

NIC Kolloquium

An Introduction to the XNAT Data Management

December 10th, 2020

Philipp T. Neukam, Christian Löschen, Dirk K. Müller &
the SFB940/INF Project

Resources at the NIC homepage

<https://nic-tud.de/research/ressourcen/IT-services/>

IT AND DATA SERVICES

NIC Data-Management Manuals

- ↓ NIC Data Management Overview
- ↓ Uploading DICOM files (zip-file) to the XNAT (German)
- ↓ Uploading non-DICOM files (e.g. logfiles) to the XNAT

Specific NIC Software Tools

- Python script to parse the NIC-specific DICOM file paths -> `nic_path.py`

Naming Conventions at the NIC

- ↓ Logfile Naming (ideally)
- ↓ MRI Sequenz (Series) Naming

Resources within the TUD VPN (restricted access)

- Access to the VPN (Virtual Private Network) and shared drives (German only)
- Granting temporary access to TUD WLAN
- Neuroimaging Center Python Pipeline (NICEpype)
- NIC XNAT Database
- PaMS
- Redcap Study Database at the ZIH

Open Science Resources

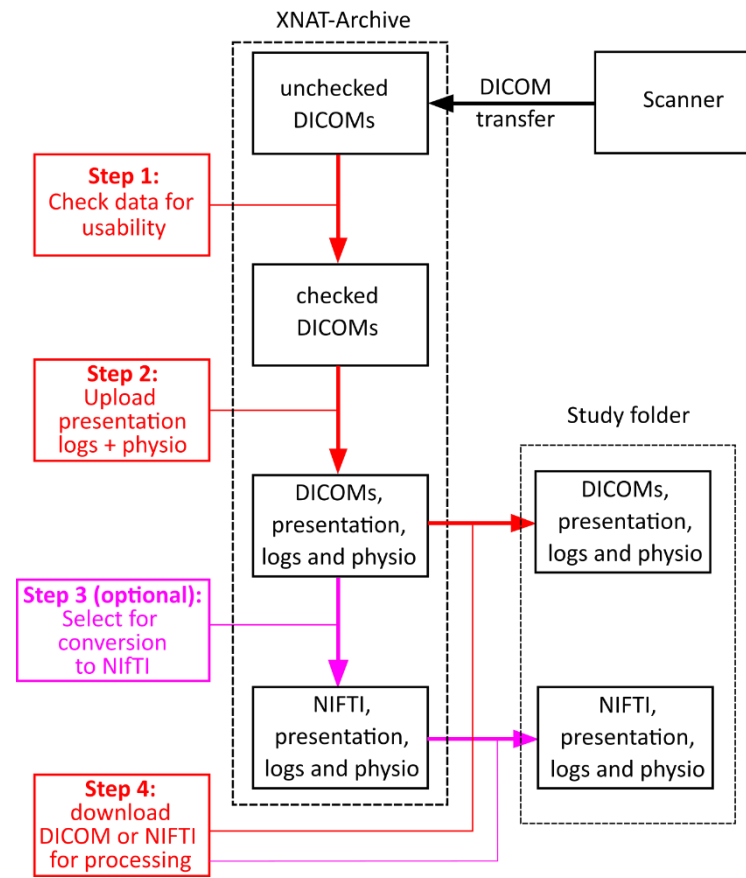
- Open Access Repository and Archive (OpARA)
- > Open Science Initiative der Fakultät Psychologie der TUD (OSIP)
- Open Science Framework (OSF)

<https://nic-tud.de/research/ressourcen/data-management-manual/>

NIC Data-Management Manual

Procedure for study staff:

Click on the individual steps for detailed instructions.

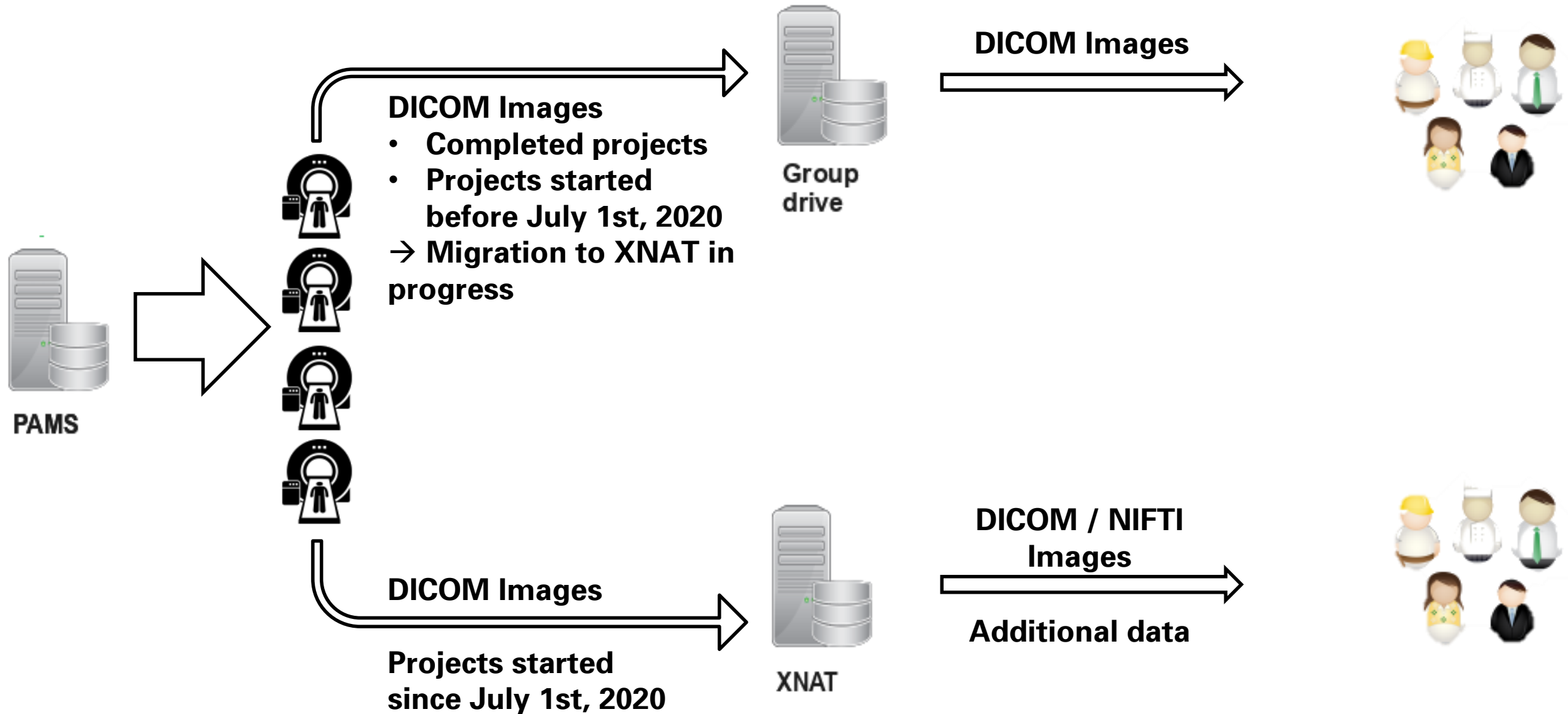


Please send feedback to mrphysik@msx.tu-dresden.de

Outline

- MRI data flow
- Quality flags for sequences
- Upload of additional data
- DICOM→NIFTI Converter
- Download data
- User groups (Owner, Member, Collaborator)
- Outlook: Automatic image processing software: NiCePyte

