAL ELECTRIC **Model:**



You can export the image series for this scan as an AFNI brick. The image series is retrieved from the SRB, converted to an AFNI brick from DICOM and tarred and gzipped for transfer efficiency.

This operation may take upto a minute (usually around 30 seconds or less),so please be patient. If you hit a cached result either requested earlier or by another user, this operation may take significantly less time.

After the download, the file needs to be saved to your local machine and needs to be expanded using the tar utility

```
tar xzvf <filename>
```

After this, you should see the **BRICK** and **HEAD** files.

[Download as AFNI BRICK](#)

[Browse Image Data](#)

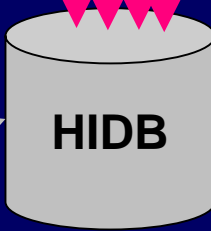
[Back to Search Results](#)

fBIRN Analysis Infrastructure

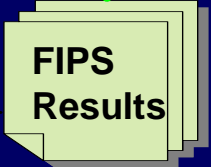
FMRI Images
Automated Image Upload
to SRB/HIDB for sharing



fMRI Scanner

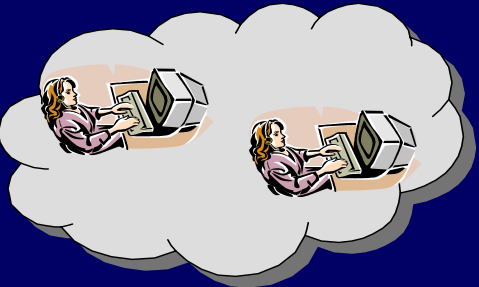


FIPS: FSL Image
Processing Scripts



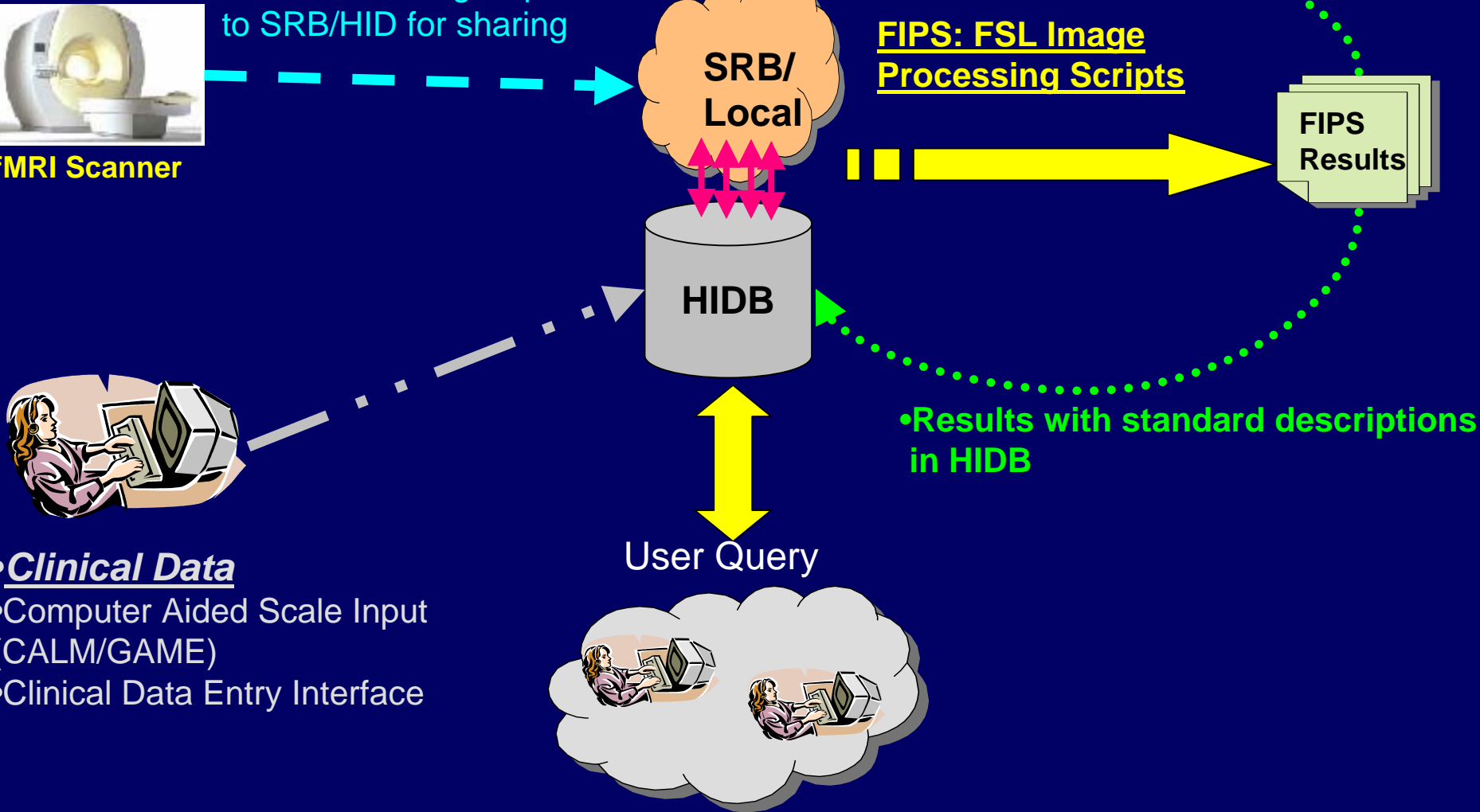
- Clinical Data
- Computer Aided Scale Input (CALM/GAME)
- Clinical Data Entry Interface

User Query



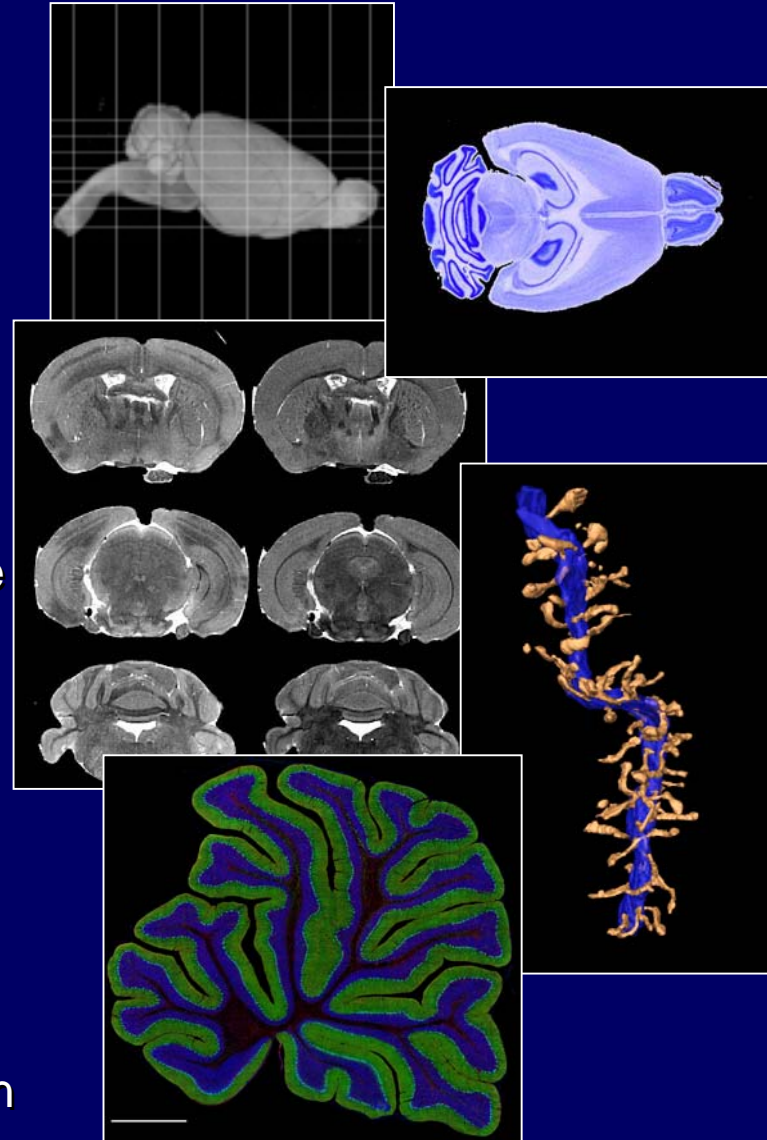
• Result Images in SRB

• Results with standard descriptions in HIDB

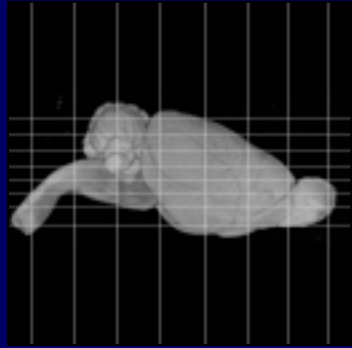


Studying animal models of disease across dimensional scales to test hypothesis with human neurological disorders

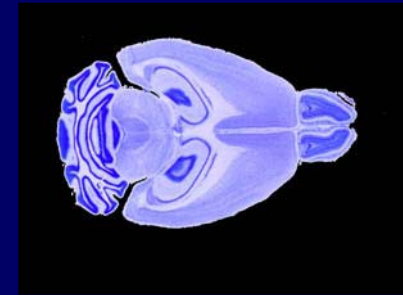
- Experimental Allergic Encephalomyelitis (EAE) mouse models characteristic of **Multiple Sclerosis (MS)**
- Dopamine Transporter (DAT) knockout mouse for studies of schizophrenia, **attention-deficit hyperactivity disorder (ADHD)**, Tourette's disorder, and substance abuse
- Using an alpha-synuclein mouse to model the symptoms/pathology of **Parkinson's Disease**
- **Cancer** animal models consortium with astrocytoma mouse model: NCI supported with Terry Van Dyke @ Duke
- Cal Tech, Duke, **UCLA**, UCSD, Univ. Tenn



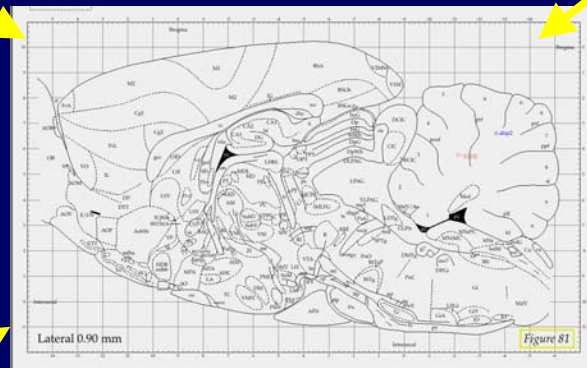
Multiscale Data Integration



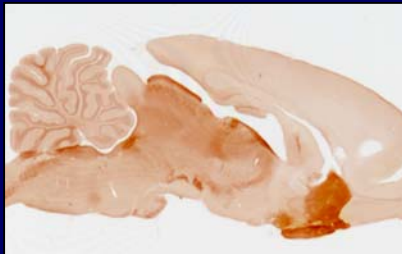
1. Databases at each site



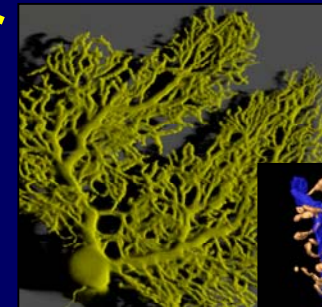
2. Create conceptual links to a shared ontology



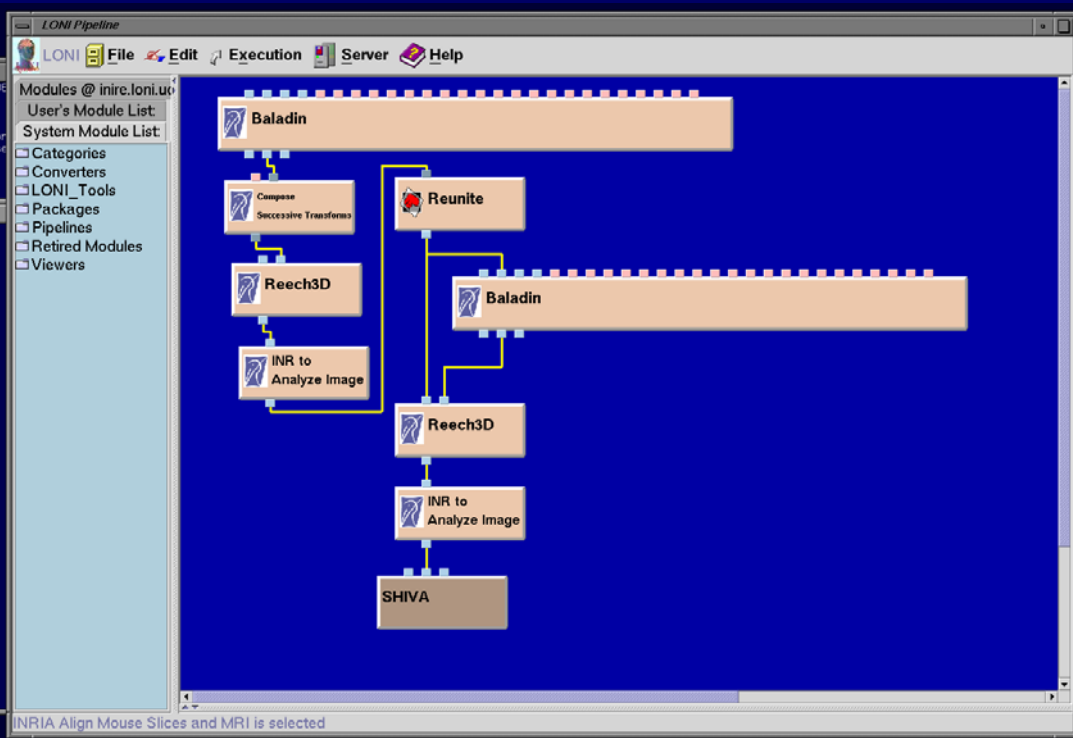
4. Use mediator to navigate and query across data sources



3. Situate the data in a common spatial framework

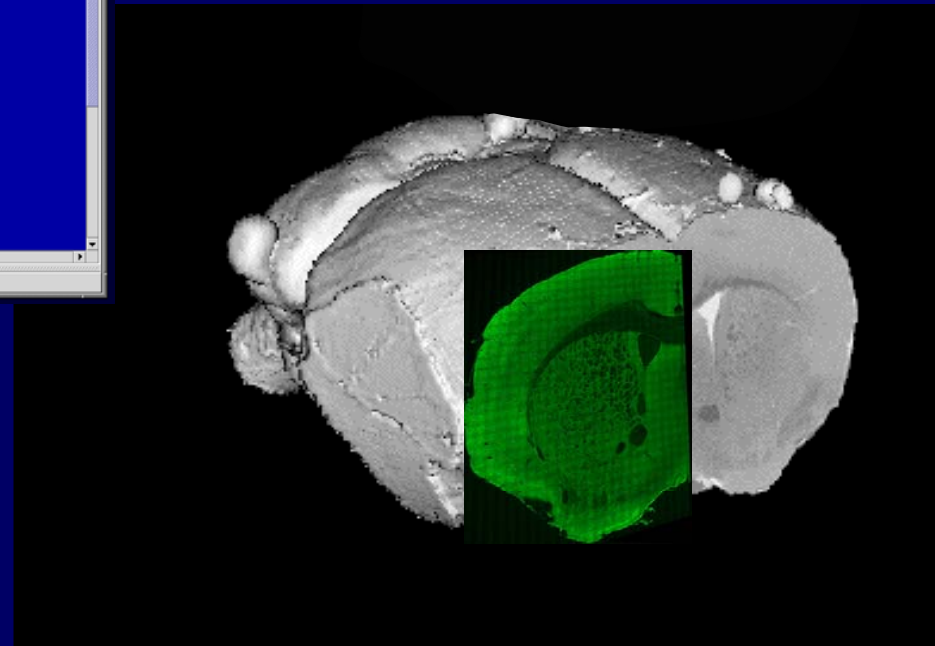


Spatial Registration of Data

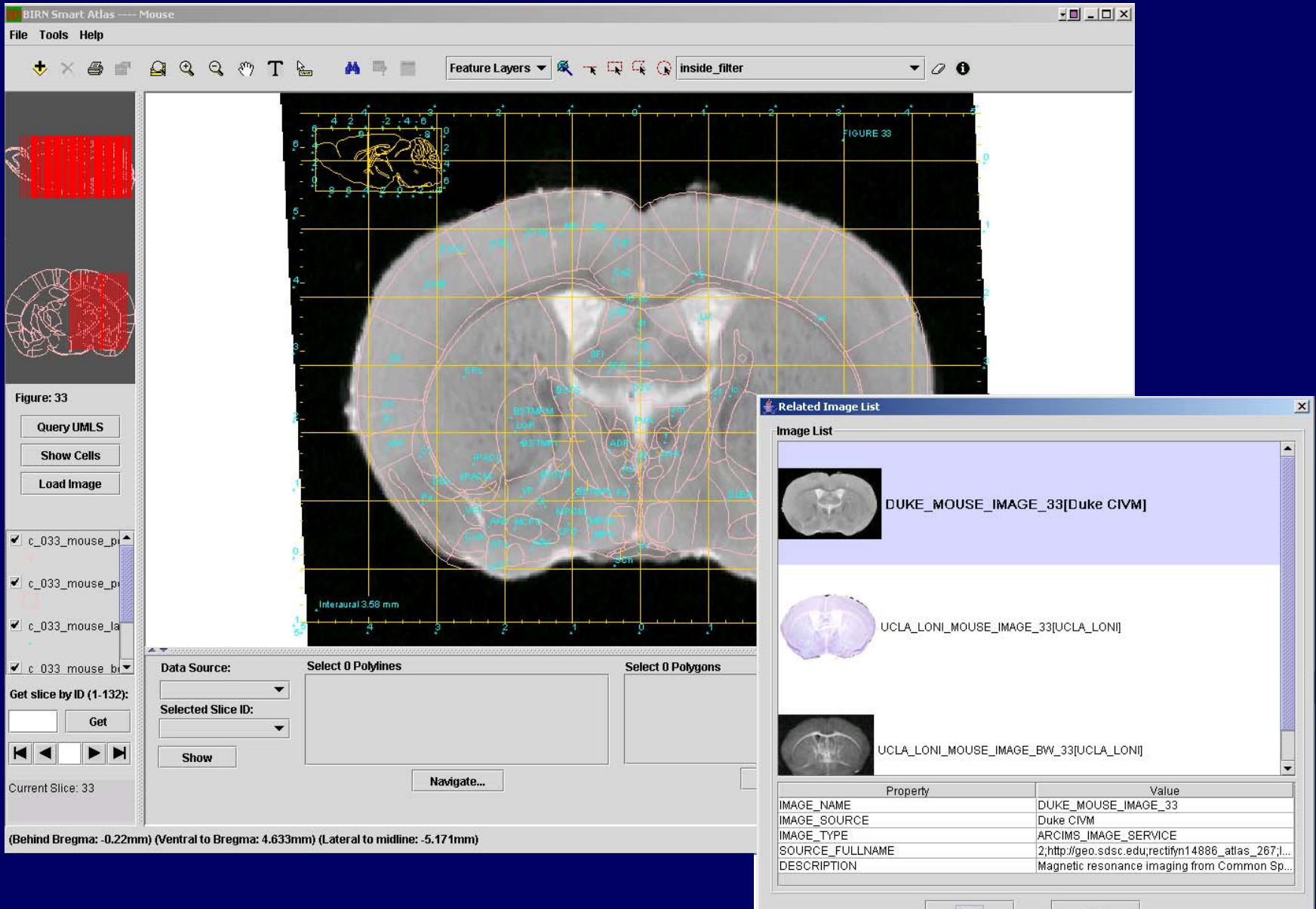


Processing stream for spatial registration of brain volumes using the LONI pipeline, UCLA:
David Rex, Allan MacKenzie-Graham

Volume and slice data brought into register in order to correlate cellular and subcellular changes with non-invasive imaging



The Smart Atlas: Spatial Integration over Distributed Data



The screenshot displays the BIRN Smart Atlas software interface. The main window shows a coronal brain slice with a grid overlay and various anatomical labels. A 'Related Image List' window is open in the foreground, listing related images and their properties.

Figure: 33

Query UMLS
Show Cells
Load Image

c_033_mouse_pi
 c_033_mouse_pi
 c_033_mouse_la
 c_033_mouse_bi

Get slice by ID (1-132):
Get

Current Slice: 33

Data Source: Select 0 Polylines Select 0 Polygons

Selected Slice ID: Show

Navigate...

(Behind Bregma: -0.22mm) (Ventral to Bregma: 4.633mm) (Lateral to midline: -5.171mm)

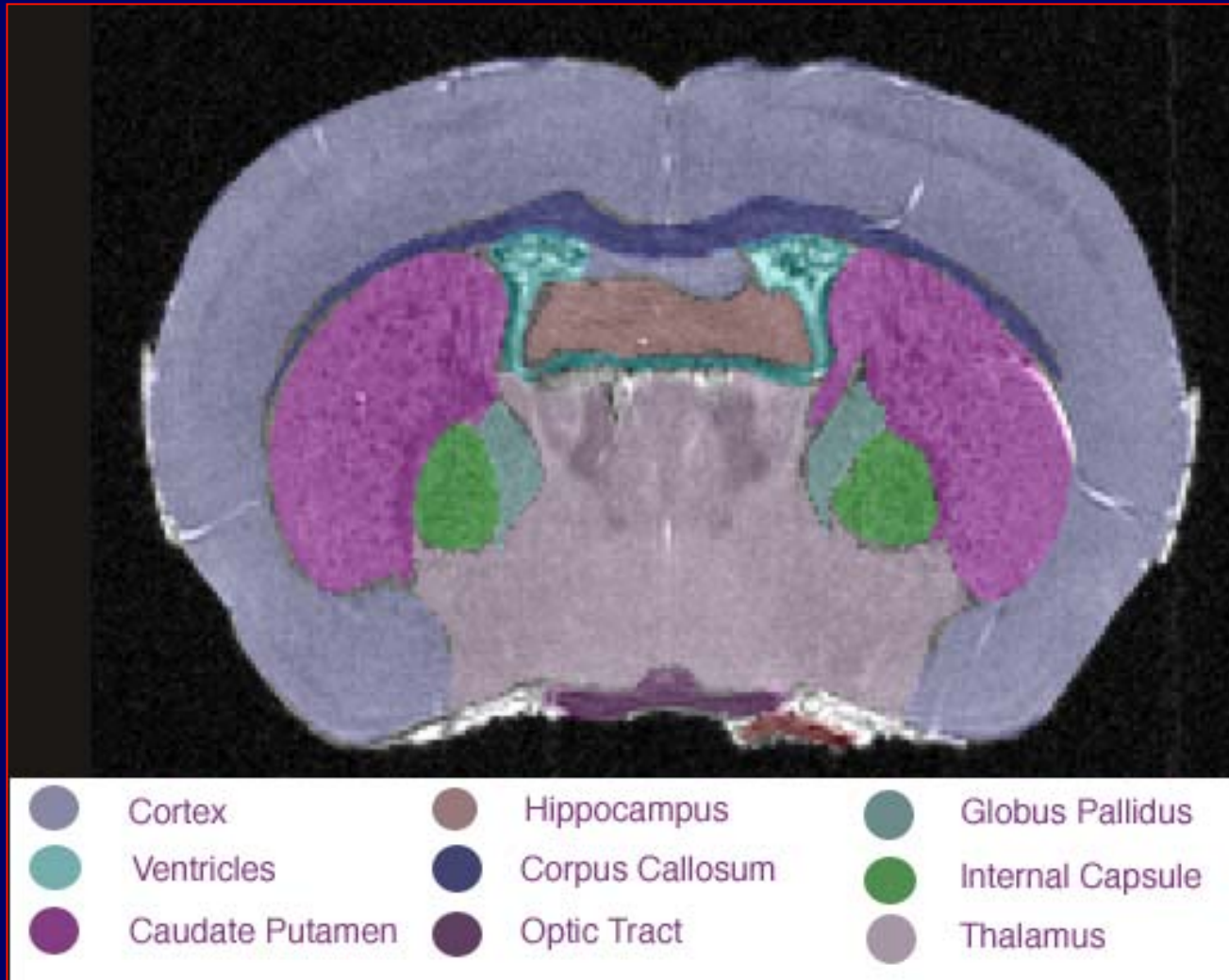
Related Image List

Image List

- DUKE_MOUSE_IMAGE_33[Duke CIVM]
- UCLA_LONI_MOUSE_IMAGE_33[UCLA_LONI]
- UCLA_LONI_MOUSE_IMAGE_BW_33[UCLA_LONI]

Property	Value
IMAGE_NAME	DUKE_MOUSE_IMAGE_33
IMAGE_SOURCE	Duke CIVM
IMAGE_TYPE	ARCIMS_IMAGE_SERVICE
SOURCE_FULLNAME	2:http://geo.sdsc.edu/rectifyn14886_atlas_267;l...
DESCRIPTION	Magnetic resonance imaging from Common Sp...