MRI Data Flow



MRI Data Flow: PaMS registration

Neuroimaging Zentrum — Probandendatenbank

Christian Löschen    

Start Probandeninfos **Untersuchungen** Befundungen Implantate Anrufprotokoll Unbefundet Befundet Rekrutieren Studien Berechtigungen ORSEE Scanner-Reboot

Spur: Implantate (Test Basicassessment) • Anrufprotokoll (Test Basicassessment) • Unbefundet • Befundet • Rekrutieren • Studien • Berechtigungen • Start • Probandeninfos (Test Basicassessment) • Studien (Test Basicassessment)

Proband #000844
Test Basicassessment (17)

Neue Untersuchung

Untersuchungsart
Magnetresonanztomographie (MRT)

Scanner
1055

Untersuchungsraum
A/11

Gewicht [kg]

Körpergröße [m]

Studiennummer

Probandencod

Studienkommentar

Erhebungsnummer

Untersuchungsdatum
06.02.2020

1. Untersucher
Löschen, Christian

2. Untersucher
Aguilera, Alvaro

Untersuchungsstatus

Teilnahmestatus

Speichern Zurücksetzen

Untersuchungen

Untersuchungs-ID	Studie	Participant ID	Erhebungsnummer	Datum	Untersucher #1	Status
1	10101	99999	1	06.02.2020 00:00	Christian Löschen	   

Export Registration to scanner

3	Surname	Study number	10101
2	Given name	Participant code	99999
3	Subject no.	PaMS-ID (6 digits)	000844

Automatic import to the scanner console

Patientenregistrierung

PATIENT

1 Nachname 10101

2 Vorname 99999

Titel 1

3 Patientennr. 000844

Geburtsdatum 25.06.1971 [dd.MM.yyyy]

Geschlecht ☒ männl. ☐ weiblich ☐ Andere

Alter 48 Jahre

Größe 1,83 [m]

Gewicht 72,00 [kg]

Bemerkungen Project:10101;Subject:99999;Sex:

Details...

METHODE

Auftragsnummer 14915

Anforderungsnr.

Erforderliche Methode(n)

Studie Kopf TRR265

Studienkommentar

Patientenlage Kopf voran - Rückenlage

Institut Systemische Neurowissenschaft

HOSPITAL

Überweisender	1	Surname	Study number	10101
Anfordernder	2	Given name	Participant code	99999
Überweisung	3	Subject no.	PaMS-ID (6 digits)	000844

Vormerken Untersuchen Suchen Abbrechen Hilfe

ISO_IR 100

XNAT Levels

 **TECHNISCHE
UNIVERSITÄT
DRESDEN**

Project Overview

XNAT_ZIH currently contains 186 projects, 3176 subjects, and 3635 imaging sessions.

Projects

Subjects

MR

PET

CT

ID:

Name:

Keywords:

Investigator:

(SELECT)

Projects

Aging and dopamine modulation of complementary control processes
Project ID: 00034
You are an owner for this project.

NICDB Testprojekt
Project ID: 01333 Pt: Dirk Müller
You are a member for this project.

Neuromodulation of structural and functional changes by homeostatic signals after smoking cessation
Project ID: 00032
You are an owner for this project.

Neuronale Plastizität im Rahmen einer kognitiv-verhaltens-therapeutischen Intervention bei Patienten mit Panikstörung
Project ID: 00201
You are an owner for this project.

Serotonergic modulation of meta-control parameters
Project ID: 00030
You are an owner for this project.

NICDB Testprojekt

Participant Overview

Details

ID: 01333

PI: Müller, Dirk

Subjects

<< first < prev 1 next > last >>

200

1 of 1 Pgs (16 Rows)

Subject	M/F	Hand
006217	U	
20190215	U	
20190624	U	
20190625	U	
20191203	U	
20191213	U	

PROJECT: [01333](#) > SUBJECT: [20190624](#) > [006217](#)

Session Overview

MR Session: 006217

Details

Projects

Accession #: XNAT_ZIH2_E01301

Date Added: 11/12/2020 13:28:31 (rbaensch)

Date: 06/24/2019

Time: 11:22:00

Scanner Name: MRC35213

Scanner Type: SIEMENS TrioTim

Acquisition Site: NIC

Subject: [20190624](#)

Gender:

Handedness:

Age: --

Actions

Edit

Build

View

Download

Email

Manage Files

View Images

Upload Additional Files

Scans

Bulk Actions:

Download

	Scan	Type	Series Desc	Usability	Files	Note
☐	1	boldA_restfb_01_32traa-6117-20202000-0987-33_SBRef	boldA_restfb_01_32traa-6117-20202000-0987-33_SBRef	usable	2.8 MB in 3 files	
☐	2	boldA_restfb_01_32traa-6117-20202000-0987-33	boldA_restfb_01_32traa-6117-20202000-0987-33	usable	30.7 MB in 20 files	
☐	3	boldA_restfb_01_32traa-6117-20202000-0987-33_SBRef	boldA_restfb_01_32traa-6117-20202000-0987-33_SBRef	usable	1.5 MB in 1 files	
☐	4	boldA_restfb_01_32traa-6117-20202000-0987-33	boldA_restfb_01_32traa-6117-20202000-0987-33	usable	10.7 MB in 7 files	

Total: 45.8 MB in 31 files

Pre-Archive

- Data are automatically transferred from the MRI to the Pre-Archive
- Images are ***exclusively*** evaluated by the MTRAs for completeness
- Complete data sets are sent to the project archive and marked as ***unchecked***
- Study personal ought to work only with the transferred data in the respective project archive!

The screenshot displays a web application interface for managing MRI sessions. The main area is a table titled 'Sessions' with columns: Project, Subject, Session, Scan Date, Upload Date, and Status. A single row is visible with the following data: Project 00034, Subject 202060, Session 16358_1, Scan Date Tue Dec 01 202..., Upload Date Tue Dec 01 2020 12..., and Status Ready. Above the table are buttons for 'Refresh', 'Check', 'Uncheck', 'Check All', and 'Uncheck All'. A large red watermark 'MTRAs ONLY!' is overlaid on the table. To the right of the table is a sidebar titled 'Details of Highlighted Session(s)' which contains fields for Project, Subject, Session (with the text 'No sessions highlighted.'), Scan Date, Upload Date, Status, Scanner, and More. Below this is an 'Actions' section with buttons for 'Archive', 'Review and Archive', 'Change Projects', 'Delete', and 'Rebuild'. At the bottom is a 'Filters' section with input fields for Projects, Upload Date (From and To), Scan Date (From and To), Status (a dropdown menu), and Subject/Session.

Project	Subject	Session	Scan Date	Upload Date	Status
00034	202060	16358_1	Tue Dec 01 202...	Tue Dec 01 2020 12...	Ready

MTRAs ONLY!

one row

Details of Highlighted Session(s)

Project :
Subject :
Session : No sessions highlighted.
Scan Date :
Upload Date :
Status :
Scanner :
More :

Actions

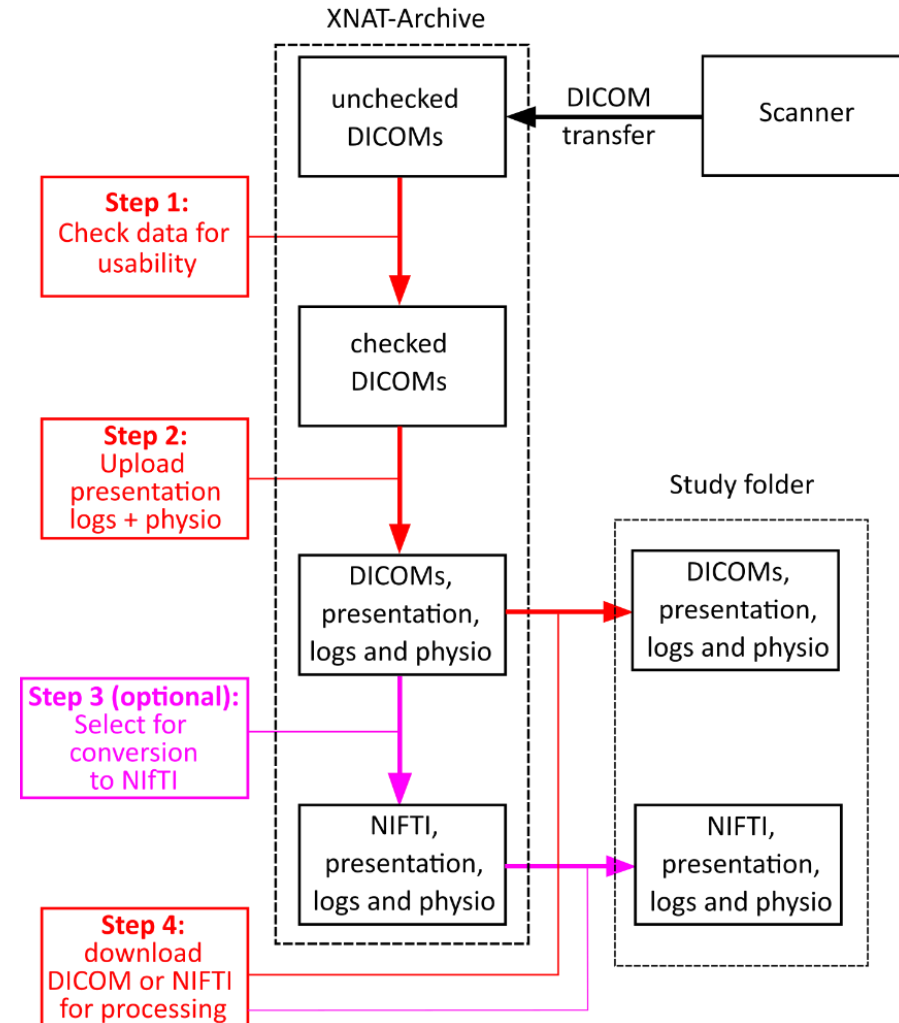
Actions are performed on checked sessions.

Filters

Projects:
Upload Date: From ... To ...
Scan Date: From ... To ...
Status:
Subject/Session:

Step 1: Quality flags - Handling incorrect or unwanted data

- Scans for positioning the subjects
 - ➔ AAScout
 - ➔ Localizer
- Data from unwanted reconstructions
 - ➔ T1 thick film
 - ➔ DTI
- Scan aborts at the request of the subjects and repeated measurements



Step 1: Archive: Set Quality Flag

Details		Projects	
Accession #:	XNAT_ZIH2_E01590	Subject:	20201203-35213
Date Added:	12/04/2020 11:27:56 (mame720c)	Gender:	
Date:	12/03/2020	Handedness:	
Time:	07:06:54	Age:	--
Operator:	M?ller Dirk		
Scanner Name:	MRC35213		
Scanner Type:	SIEMENS TrioTim		
Acquisition Site:	NIC		

Actions

- Edit
- Build
- View
- Download
- Email
- Manage Files
- View Images
- Delete

Scans

Bulk Actions:		Download				
☐	Scan	Type	Series Desc	Usability	Files	Note
☐	1	ep2d_bold_rsfMRT_Phantom	ep2d_bold_rsfMRT_Phantom	UNCHECKED	4.1 MB in 11 files	
☐	2	ep2d_bold_rsfMRT_Phantom	ep2d_bold_rsfMRT_Phantom	UNCHECKED	55.8 MB in 150 files	
☐	3	boldA_restfb_01_32traa-6117-20202000-0987-33_SBRef	boldA_restfb_01_32traa-6117-20202000-0987-33_SBRef	UNCHECKED	1.5 MB in 1 files	
☐	4	boldA_restfb_01_32traa-6117-20202000-0987-33	boldA_restfb_01_32traa-6117-20202000-0987-33	UNCHECKED	384.0 MB in 250 files	
☐	5	boldA_TRR-rest_1-1_32-t-a-1-6-1-8-24242400-38-869_SBRef	boldA_TRR-rest_1-1_32-t-a-1-6-1-8-24242400-38-869_SBRef	UNCHECKED	1.1 MB in 1 files	
☐	6	boldA_TRR-rest_1-1_32-t-a-1-6-1-8-24242400-38-869	boldA_TRR-rest_1-1_32-t-a-1-6-1-8-24242400-38-869	UNCHECKED	263.1 MB in 250 files	

Total: 709.5 MB in 663 files

Step 1: Archive: Set Quality Flag

Scans Add Scan

Scan	Type ?	Quality	Note	
+ 1	AAHScout_32 ✓	usable ▼		15.2 MB in 128 files
+ 2	AAHScout_32_MPR ▼	(SELECT)		491.9 KB in 4 files
+ 3	localizerA_standard_1_32-m ▼	UNCHECKED		1.1 MB in 7 files
+ 4	T1wB_standard_1_32-s-a-1- ▼	usable		65.0 MB in 240 files
+ 5	T1wD_vibeFlip15_1_32-t-r-2 ▼	questionable		15.2 MB in 60 files
+ 6	T1wD_vibeFlip15_2_32-t-r-2 ▼	unusable		15.2 MB in 60 files
+ 7	T1wD_vibeFlip15_2_32-t-r-2 ▼	usable ▼		15.2 MB in 60 files