Load Close



Human-Mouse integration

The image displays two instances of a brain parcellation software interface. The top instance shows a 3D brain model with colored regions (green, red, blue, purple) and a pink bounding box. The bottom instance shows a similar view with a different configuration.

Left Panel (Parcellation Options):

- Configuration:
 - Model: [Empty]
 - Annotation File: /home/ajoyner/brains/MGH
 - Talairach File: /home/ajoyner/brains/MGH
- Fiducials:
 - pt 3 G_frontal_middle (9)
Freesurfer Label UMLS ID C0152297
- Extra Terms: [Empty]
- Buttons: Update, Site: google, Query

Right Panel (Parcellation Options):

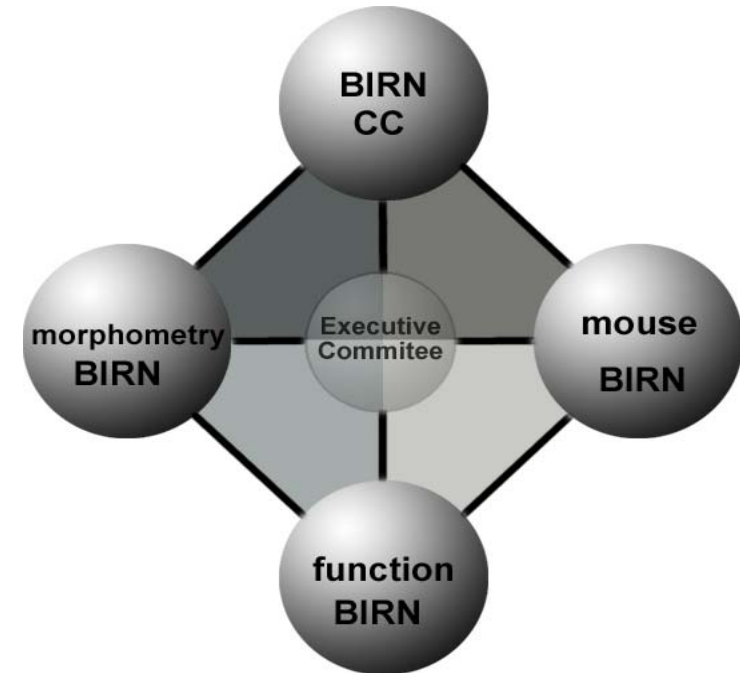
- Configuration:
 - Model: lh-pial
 - Annotation File: /home/ajoyner/brains/MGH-Siemens15-SP.1-uw/label/lh.aparc.annot [Browse...]
 - Talairach File: /home/ajoyner/brains/MGH-Siemens15-SP.1-uw/mri/orig/tal/MGHBrain+tlrc.HEAD [Browse...]
 - Apply
- Fiducials:
 - Point Not on Surface Model
 - pt 4 Caudate (Grey Matter) (Caudate Body) {} mm
Talairach Label UMLS ID C0152338
- Extra Terms: [Empty]
- Buttons: Update, Site: google, Query
- Footer: Swanson's Connectivity Tool (BAMS), Washington University's BrainInfo, SMART Atlas

- Driving **Big Science** where it Didn't Exist Before

- Encouraging Collaboration

- Removing Barriers to Multi-Site Collaborative Research

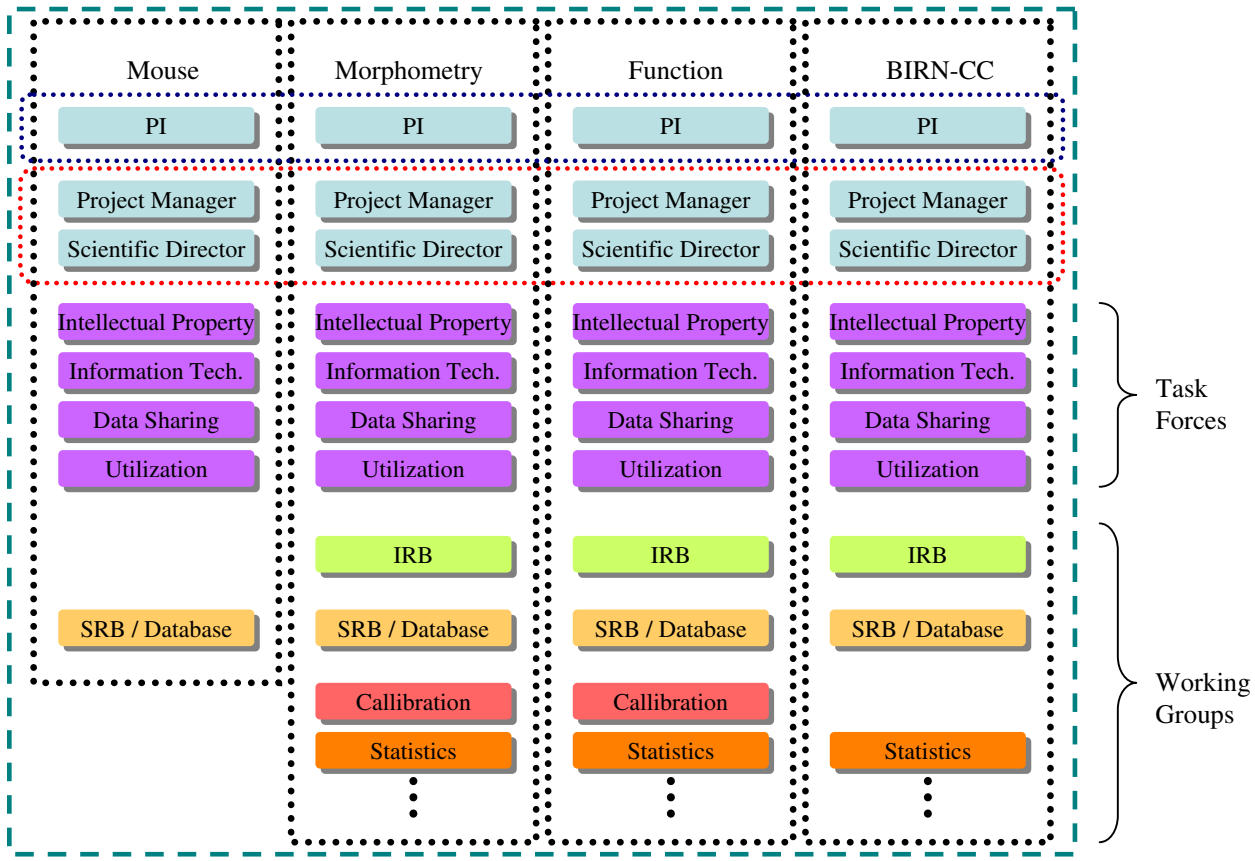
- Calibration
- Compute / Storage Resources
- Databases
- Common Protocols
- Post-Processing Tools
- Governance



Challenges: Creating a New Culture

- How to get competitors to cooperate
 - Will this project decrease the RO1 \$ pool
 - How to share glory, work and \$
 - Governance - who makes and keeps the rules
- How to avoid data-mine-ing
 - “What’s mine is mine and what’s yours is mine”
- How to communicate across fields efficiently:
 - Clinician scientists Computer scientists
 - Experimental psychologists MRI physicists
 - Statisticians Database engineers
- How to show a clear scientific benefit from cooperation
 - Efficiency of multiple studies in parallel; quick revisions
 - Different perspectives create new ideas or achieve the lowest common denominator “designed by committee”

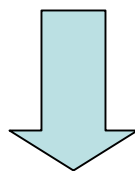
BIRN Working Groups



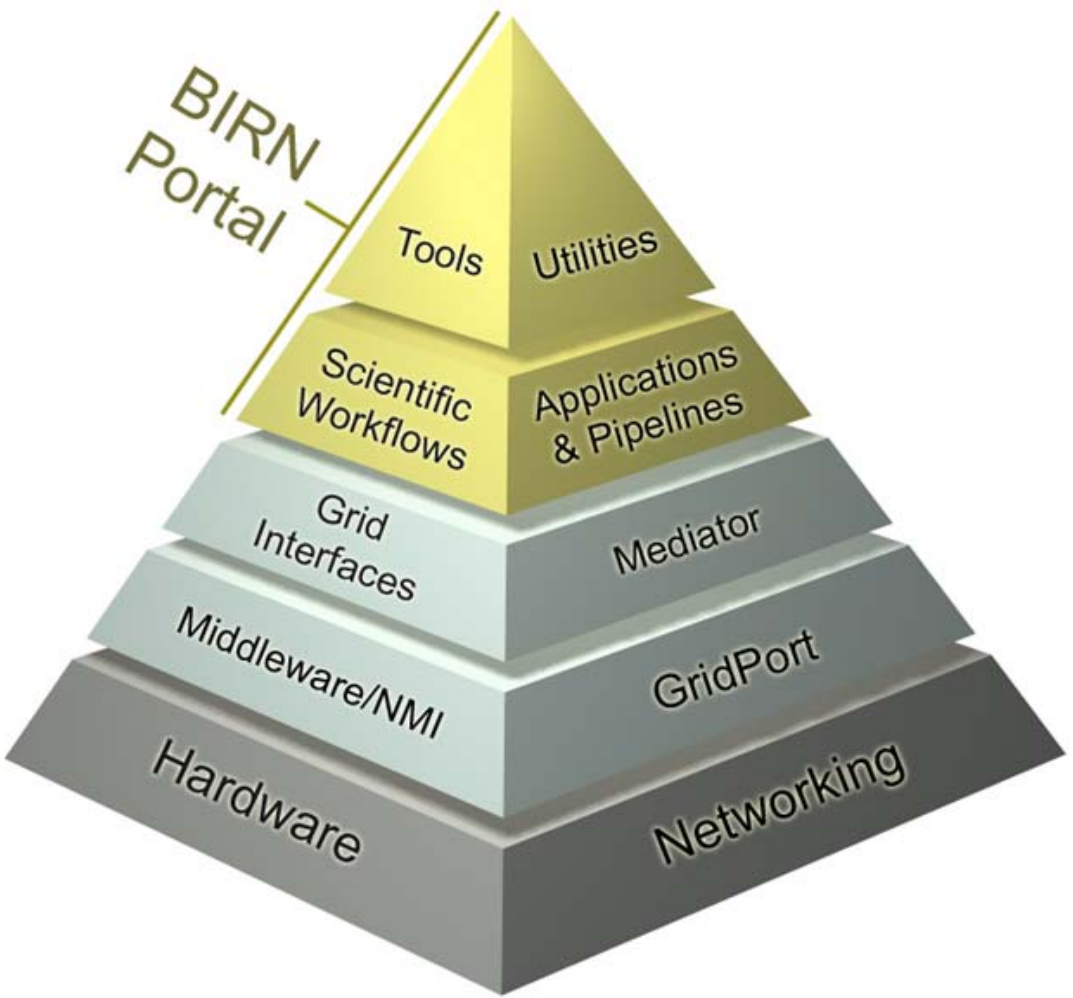
- BIRN All Hands meeting held annually
- BIRN PIs meet quarterly as part of the BIRN Steering Committee
- Cross BIRN working group has video teleconferences monthly