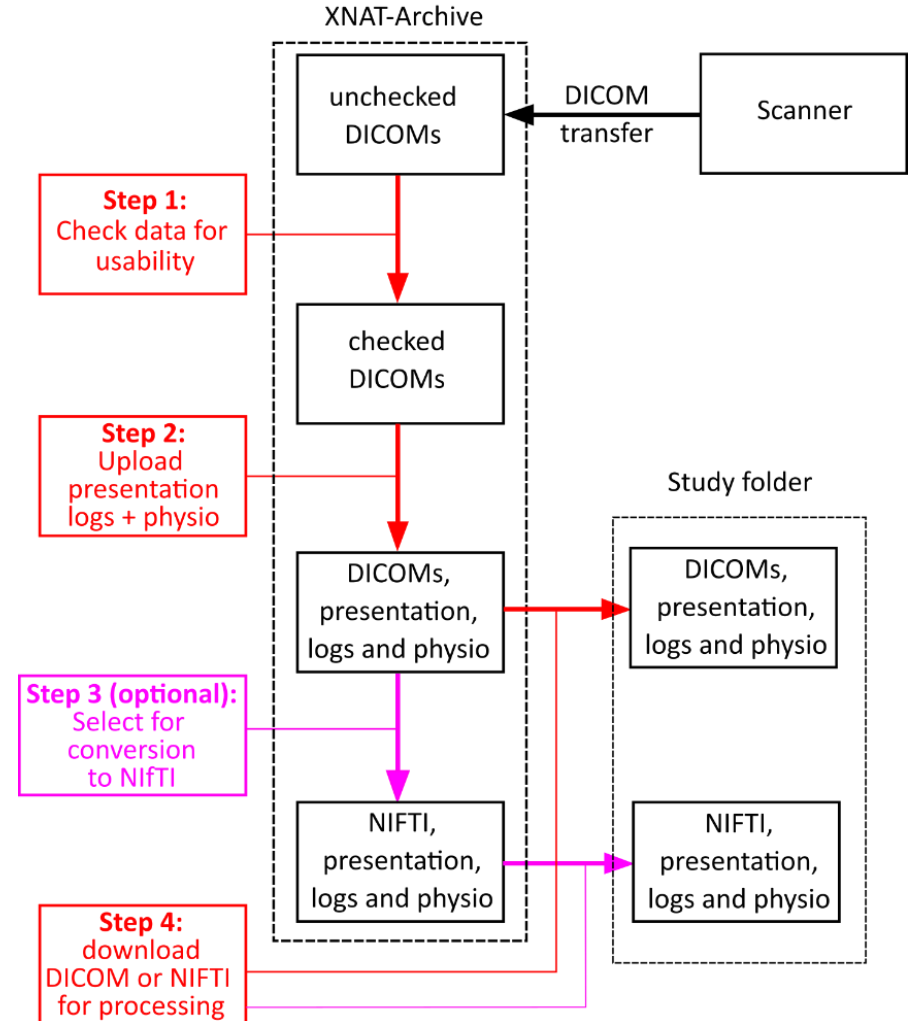
Total: 127.4 MB in 559 files

Step 1: Archive: Set Quality Flag

- **Usable:** data remain in archive and can be used for further processing
- **Questionable:** data remain in archive but should be reviewed before further processing
- **Unusable:** data will be removed from the project archive but can be recovered if necessary

Step 2: Upload of additional data

- Paradigm logging files
- Pulse oximetry
- Electrodermal activity
- ...



Step 2: Upload of additional data

[PROJECT: 01333](#) > [SUBJECT: 20200527](#) > [15133_1](#)

MR Session: 15133_1

DetailsProjects

Accession #:

XNAT_ZIH02_E02675

Date Added:

05/27/2020 11:50:10 (admin)

Date:

05/27/2020

Time:

11:39:10

Scanner:

MRC35213 SIEMENS TrioTim

Acquisition Site:

NIC

Subject:

20200527

Gender:

Handedness:

Age:

--

Actions

Edit

View

Download

Email

Manage Files

View Images

Delete

Scans					
Scan	Type	Series Desc	Usability	Files	Note
⊕ 2	AAScout	AAScout	usable	23.0 MB in 256 files	
⊕ 4	ep2d_bold_rsMRT_Phantom	ep2d_bold_rsMRT_Phantom	usable	2.3 MB in 6 files	
				Total: 25.2 MB in 262 files	

Step 2: Upload of additional data

The screenshot shows a 'File Manager' window with a tree view of folders. The 'Add Folder' dialog box is open, showing the 'New Folder' section with 'Level' set to 'scans', 'Item' set to '2', and 'Folder' set to 'Logfiles'. The 'Format Information' section has empty fields for 'Format', 'Content', and 'Tags'. The 'Create' button is highlighted in blue. At the bottom of the File Manager window, the 'Add Folder' button is circled in red, along with 'Upload Files' and 'Update File Data' buttons. A 'zip' dropdown menu, 'Download' button, and 'Close' button are also visible at the bottom right.

File Manager

- scans
 - 2 AAScout
 - DICOM 256 files, 22.96 MB DICOM RAW
 - SNAPSHOTS 2 files, 161 KB GIF SNAPSHOTS
 - 4 ep2d_bold_rsMRT_Phantom
 - DICOM 6 files, 2.25 MB DICOM RAW
 - SNAPSHOTS 2 files, 99 KB GIF SNAPSHOTS

Add Folder

New Folder

Level scans

Item 2

Folder Logfiles

Format Information

Format

Content

Tags

Create Close

Upload additional data such as
paradigm logging files or
physiological data

Add Folder Upload Files Update File Data

zip Download Close

Step 2: Upload of additional data

Upload File

Destination

Level:

Item:

Folder:

File Information

Rename:

Format:

Content:

Tags:

Overwrite: ☐

Durchsuchen... Logfile_sj_9999.txt

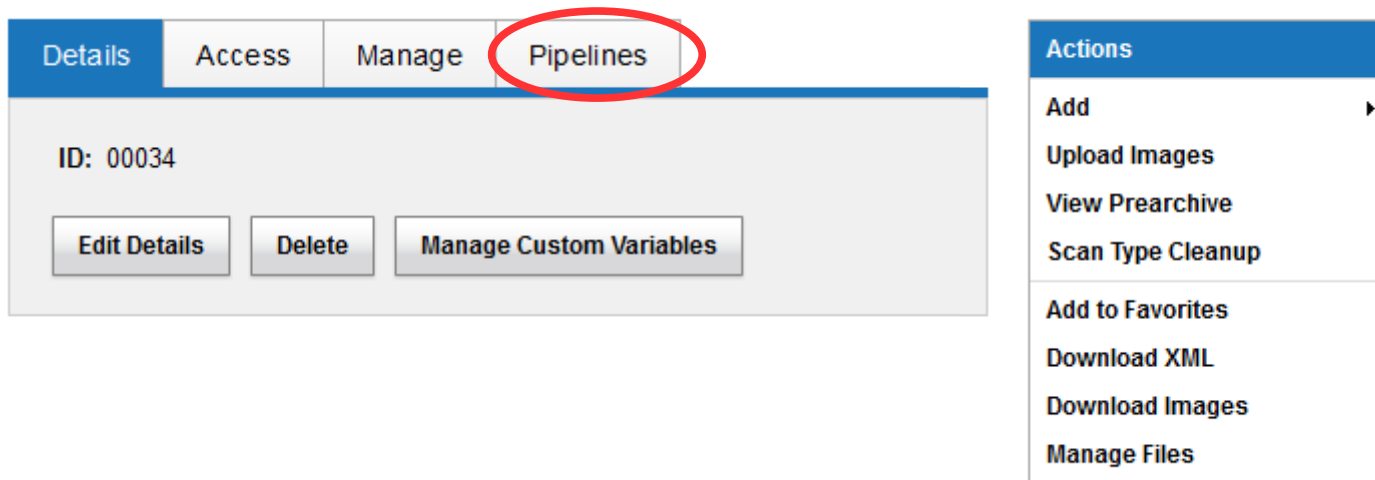
Upload **Close**

File Manager

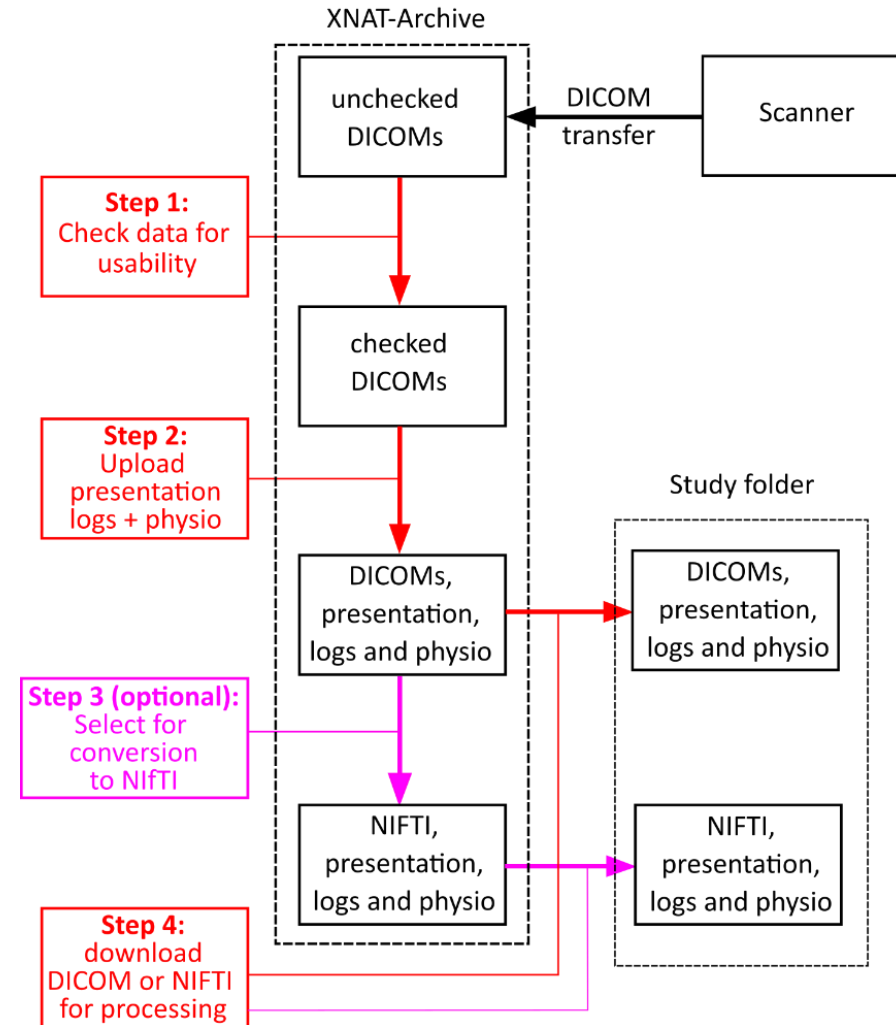
- Resources
- paradigm 1 files, 34 bytes
- scans
 - 2 AAScout
 - Logfiles 1 files, 0 bytes**
 - Logfile_sj_9999.txt 0 bytes**
 - DICOM 256 files, 22.96 MB DICOM RAW
 - SNAPSHOTS 2 files, 161 KB GIF SNAPSHOTS
 - 4 ep2d_bold_rsfMRT_Phantom
 - log_files 1 files, 0 bytes
 - SNAPSHOTS 2 files, 99 KB GIF SNAPSHOTS
 - paradigm 1 files, 34 bytes gif cross
 - DICOM 6 files, 2.25 MB DICOM RAW

Add Folder **Upload Files** **Update File Data** **Download** **Close**

Step 3: XNAT pipelines



Project owners only!



Step 3: XNAT pipelines

Aging and dopamine modulation of complementary control processes

Details

Access

Manage

Pipelines

ID: 00034

Edit Details

Delete

Manage Custom Variables

Aging and dopamine modulation of complementary control processes

Details

Access

Manage

Pipelines

Pipelines for 00034

	Applies To	Generates	Name	Description
No records found.				

Add More Pipelines

Project owners only!

Step 3: XNAT pipelines

Aging and dopamine modulation of complementary control processes

Details

Access

Manage

Pipelines

Additional Pipelines for 00034

		Applies To	Generates	Name	Description
Add	Details	All Datatypes		dicom2nifti.xml	New DICOM to NIFTI image data converter (dcm2niix)

Show Project Pipelines

Project owners only!

Step 3: Convert DICOMs to NIFTI

[PROJECT: 01303](#) > [SUBJECT: 20200221](#) > [15012_1](#)

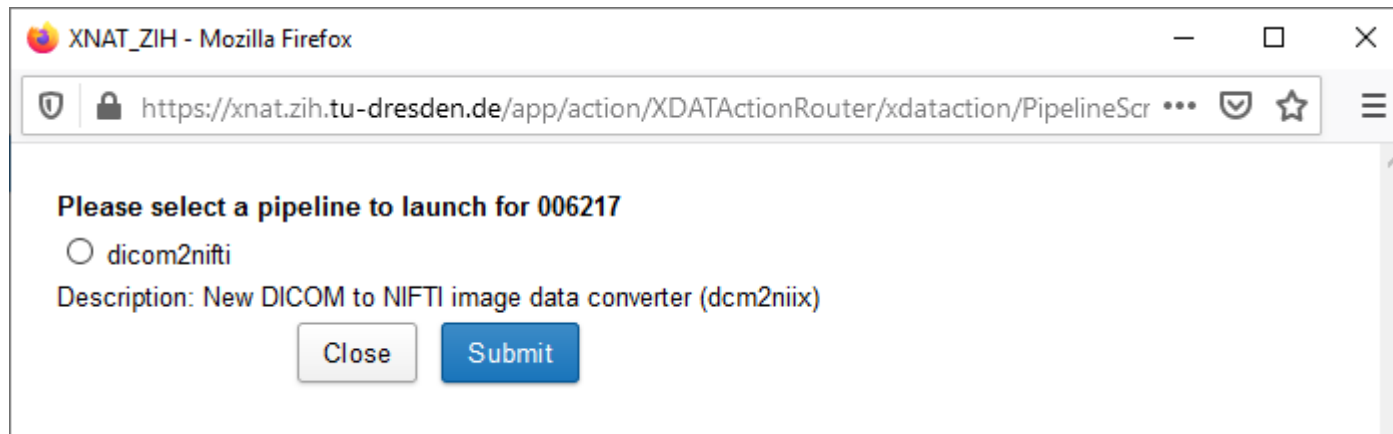
MR Session: 15012_1

Details		Projects	
Accession #:	XNAT_E00755	Subject:	20200221
Date Added:	02/21/2020 06:42:49 (admin)	Gender:	
Date:	02/21/2020	Handedness:	
Time:	06:29:18	Age:	--
Operator:	Geißler		
Scanner Name:	MRC35213		
Scanner Type:	SIEMENS TrioTim		
Acquisition Site:	NIC		

Actions

- Edit
- View ▶
- Download ▶
- Email
- Build**
- Manage Files
- View Images
- Delete

Step 3: Convert DICOMs to NIFTI



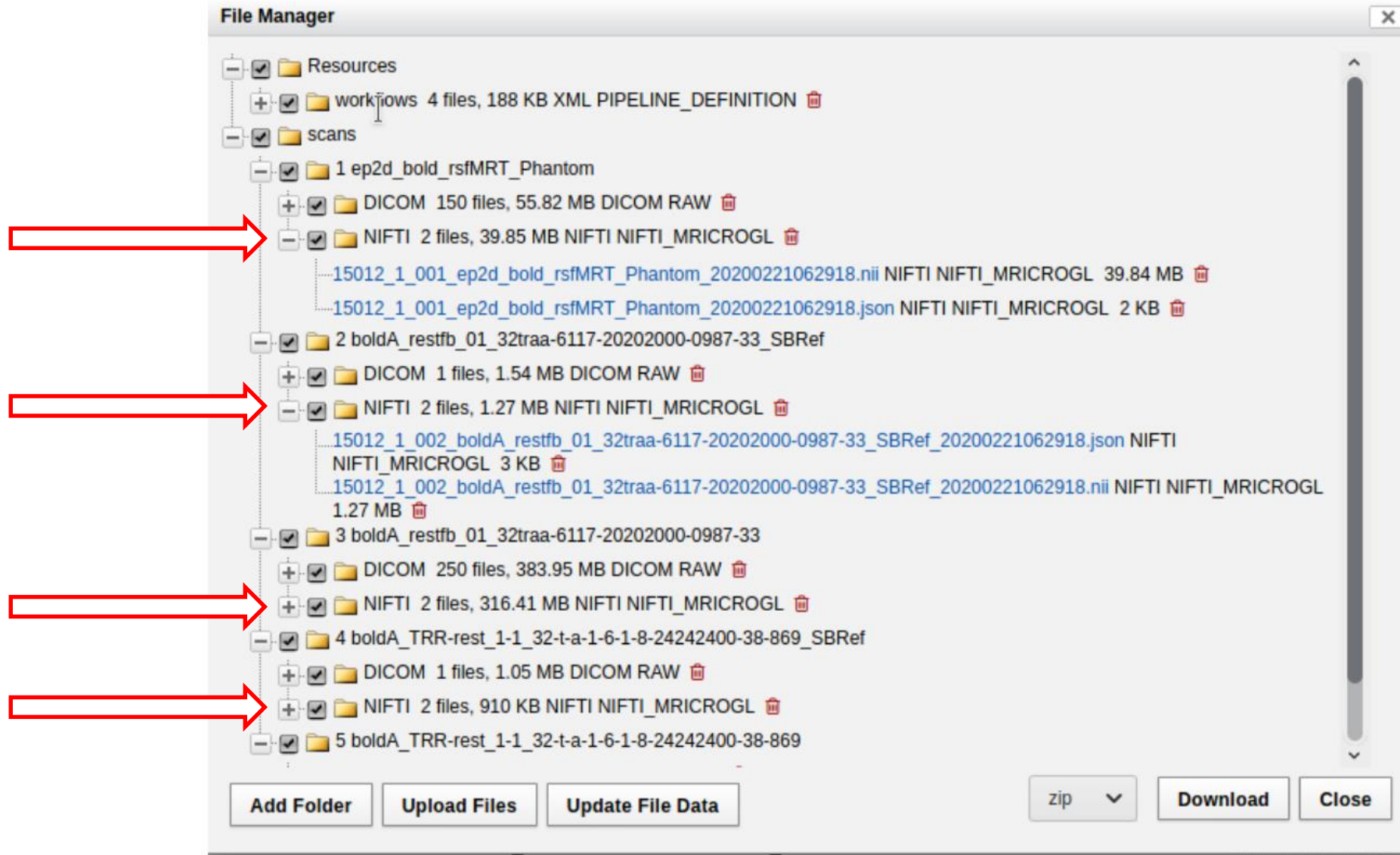
Step 3: Convert DICOMs to NIFTI

New DICOM to NIFTI image data converter (dcm2niix) for 15012_1

Name	Value
scanIDs	☒ 1 ☒ 2 ☐ 3 ☐ 4 ☒ 5
sessionID	XNAT_E00755
sessionName	15012_1
projectID	01303
subjectID	XNAT_S00649
compress	n
notify	0

- ☐ Run pipeline in-process?
- ☐ Suppress workflow entries for pipeline execution?