- Task Forces** Task forces commissioned by the BIRN Steering Committee hold monthly video teleconferences
- IRB** IRB working group holds monthly teleconferences and interacts closely with the Data Sharing Task Force
- SRB / Database** SRB / Database working groups are held weekly covering a wide range of topics
- Callibration** Ad hoc working groups created by the test beds meet according to their needs

- One member from each BIRN site required to participate
- Each member is required to review BIRN consents, waivers and procedures with local IRBs
- Regular video conferences among members to coordinate information and activities



- Produce BIRN template language for subject consent, IRB waiver for data upload and IRB waiver for data download
- Produce guidelines and procedures for data sharing across institutions taking into account Common Rule, HIPAA and state regulations
- Develop procedures to allow for longitudinal studies within BIRN



Domain Specific Software

Shared Software and Services

Provisioning

BIRN Cyberinfrastructure

We Began with Standard Hardware



- Jumpstarted BIRN for functionality
- Software footprint managed by the BIRN-CC
- Integration of domain tools, middleware, OS, updates, and more
- Expansion/upgrade of existing sites have more generic (and fewer \$\$) hardware
 - e.g. Opteron, New Xeon, Multi-vendor

- **Enable Analysis of Distributed Biomedical Data in a National-Scale Production Facility**

Data &
Network

- Data Sets are Large – Data Sets are Many
- Enable New Queries that Integrate Multiple Sources
- Specialized Application Codes (from Test Beds) need to work on BIRN-accessible Data

CPU

- Some Analysis Pipelines Require Significant Computation

Security

- Privacy, Patient Anonymity Required
- Institutional Ownership of Originals

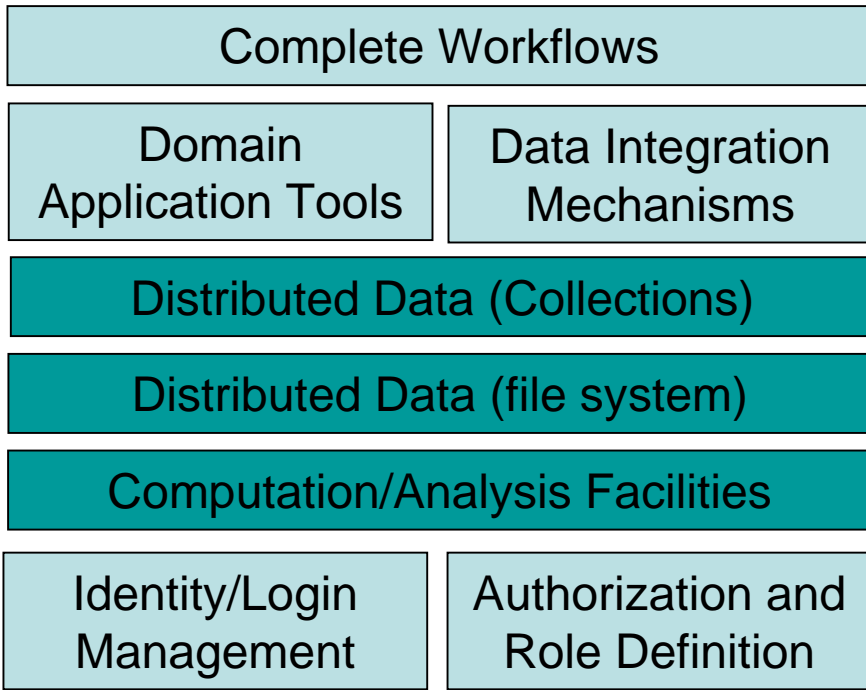
- **Easily Replicate Entire Software Stack**
(Including Centralized Services) for other Groups

Major System Components

Collaborating Groups of Biomedical Researchers

Application Portal

Command/Batch Access



Integrated SW Distribution

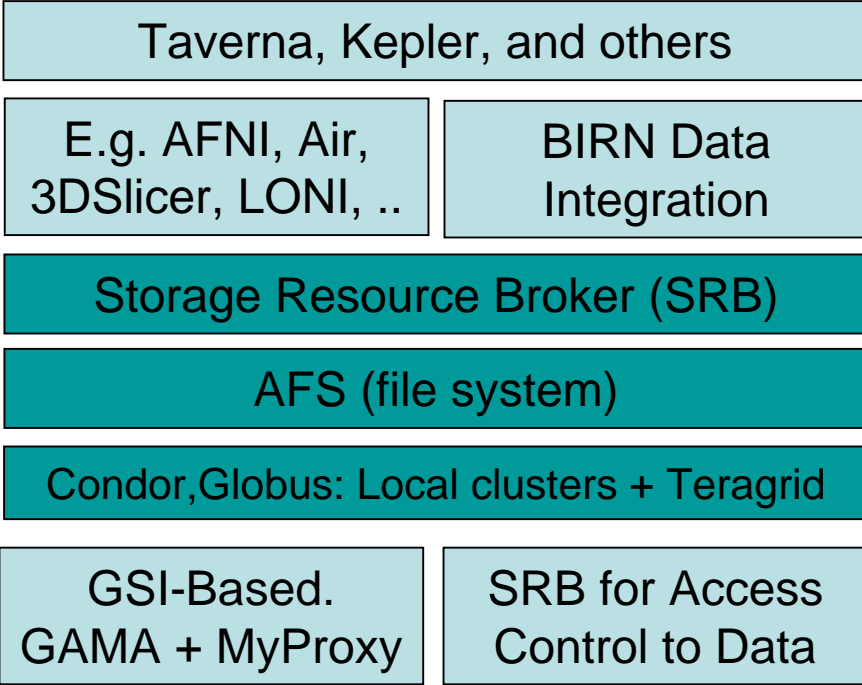
Overall Operations

Specific Implementations

Mouse, Function, Morphometry (+ New Areas and Users)

BIRN Portal

Command/Batch Access



Semi-Annual BIRN SW Distribution (April/Oct)

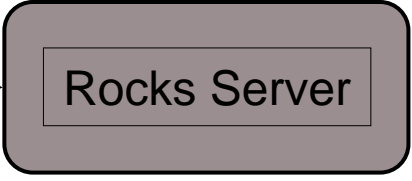
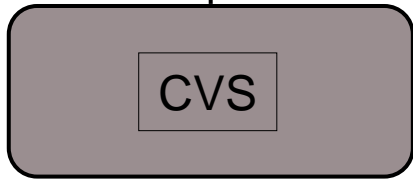
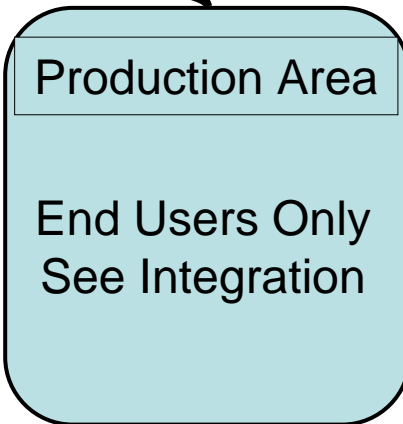
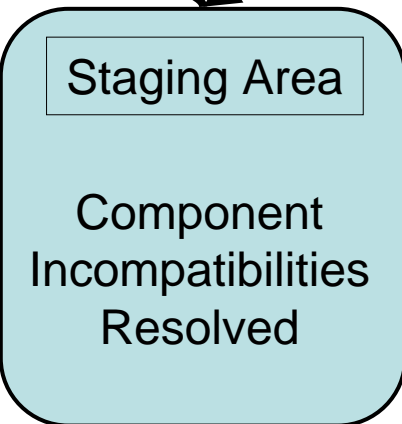
BIRN-CC

- Utilizing Rocks grid management software
- BIRN specific extensions to Rocks, also under CVS, means automated, repeatable deployment of any version of the BIRN system
- We've created BIRN "rolls" that integrate
 - BIRN domain tools (e.g. 3DSlicer, LONI Pipeline, FreeSurfer)
 - Database (Oracle) and SRB Configuration
- Rocks, with BIRN extensions, includes automated deployment mechanism for
 - Middleware (Security, Computational, Data)
 - Data mediation/integration
 - Application codes
 - Portal and other Workflows

Software Integration Cycles

Each Area is a (Model) BIRN System = Racks + Central SVCs + Apps

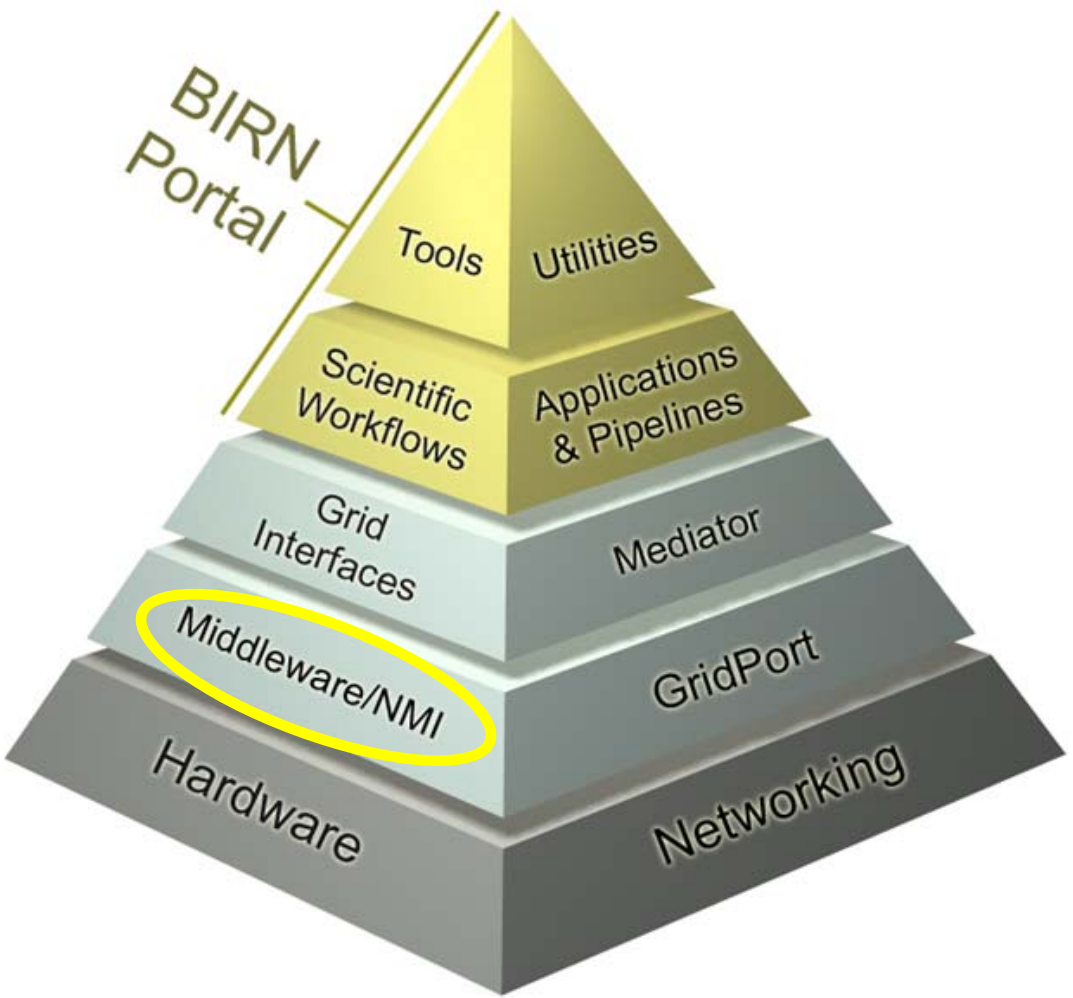
Feedback of Capability Gaps



Agile



Stable



Domain Specific Software

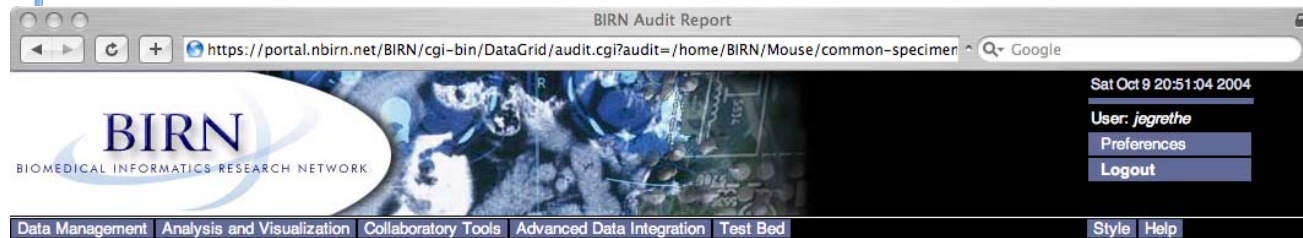
Shared Software and Services

Provisioning

BIRN Cyberinfrastructure

Single sign-on and credential management

Full access control and audit logs for all data within the BIRN infrastructure



Audit Report

/home/BIRN/Mouse/common-specimen-study/UCLA-BFI/Nissl/C

File	Action	User @ Domain	Date and Time
020417-2_1_Nissl_091.tif	read	mfehnel @ duke-civm	2003-11-14-16.37.46
020417-2_1_Nissl_091.tif	insert_permission	mfehnel @ duke-civm	2004-03-11-06.44.26
020417-2_1_Nissl_091.tif	read	jegrethe @ ucsd-bcc	2004-10-10-03.40.15