Step 3: Convert DICOMs to NIFTI



Download Data

MR Session: 006217

DetailsProjects

Accession #: XNAT_ZIH2_E01301 **Subject:** 20190624

Date Added: 11/12/2020 13:28:31 (rbaensch) **Gender:**

Date: 06/24/2019 **Handedness:**

Time: 11:22:00 **Age:** --

Scanner Name: MRC35213

Scanner Type: SIEMENS TrioTim

Acquisition Site: NIC

Actions

Edit

Build

View ▶

Download ▶

Email

Manage Files

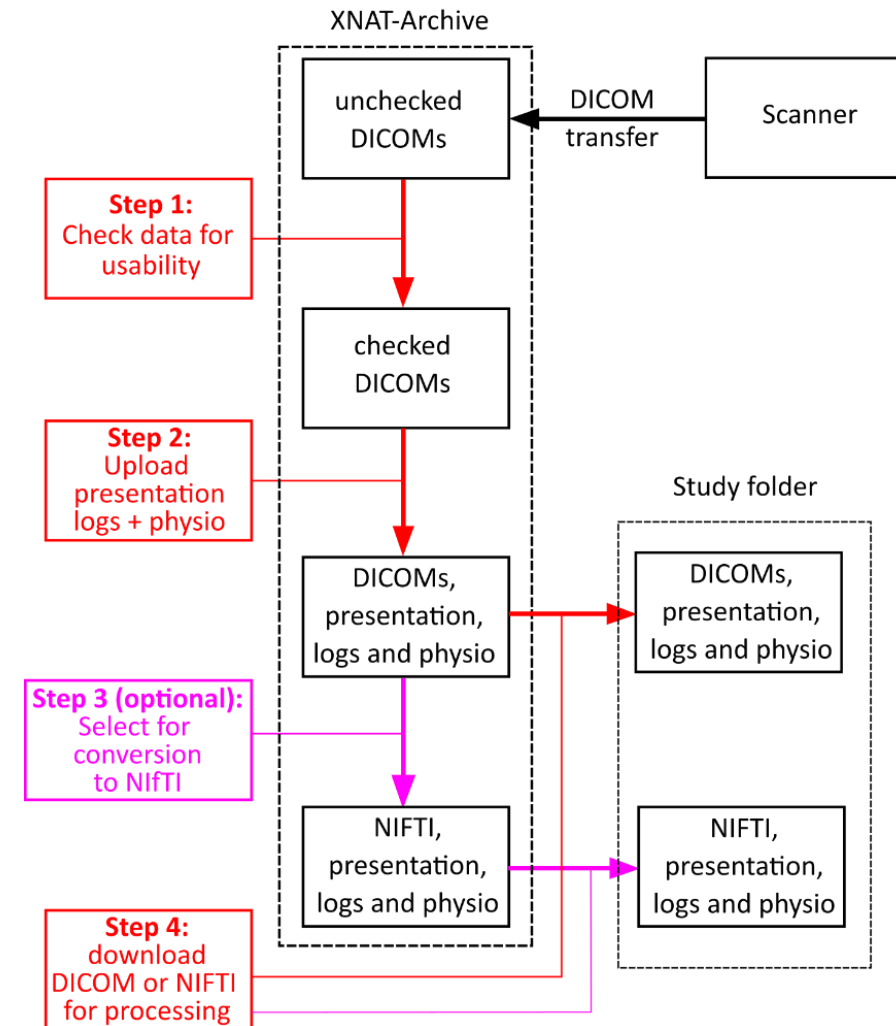
View Images

Upload Additional Files

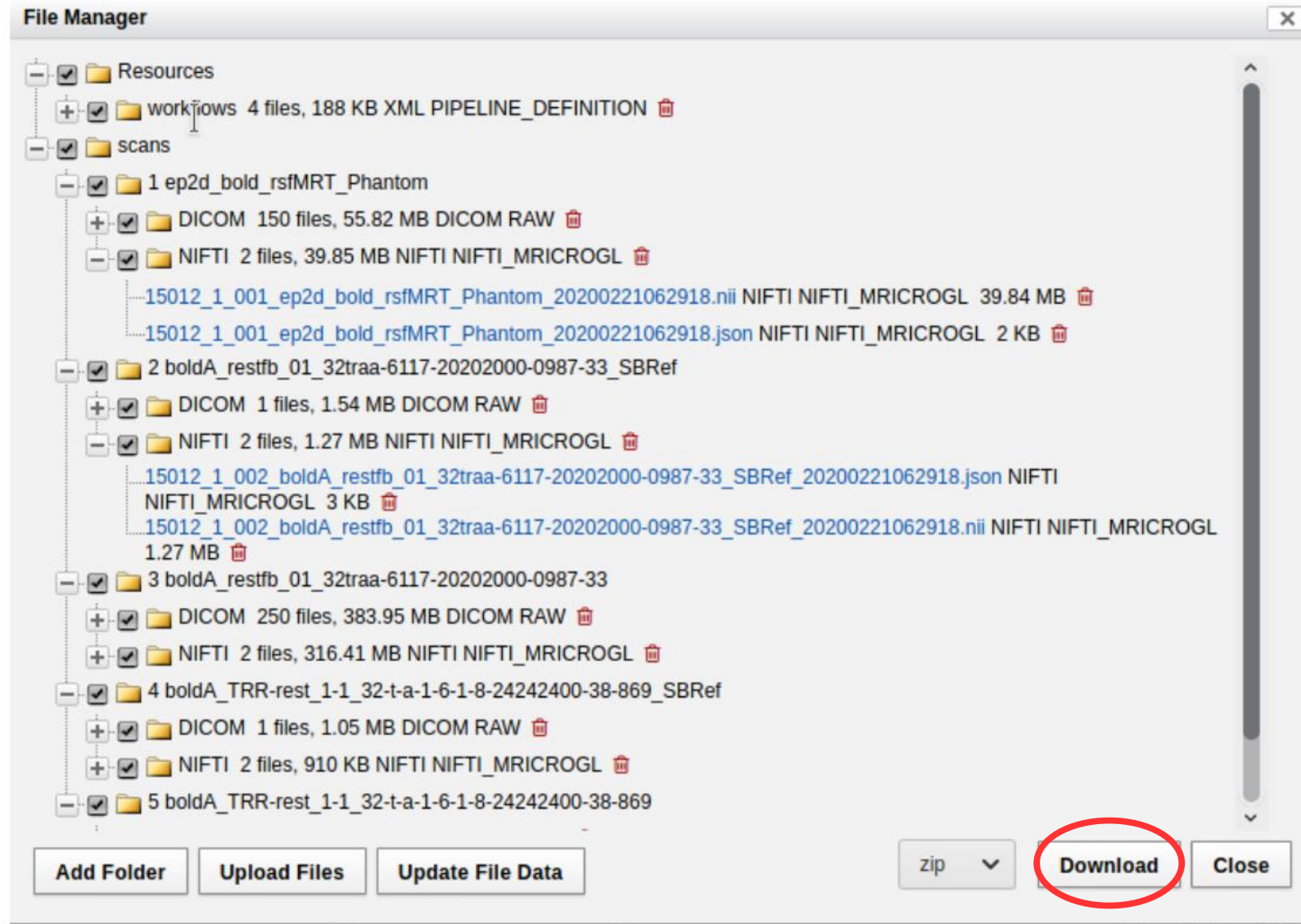
Scans

Bulk Actions: Download					
☐	Scan	Type	Series Desc	Usability	Files
☐	1	boldA_restfb_01_32traa-6117-20202000-0987-33_SBRef	boldA_restfb_01_32traa-6117-20202000-0987-33_SBRef	usable	2.8 MB in 3 files
☐	2	boldA_restfb_01_32traa-6117-20202000-0987-33	boldA_restfb_01_32traa-6117-20202000-0987-33	usable	30.7 MB in 20 files
☐	3	boldA_restfb_01_32traa-6117-20202000-0987-33_SBRef	boldA_restfb_01_32traa-6117-20202000-0987-33_SBRef	usable	1.5 MB in 1 files
☐	4	boldA_restfb_01_32traa-6117-20202000-0987-33	boldA_restfb_01_32traa-6117-20202000-0987-33	usable	10.7 MB in 7 files

Total: 45.8 MB in 31 files



Download Data



User rights management

Understanding User Roles and Permissions

By default, XNAT defines three common project roles: **Owners**, **Members**, and **Collaborators**. As a project owner, you have the ability to add specific users to your project within these roles. These users will then have the permissions associated with their defined role (which overrules the default accessibility permissions).

Role/Activity	Project Owners	Project Members	Project Collaborators
Create Data	C	C	
Read/Download Data	R	R	R
Update Data	U	U	
Delete Data	D		

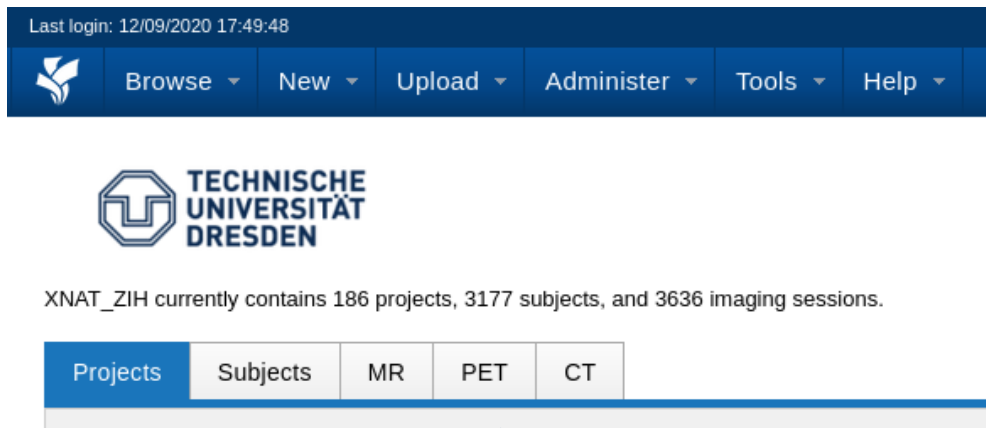
The "CRUD" model of permissions

- **Project Owners:** If you define additional project owners, they will have all of the permissions on your project that you do. They can read, insert, modify, and delete anything (and everything) associated with your project. They can also add additional users to your project and modify the data types associated with your project.
- **Project Members:** Members have the ability to manage the data in your project. They can read, insert, and modify subjects and experiments in your project. They cannot modify the project users and data types.
- **Project Collaborators:** Collaborators have read-only access on all of the data in your project. They cannot insert or modify data owned by your project. They can download your data and use it within their projects.

Outlook: Automatic MRI Data Preprocessing: NiCePy

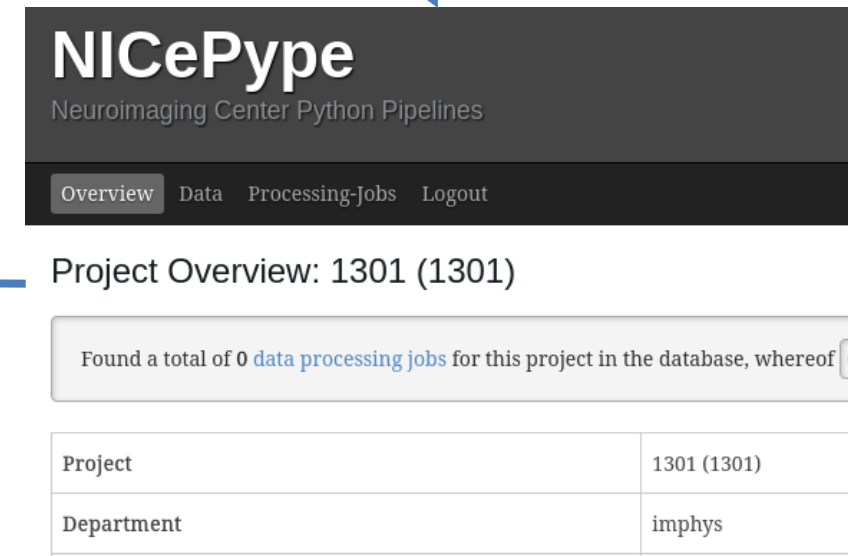
Currently under development for the TRR265

Specify required data
and evaluation
pipelines once only



Automatic download of
imaging data

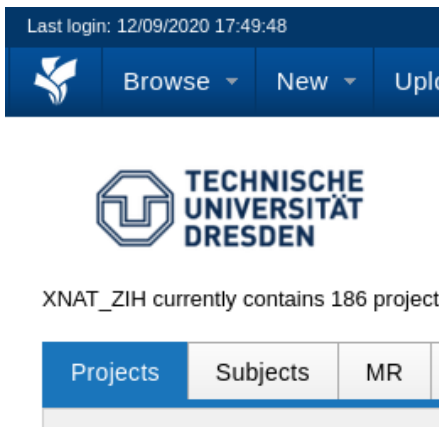
```
[10101|sst_1_2_61_3|MRC35396]  
dir_name=mannheim  
subject_regex=RecoTest  
fmri_magnitude_regex=bold\S*SST  
fmri_magnitude_frames=200  
fieldmap_magnitude_regex=fmapA\S*  
fieldmap_phase_regex=fmapA\S*
```



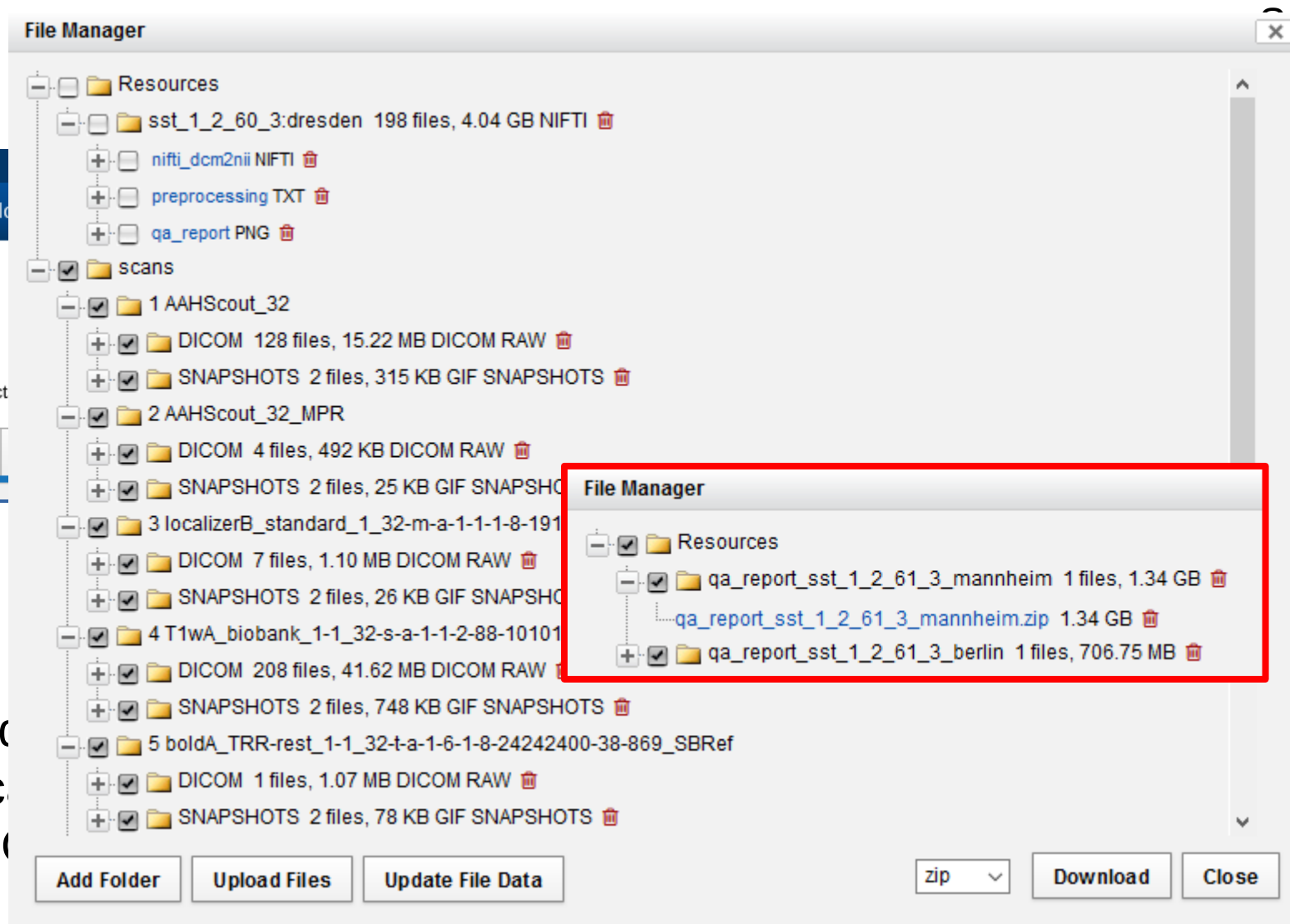
Processed data will be
automatically uploaded,
including QA

Outlook: Automatic MRI Data Preprocessing: NiCePyte

Currently under



Processed
automatic
including



Specify required data
and evaluation
pipelines once only

```
[sst_1_2_61_3|MRC35396]  
me=mannheim  
t_regex=RecoTest  
magnitude_regex=bold\S*SST  
magnitude_frames=200  
ap_magnitude_regex=fmapA\S*  
ap_phase_regex=fmapA\S*
```

Project in the database, whereof	
	1301 (1301)
	imphys

Thank you

Ressources

Contact: sfb940-inf@groups.tu-dresden.de
mrphysik@msx.tu-dresden.de

NIC homepage:
<https://nic-tud.de/research/ressourcen/>

XNAT webpage:
<https://xnat.zih.tu-dresden.de>

Select „TU Dresden“ as Login and use your
ZIH Login