export csv

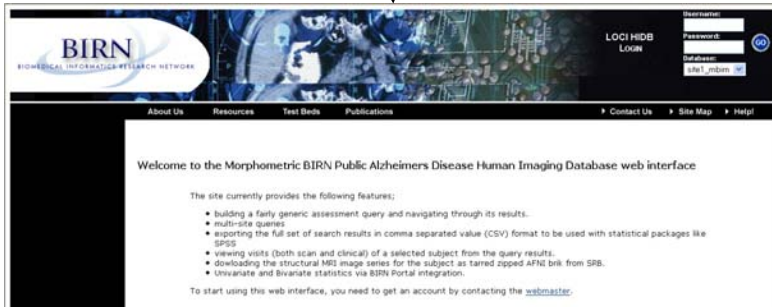
Audit Information

Please enter a valid filename to view audit information from the BIRN Data Grid.

This report will tell you which users have accessed a file and when

- Data Management
- Browse Files
- Upload Files
- Audit Files
- Access Control
- Meta Data
- Advanced

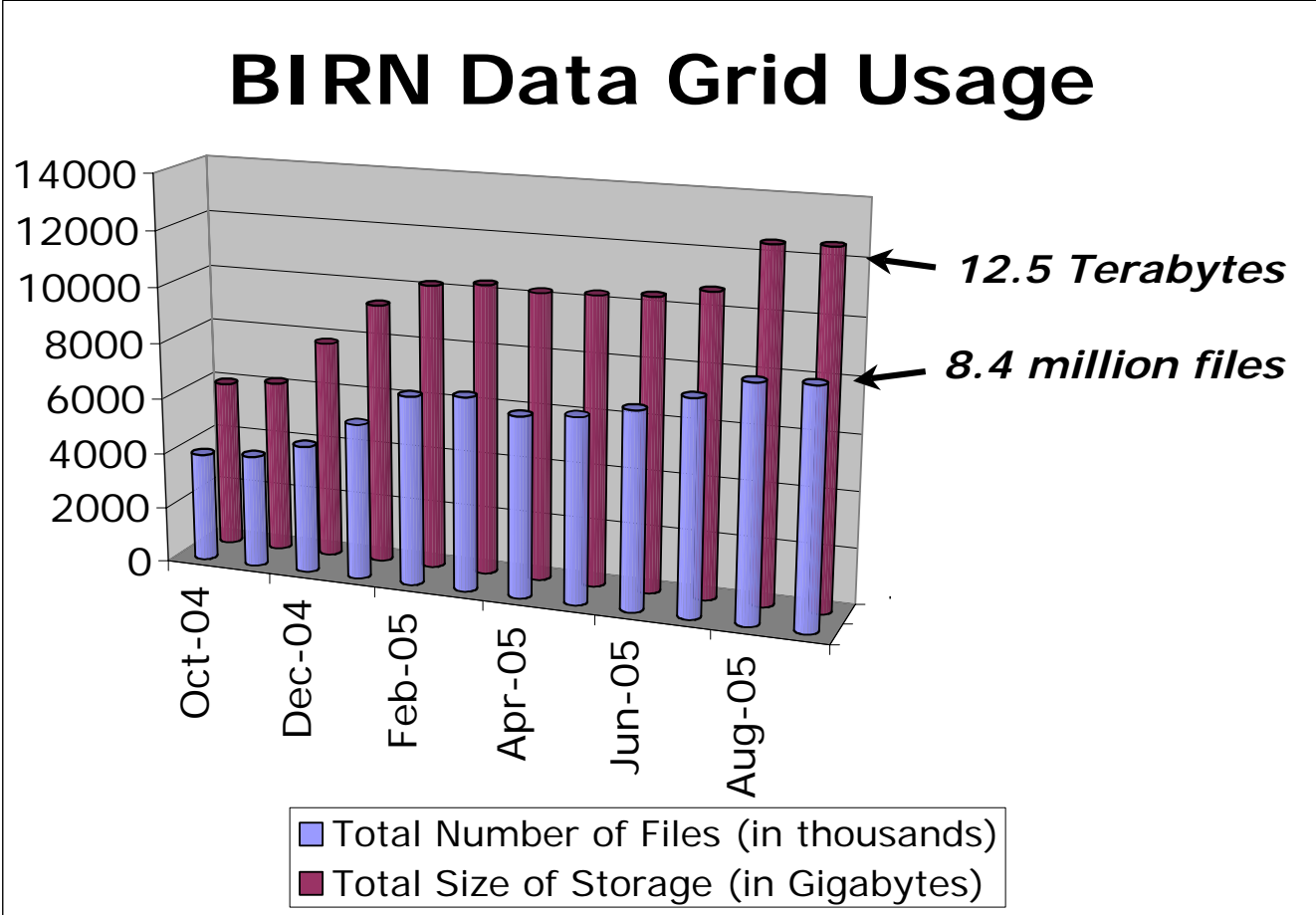
Authentication service available to all BIRN applications



The BIRN Coordinating Center is deploying a common authentication and security infrastructure.

- Provides for Single Sign-On to access all portal, data and computational resources
- Available to all BIRN applications
- Will provide access to external resources (e.g. OptiPuter and TeraGrid)

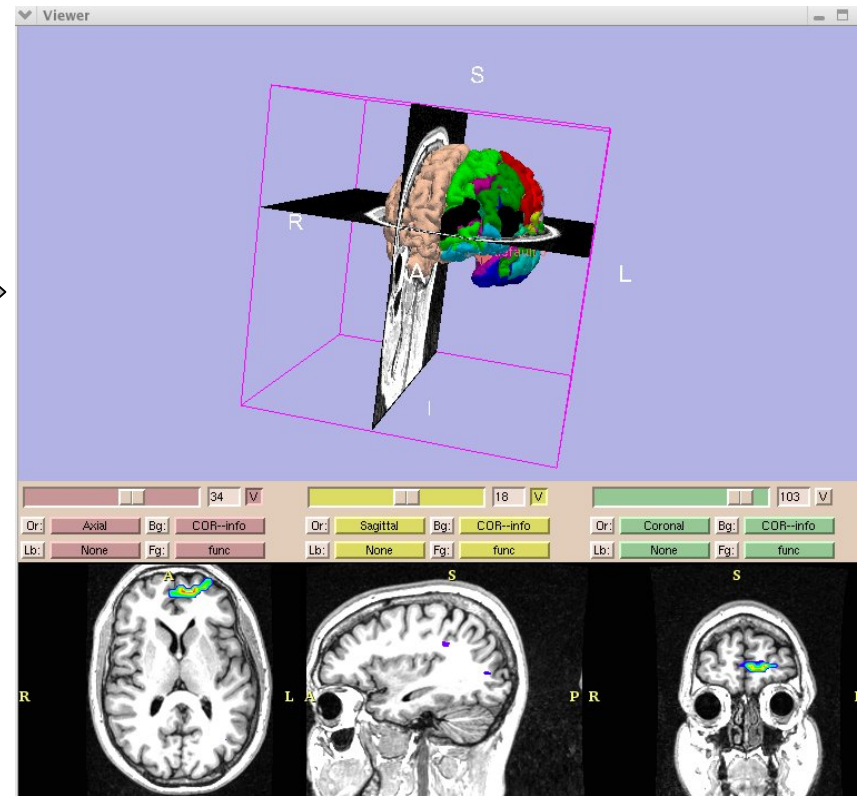
- BIRN Data Grid: a Distributed Data Handling System built utilizing the Storage Resource Broker (SRB)
- Data has more than doubled in the last year
- Provides a scalable and distributed solution for distributing publicly available data



From outliers in univariate statistics, launch 3DSlicer to view anatomical data and use Query Atlas tool

/home/BIRN/Human/Clinical	
/home/Public/MorphAD__p0001/009007669326	Launch 3D Slicer Browse Data
/home/Public/MorphAD__p0001/009022174223	Launch 3D Slicer Browse Data
/home/Public/MorphAD__p0001/009134330441	Launch 3D Slicer Browse Data
/home/Public/MorphAD__p0001/009157526843	Launch 3D Slicer Browse Data
/home/Public/MorphAD__p0001/009196266232	Launch 3D Slicer Browse Data

Java Grid Interface
(Java Webstart)

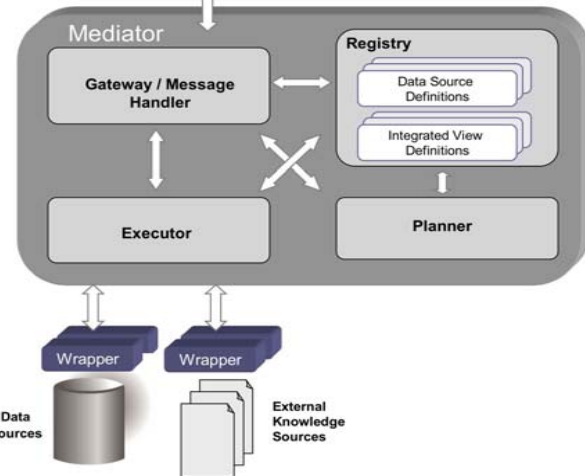


Integrating the Local Desktop

- Java Grid Interface (JGI) provides wrapper for applications on a users desktop
 - Brokers communications and information/data transfer between the application and BIRN resources (e.g. BIRN Data Grid)
 - Allows for domain applications to be integrated with the BIRN infrastructure in a straightforward way
- Improved version being developed in collaboration with Telescience for GridSphere Portal

Integrating Data using the BIRN Mediator

Mediator Query Builder



Query Results for Mouse BIRN Integrated View

P021_4401	P021_1.N01	P021_...
P08_1.N01	P021_1.N01	P021_...
PD_2f2.N01	P021_1.N01	P021_...
duke7.N01	P021_1.N01	P021_...
duke8.N01	P021_1.N01	P021_...
03.graham.01	P021_1.N01	P021_...
PD_Nov02.N01	P021_1.N01	P021_...

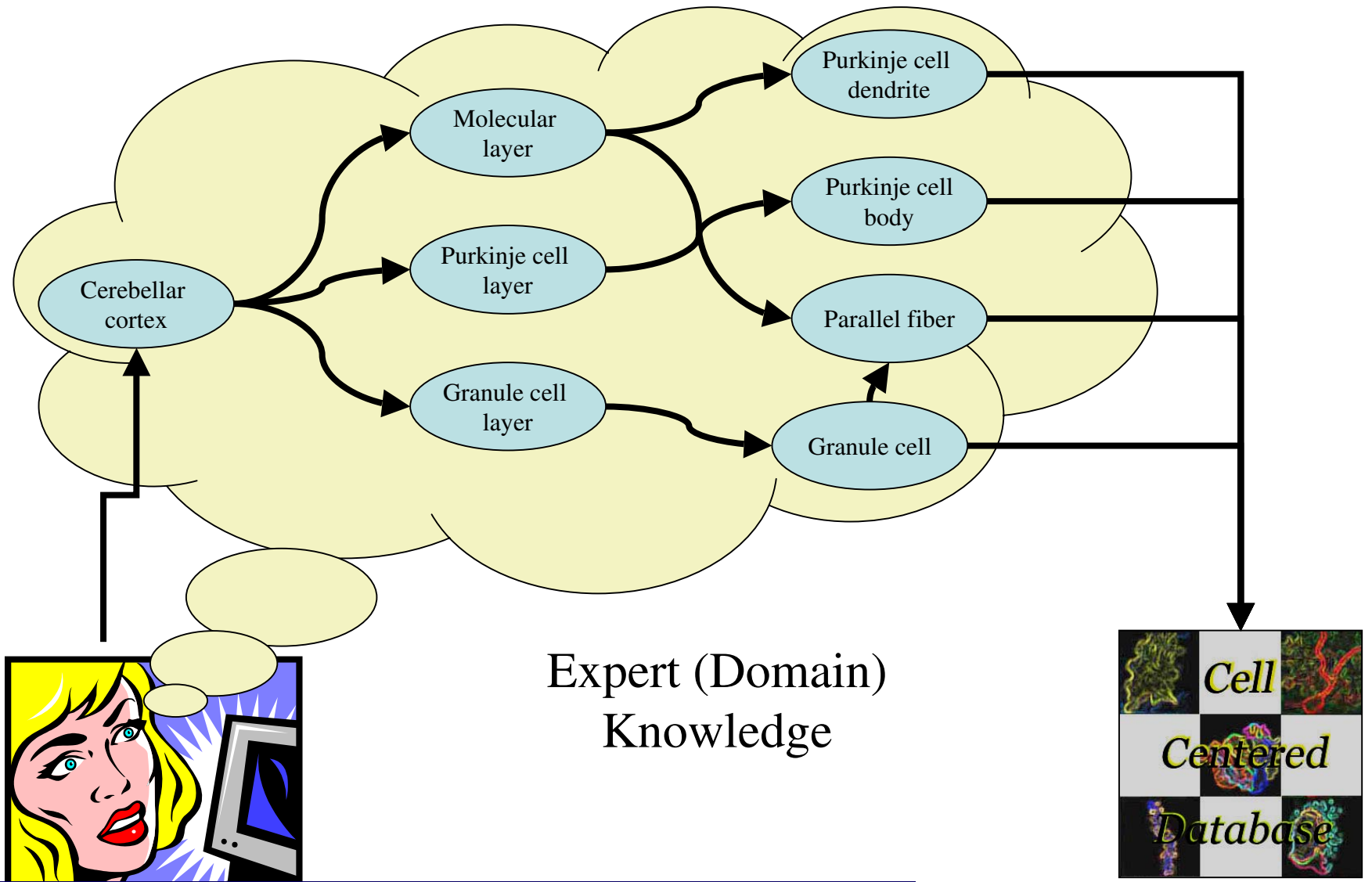
INSTRUMENT: RTS 2000
 NSIZE: 31
 YSIZE: 27
 CREATDATE: 2003-03-19 00:00:00
 PURL: NA
 PRODUCTTYPE: optical section series/montage
 MICROSCOPYTYPE: multiphoton
 IMAGEBASENAME: asy1
 SYSTEM: CNS
 ORGAN: brain
 REGION: neostriatum
 CELLTYPE: unspecified
 STRUCTURE: NA
 ATLAS: Paxinos and Franklin
 MAPLOCATION: asy1/P1187_27.jpg

The Image is:

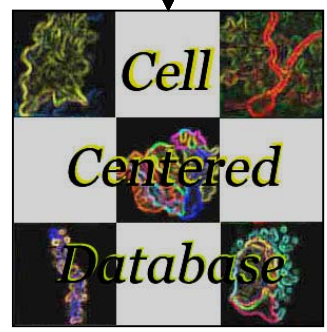
The BIRN mediator, a core component of BIRN 2.0, provides:

- Enhanced user tools for registration, view definition and query building
- Improved performance
- Support for PostgreSQL databases
- Integrated with BIRN authentication infrastructure

Integration with BIRN Test Bed Applications (e.g. Mouse BIRN)

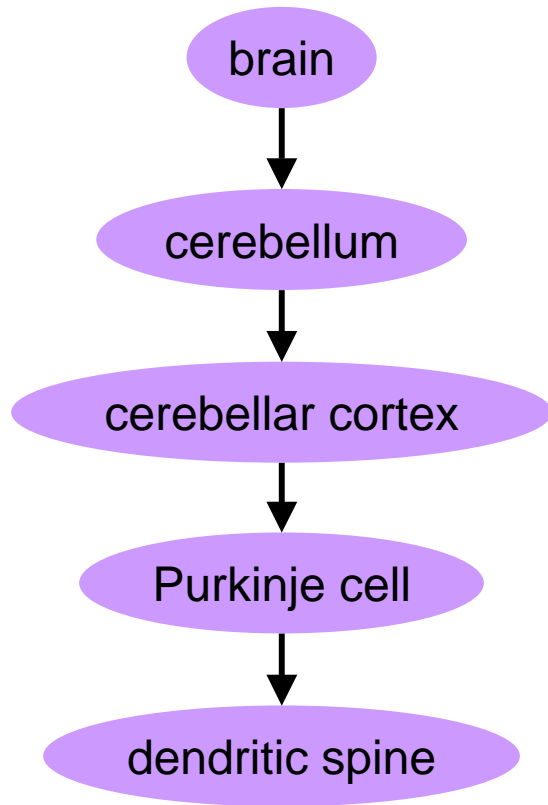


Expert (Domain) Knowledge

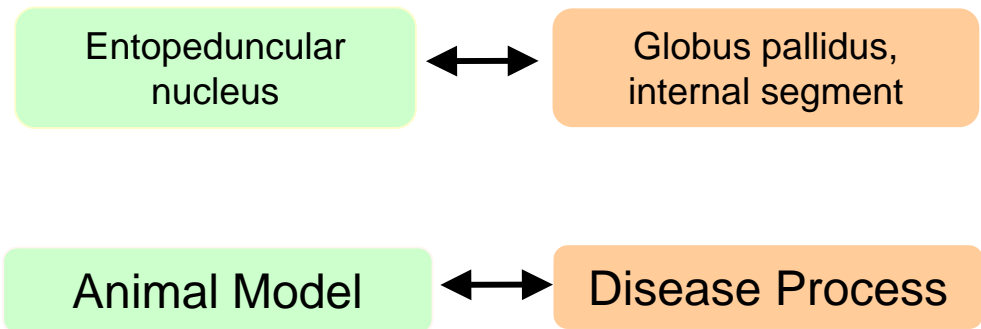


“Find proteins located in cerebellar cortex”

Navigating through Multi-resolution information



Linking animal and human imaging data



- Link database concepts to Ontologies
- Augment ontology with new information (BONFIRE)
- Utilize homologies
- *Develop disease and animal model knowledge maps*

UMLS BROWSER

Select Operation: Save Graph as Text

Find Related Concepts

Input Parameters

Concept ID: C0007765

Neighbor Type: All Edges

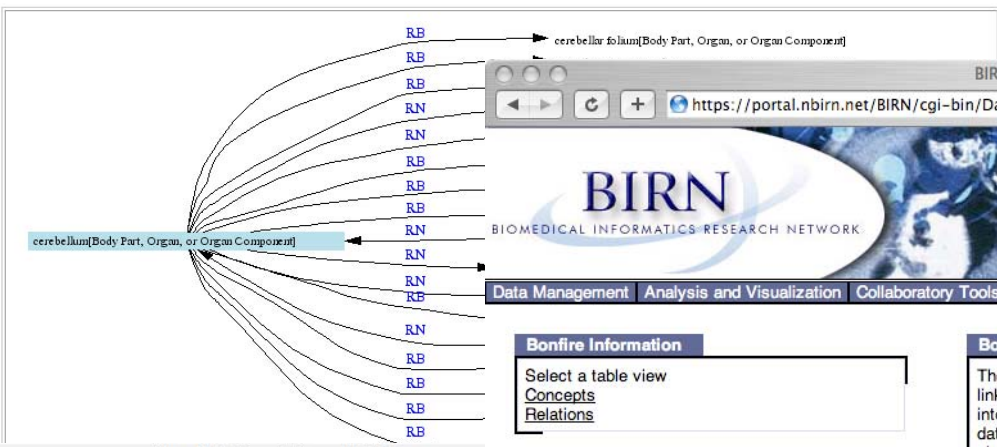
UMLS Relationship: a) Relationship Label: Broader, Narrower, Other

b) Semantic Relationship: * (any)

Create New Graph? Yes No

Display Semantic Types? Yes No

Submit Clear



UMLS Browser

BIRN Bonfire Database

https://portal.nbirn.net/BIRN/cgi-bin/DataGrid/Bonfire/bonfire.cgi?concepts=1

Tue Oct 12 08:30:09 2004

User: jgrethe

Preferences Logout

Data Management Analysis and Visualization Collaboratory Tools Advanced Data Integration Test Bed Style Help

Bonfire Information

Select a table view

Concepts Relations

Bonfire Description

The BIRN Data Mediation architecture employs ontologies as the means for linking concepts in different databases and to perform multiscale data integration across distributed data sources. Concepts in each of the source databases should be mapped to one or more concept identifiers from the shared knowledge sources available to BIRN. [more](#)

UMLS Browser

Concept : cerebellum

CUI : C0007765

Semantic Type(s) : Body Part, Organ, or Organ Component

Definition :

- Part of the metencephalon that lies in the posterior cranial fossa below the pons. It is concerned with the coordination of movement. (MSH)
- The portion of the brain in the back of the head between the cerebellum and the brain stem. The cerebellum controls balance for walking and standing, complex motor functions. (PDQ)

Synonym(s) :

- cerebellums
- cerebellum, nos
- cerebellum <1>
- tissue of cerebellum
- corpus cerebelli <2>
- corpus cerebelli
- cb - cerebellum
- epencephalon-1
- a60 cerebellum

concepts Lookup			
concept	conceptid	conceptontology	language
CA3	C0694600	UMLS	ENG
CA3-field CA3 of hippocampus	C0694600	UMLS	ENG
CB	BF_C000202	BONFIRE	ENG
Cg/Rs	BF_C000203	BONFIRE	ENG
IPI	BF_C000272	BONFIRE	ENG
KF	C0175530	UMLS	ENG
Kolliker-Fuse nucleus	C0175530	UMLS	ENG
LAcSh	BF_C000273	BONFIRE	ENG
LDDM	BF_C000279	BONFIRE	ENG
LDTg	BF_C000280	BONFIRE	ENG
LDTgV	BF_C000281	BONFIRE	ENG
LDVL	BF_C000282	BONFIRE	ENG
LEnt	BF_C000283	BONFIRE	ENG
LHbL	BF_C000284	BONFIRE	ENG
LHbM	BF_C000285	BONFIRE	ENG

Distributed Computation

- Enhanced job management functions provide detailed job information for execution on remote resource



BIRN LDDMM

https://portal.nbirn.net/BIRN/cgi-bin/CompGrid/lddmm.cgi

Fri Sep 10 16:29:12 2004
 User: *jegrethe*
 Preferences
 Logout

Data Management Analysis and Visualization Collaboratory Tools Advanced Data Integration Test Bed Style Help

BIRN LDDMM

LDDMM Input Parameters

2D Image 3D Image

Instructions

Select 'Browse' to view a pop-up data grid browser or manually type the location for each of the respective fields required for your LDDMM comparison.

Job Status

BIRN Grid Job Status

https://portal.nbirn.net/BIRN/cgi-bin/CompGrid/job_status.cgi?jobid=4030

Fri Sep 10 16:52:20 2004
 User: *jegrethe*
 Preferences
 Logout

Data Management Analysis and Visualization Collaboratory Tools Advanced Data Integration Test Bed Style Help

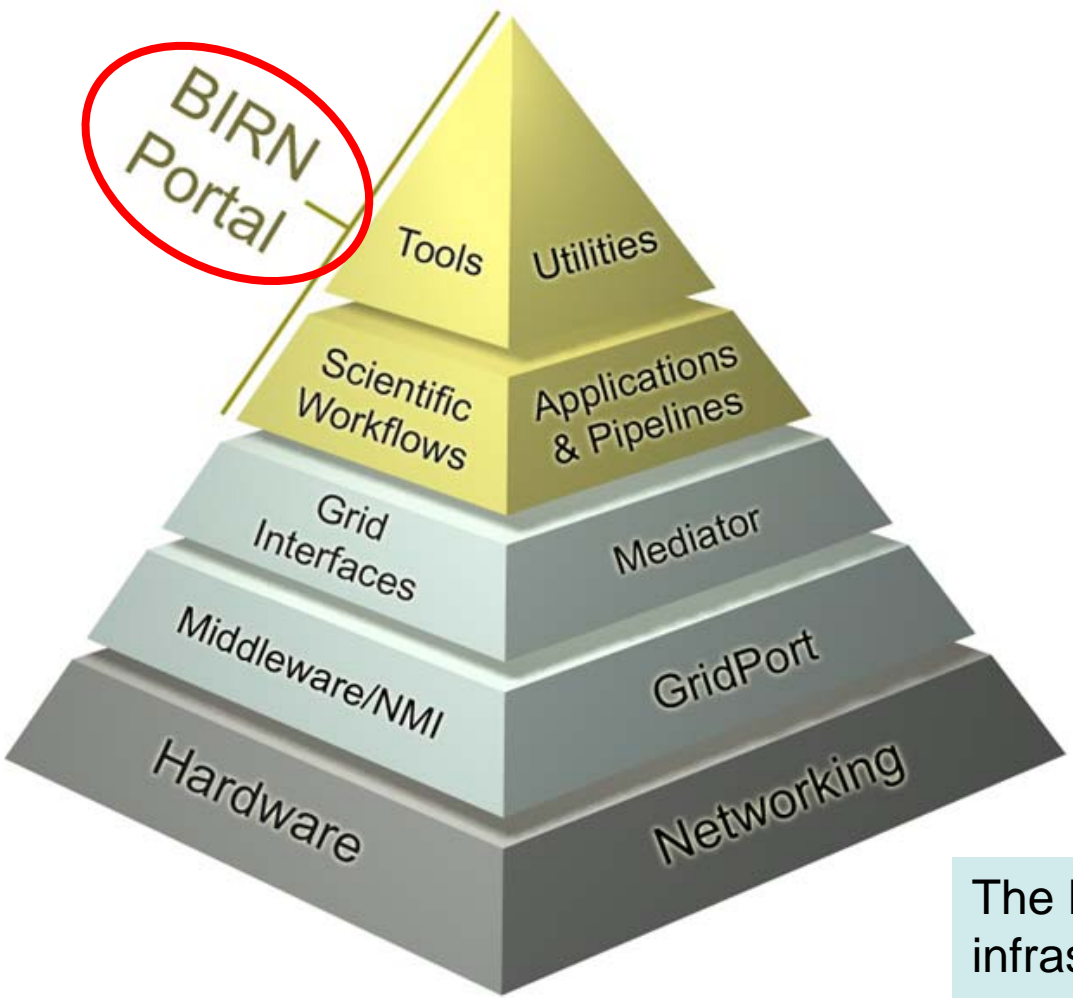
BIRN Grid Job Status

List all Jobs

LDDMM Job	
Start Time	Fri Sep 10 16:41:44 2004
User	jegrethe
Execution	/opt/birn/ldmm/bin/ldmm -d 3 -A srbfile:/home/BIRN/Human/Dev/lddmm/human/hippocampus/renewal_demo_2004/registered_80_96_80/XJJ_1h.hippocampus_96.img -T srbfile:/home/BIRN/Human/Dev/lddmm/human/hippocampus/renewal_demo_2004/registered_80_96_80/XSP_1h.hippo
Resource	jhu-gpop.nbirn.net
Status	PENDING

[refresh](#)

application which aims to
 onal Anatomy thereby
 ges in shapes. As part of
 develop techniques to not



Domain Specific Software

Shared Software and Services

Provisioning

BIRN Cyberinfrastructure

The BIRN shared information technology infrastructure for basic and translational research is available to all researchers from any internet capable location.

The BIRN is developing a shared information technology infrastructure for basic and translational research that is available to all researchers from any internet capable location.



Choose Your Testbed

Function - studying regional brain dysfunctions related to the progression and treatment of schizophrenia.

Morphometry - examining unipolar depression, mild Alzheimer's disease and mild cognitive impairment.

Mouse - studying animal models of multiple sclerosis, schizophrenia, Parkinson's disease, ADHD, Tourette's disorder, brain cancer.

NAMIC - The National Alliance for Medical Imaging Computing (NAMIC) is a multi-institutional, interdisciplinary team of computer scientists, software engineers, and medical investigators who develop computational tools for the analysis and visualization of medical image data.

BIRN CC - supports these projects and the overall information technology (IT) infrastructure of the BIRN

BIRN Announcements

May 13, 2004

The BIRN CC released the [BIRN Grid Portal API](#) for use on the production BIRN portal.

March 22, 2004

BIRN test bed participants presented a "Building on the BIRN" workshop at the National Institutes of Health. View [presentations](#) from and [photos](#) of the event.

March 3-5, 2004

UCI hosted a Function BIRN All Hands Meeting at the Beckman Center of the National Academy of Sciences, Irvine.

BIRN Grid Status

Grid Host	Data Grid Resources				
UCSD - NCMIR	nas0:88%	nas1:92%			
UCSD - FMRI	nas0:75%	nas1:88%	nas2:88%	nas3:54%	nas4:57%
UCLA - LONI	nas0:11%	nas1:4%	nas2:4%	nas3:3%	
Caltech - BIC	nas0:36%	nas1:61%			
Duke - CIVM	nas0:75%	nas1:46%	nas0:75%		
Duke - UNC	nas0:3%	nas1:2%	nas2:3%	nas3:3%	
Harvard - BWH	nas0:81%	nas1:31%			
Harvard - MGH	nas0:23%	nas1:21%	nas2:45%		
UI - MHCRC	nas0:21%				
UMN - CMRR	nas0:12%				
UNM - HSC	nas0:10%	nas1:7%			

BIRN Portal

- Application environment that provides transparent and pervasive access to the BIRN infrastructure (i.e. tools, applications, resources) with a **Single Login** from any Internet capable location
- Provides simple, intuitive access to distributed resources for data storage, distributed computation, and visualization
- Support for dynamic collaborative projects
- Built on standard Portal framework

Providing an Intuitive Interface to the BIRN Collaborative Environment



BIRN
BIOMEDICAL INFORMATICS RESEARCH NETWORK

Home Account Password Sign Out

BIRN Portal Login

Username: _____
Password: _____
Login

Portal Announcements

Browser cookies enabled to: You must have cookies enabled to sign to the BIRN Portal. In addition, JavaScript is highly recommended but not required.

The latest version of Java will be required to access some of the applications.

For optimal browsing please use a Mozilla based browser.

Older versions of Safari will experience problems, please upgrade to the latest version of Safari.

Welcome to the BIRN Portal

The Biomedical Informatics Research Network (BIRN) Portal provides BIRN members with a single sign on web portal to access data grid files, computation and resources and a variety of collaboration tools to facilitate the scientific needs of BIRN researchers. Non-BIRN participants may access the portal through a guest registration.



Currently the BIRN involves a consortium of 14 universities and 22 research groups that participate in one or more of three test bed projects: Central Animal Brain Imaging of human neurological disorders and associated animal models.

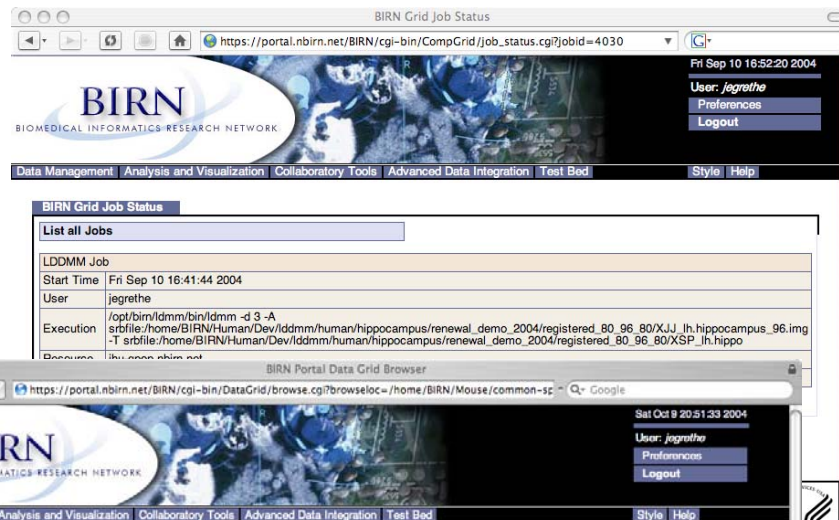
While the pioneering data sites involve dedicated hardware, the system is rapidly evolving to include data repositories associated with any laboratory research program. Access to these distributed data is available from web interfaces and through high or low bandwidth network connections.

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http://www.nih.gov

Distributed Computation

Data Management

Data Visualization



BIRN
BIOMEDICAL INFORMATICS RESEARCH NETWORK

Data Management | Analysis and Visualization | Collaboratory Tools | Advanced Data Integration | Test Bed | Style | Help

BIRN Grid Job Status

List all Jobs

LDDMM Job

Start Time: Fri Sep 10 16:41:44 2004

User: jgrethe

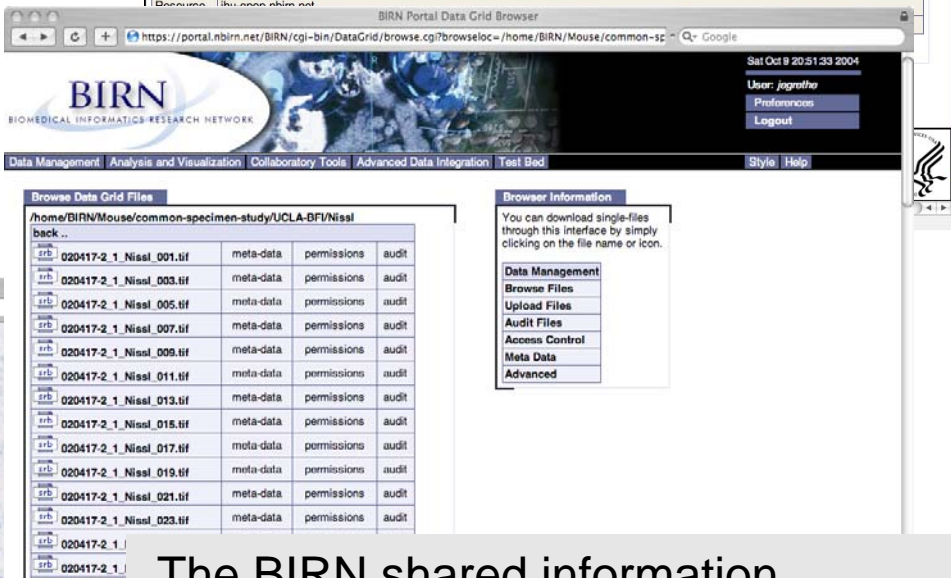
Execution: /opt/birn/ldmm/bin/ldmm -d 3 -A srbfile:/home/BIRN/Human/Dev/ldmm/human/hippocampus/renewal_demo_2004/registered_80_96_80/X.LJ.lh.ippocampus_96.img -T srbfile:/home/BIRN/Human/Dev/ldmm/human/hippocampus/renewal_demo_2004/registered_80_96_80/XSP.lh.ippo

BIRN Portal Data Grid Browser

https://portal.nbirn.net/BIRN/cgi-bin/DataGrid/browse.cgi?browseloc=/home/BIRN/Mouse/common-specimen-study/UCLA-BFI/Nissl

Sat Oct 9 20:51:23 2004

User: jgrethe
Preferences
Logout



BIRN
BIOMEDICAL INFORMATICS RESEARCH NETWORK

Data Management | Analysis and Visualization | Collaboratory Tools | Advanced Data Integration | Test Bed | Style | Help

Browse Data Grid Files

/home/BIRN/Mouse/common-specimen-study/UCLA-BFI/Nissl

back ..

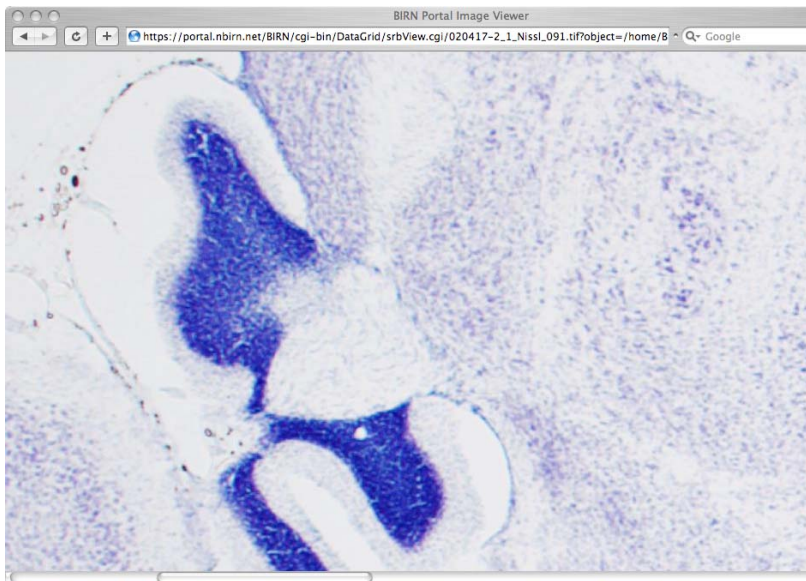
020417-2_1_Nissl_001.tif	meta-data	permissions	audit
020417-2_1_Nissl_003.tif	meta-data	permissions	audit
020417-2_1_Nissl_005.tif	meta-data	permissions	audit
020417-2_1_Nissl_007.tif	meta-data	permissions	audit
020417-2_1_Nissl_009.tif	meta-data	permissions	audit
020417-2_1_Nissl_011.tif	meta-data	permissions	audit
020417-2_1_Nissl_013.tif	meta-data	permissions	audit
020417-2_1_Nissl_015.tif	meta-data	permissions	audit
020417-2_1_Nissl_017.tif	meta-data	permissions	audit
020417-2_1_Nissl_019.tif	meta-data	permissions	audit
020417-2_1_Nissl_021.tif	meta-data	permissions	audit
020417-2_1_Nissl_023.tif	meta-data	permissions	audit
020417-2_1			
020417-2_1			

Browser Information

You can download single-files through this interface by simply clicking on the file name or icon.

Data Management

- Upload Files
- Audit Files
- Access Control
- Meta Data
- Advanced



The BIRN shared information technology infrastructure for basic and translational research is available to all researchers from any internet capable location.



BIRN Supports Grid Portal Technology

BIRN Portal Main Page

Username: _____ Password: _____

Home | Account Request | Style | Help

Login Information

BIRN Portal Login

Enter your username/password

Username: _____ Password: _____

• Forgot a BIRN account (only for BIRN participants)
• Don't BIRN Portal admin

Portal Requirements

You must have cookies enabled to login to the BIRN Portal, in addition, Javascript is highly recommended but not required.

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For optimal browsing please use a Mozilla based browser.

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While the pioneering data sites involve dedicated hardware, the system is rapidly evolving to include data repositories associated with any laboratory research program. Access to these distributed data is available from web interfaces and through high or low bandwidth network connections.

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gridisphere portal framework
open-source / portlet jsr168 compliant

GridSphere | Download | Documentation | Developers | Projects | Consulting | About

Home | News | Events | Contact

News

7/6/2005 Grid Portlets 1.1 is now available for download!

6/13/2005 Grid Portlets 1.0.3 is now available for download!

5/27/2005 Grid Portal Workshop, hosted by Australian Partner Advanced Computing Centre, is now open for registration

Welcome to the GridSphere Project!



The GridSphere portal framework provides an open-source portlet based Web portal. GridSphere enables developers to quickly develop and package third-party portlet web applications that can be run and administered within the GridSphere portlet container. Here you will find the GridSphere portal framework available for download and documentation related to the installation and development of portlets using GridSphere.

GridSphere Portal - Mozilla Firefox

http://localhost:8080/gridisphere/gridisphere?od=projectManagerPortlet&js_action=viewProject&JavaScript-enabled

Apache Tomcat 5.0.28 | local-gridisphere | GridSphere Portal - dev - Biomedical Informatics ...

BIRN
Biomedical Informatics Research Network

Logout
Welcome, Thien Nguyen

Home | My Projects | My Activities

Project Overview

Project Info : Analysis, Visualization and Interpretation

Project ID: 4
Project Name: Analysis, Visualization and Interpretation
Public Info: Continued development, integration, and deployment of a suite of freely available software to enable scientific investigation of the morphological bases of dysfunction through increasingly sophisticated image analysis on increasingly large subject populations acquired at multiple research sites.
Private Description: Continued development, integration, and deployment of a suite of freely available software to enable scientific investigation of the morphological bases of dysfunction through increasingly sophisticated image analysis on increasingly large subject populations acquired at multiple research sites.
Accessible: Private
Type: Normal
SIB Group Name: avi_0004
Founded: 10-29-2004 09:31:54
Number of Members: 7

Current Activities

Contract All | Expand All
Activities

Memberships

Memberships (7)				
ID	Username	Role	Started	Status
56	akozlany	Owner	10-29-2004	Active
67	thien	Member	10-30-2004	Active

Project Summary

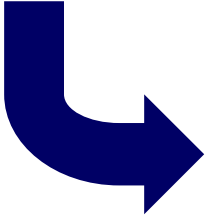
Name: Analysis, Visualization and Interpretation
Members: 7
Access: Private
Type: Normal
Started: Oct 29, 2004

My Memberships

User: thien
Email: thiennguyen@bim.nih.gov
Role: Member
Joined: Oct 29, 2004
Status: Active

Select Project(15)

Analysis, Visualization and Interpretation	7
NAASIC	7
Portal Test	2
Too many ways to mess w/ code	1
Test two	2
aa	1
BIRN Neuroimaging Calibration Study, Phase I	7



The BIRN-CC is supporting development of the leading open-source standards-based grid portal.

Integration with BIRN Services

- Portal provides Intuitive user interfaces to access commonly used functionality
- With authentication service there is seamless interaction with Portal services

Stats: Univariate Analysis **Statistics** << (1) >>
Results 1-20 of 20

[Export CSV](#)

Subject ID	Site ID	MMSE	Demographics			Diagnosis CVLT		VFT	Left Hippocampus	Right Hippocampus
			MMSE Score	Age	Gender	Years of Education	Diagnosis	Discriminability raw score	"Animals" correct responses	Volume
009007669326	Visit: 2 Seg: 1	SITE1	25				.66	13		
	Visit: 1 Seg: 1	SITE1		75	F	14	Alzheimer		2377.0	2480.0
009015726375	Visit: 2 Seg: 1	SITE1	30							
	Visit: 1 Seg: 1	SITE1		71	F	14	Control		3760.0	3650.0
	Visit: 3 Seg: 1	SITE1					.93	22		
009016532513	Visit: 2 Seg: 1	SITE1	17				.41	7		
	Visit: 1 Seg: 1	SITE1		60	F	16	Alzheimer		3565.0	3435.0
009022174223	Visit: 2 Seg: 1	SITE1	30				.93	19		
	Visit: 1 Seg: 1	SITE1		71	M	18	Control		4774.0	4495.0
009028001105	Visit: 2 Seg: 1	SITE1	24				.8	9		
	Visit: 1 Seg: 1	SITE1		77	F	13	Alzheimer		2852.0	2979.0
009042378934	Visit: 2 Seg: 1	SITE1	29							
	Visit: 1 Seg: 1	SITE1		70	F	12	Control		3313.0	3466.0
	Visit: 3 Seg: 1	SITE1					1	16		
							.39	4	2932.0	2907.0
							.75	14	2961.0	3335.0
							1	15	3754.0	4260.0
							.93	22	3990.0	4152.0
							.84	6	3267.0	3386.0
							.59	5		



Univariate Analysis

Structure

Brain
 Hippocampus.Volume
 Laterality: Total, Left, Right

Demographic Factors

Continuous
 MMSE.MMSE.Score
 Demographics.Age
 Demographics.Years.of.Education

Dichotomous
 Demographics.Gender
 Diagnosis.Diagnosis

Output Selection

Mean, Standard Deviation
 Stem & Leaf Plot
 Plot Histogram
 Empirical Cumulative Distribution Function
 Quartile-Quantile (Q-Q) Plot
 Shapiro-Wilk Normality Test
 Box Plot

Analysis Information

This is a prototype for univariate statistical summary analysis of morphometric data. It is an example of some of the basic statistical features that we need for accomplishing our Morph BIRN clinical specific aims.

Case Study:

Human Imaging Database integration with Authentication Services and Portal Environment

Biomedical Informatics Research Network – Home Page

http://www.nbirn.net

Google

BIRN Portal Login

Username:

Password:

Search This Site

[About Us](#) [Resources](#) [Test Beds](#) [Publications](#) [Contact Us](#) [Site Map](#) [Help!](#)

BIRN is...

The [Biomedical Informatics Research Network](#) (BIRN), a [National Institutes of Health \(NIH\)-National Center for Research Resources \(NCRR\)](#)-sponsored initiative, is establishing a distributed information technology infrastructure to improve biomedical research.

This evolving "cyberinfrastructure" will enable researchers throughout the United States to collaborate on large-scale studies of human disease with unique, multi-resolution tools.

[More >](#)

News

October 6, 2003
The newest BIRNING Issues, volume 2, issue 1, is online ([PDF](#)).

July 17, 2003
The **New York Times** ran an **article** in their science section that included the **BIRN Project** and the **Morphometry BIRN Test Bed**. Read the text ([PDF](#)).

July 17, 2003
An updated **BIRN-CC Project Schedule** has been released. View the document as a [PDF](#) or [Microsoft Project](#) file.

July 10, 2003
Minutes of the first BIRN Steering Committee meeting are available to BIRN participants via [PDF](#) or from the new [Steering Committee section](#) of the Web site.

June 27, 2003
The June 2003 *BIRNING Issues* is now posted on the Web. ([PDF](#))

Events

2003 All Hands Meeting, October 8-10 at UCSD.

The 2003 All Hands Meeting was extremely productive.

Review details, take our post-event survey, and view the pictures: [AHM 2003](#)

Research Focus

The BIRN currently consists of three "test bed" projects that are conducting structural and functional studies of neurological disease:

[Function BIRN](#) - studying regional brain dysfunctions related to the progression and treatment of schizophrenia.

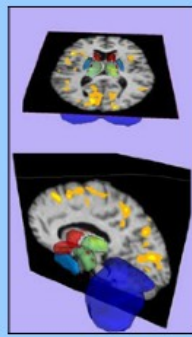
[Morphometry BIRN](#) - examining unipolar depression, mild Alzheimer's disease and mild cognitive impairment.

[Mouse BIRN](#) - studying animal models of multiple sclerosis, schizophrenia, Parkinson's disease, ADHD, Tourette's disorder, brain cancer.

These projects and the overall information

Hot Topic

3D Slicer



The Function, Morphometry, and Mouse BIRNs are working to develop images like these: generated from subject populations, collected across different imaging modalities and sites, applying the strengths of various analysis and visualization packages. This kind of detail will allow researchers to better understand aspects of brain function and dysfunction.