

NeuroLOG: software technologies for integration of processes, data and knowledge in neurosciences



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on behalf of the NeuroLOG consortium



CrEDIBLE workshop
Sophia Antipolis, October 15th, 2012

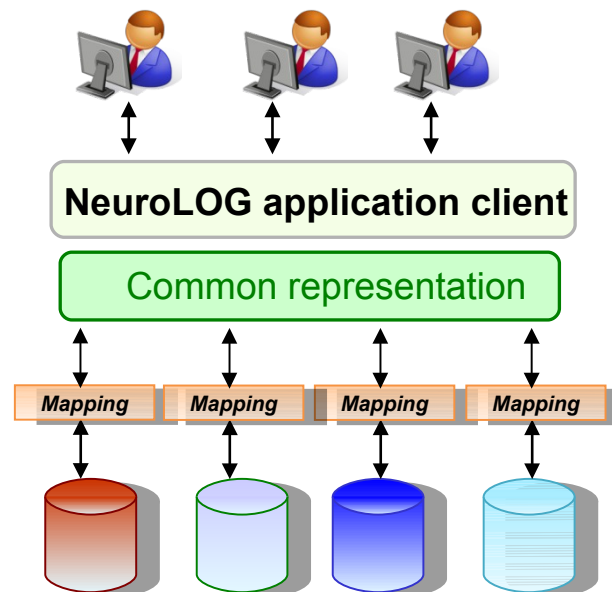


- **Data federation approach**

- Preserve legacy environment (e.g. relational databases)
- Cope with heterogenous schemas
- Implement data mediation and federation

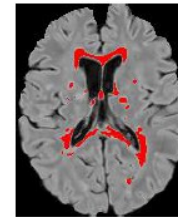
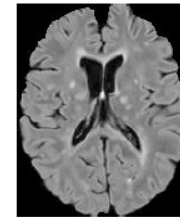
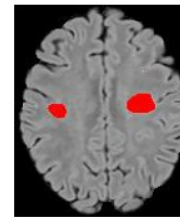
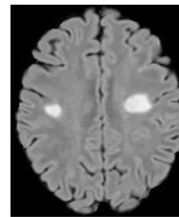
- **Technological investigation**

- Experimenting both relational and semantics technologies, using the same data sources

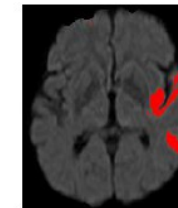
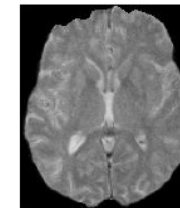
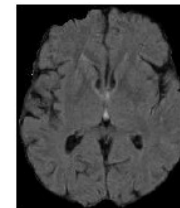
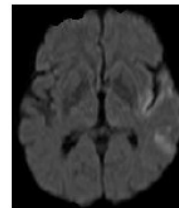


- **Pathologies**

- Multiple Sclerosis
- Brain strokes
- Brain tumors
- Alzheimer's



MS



Stroke

- **Data considered**

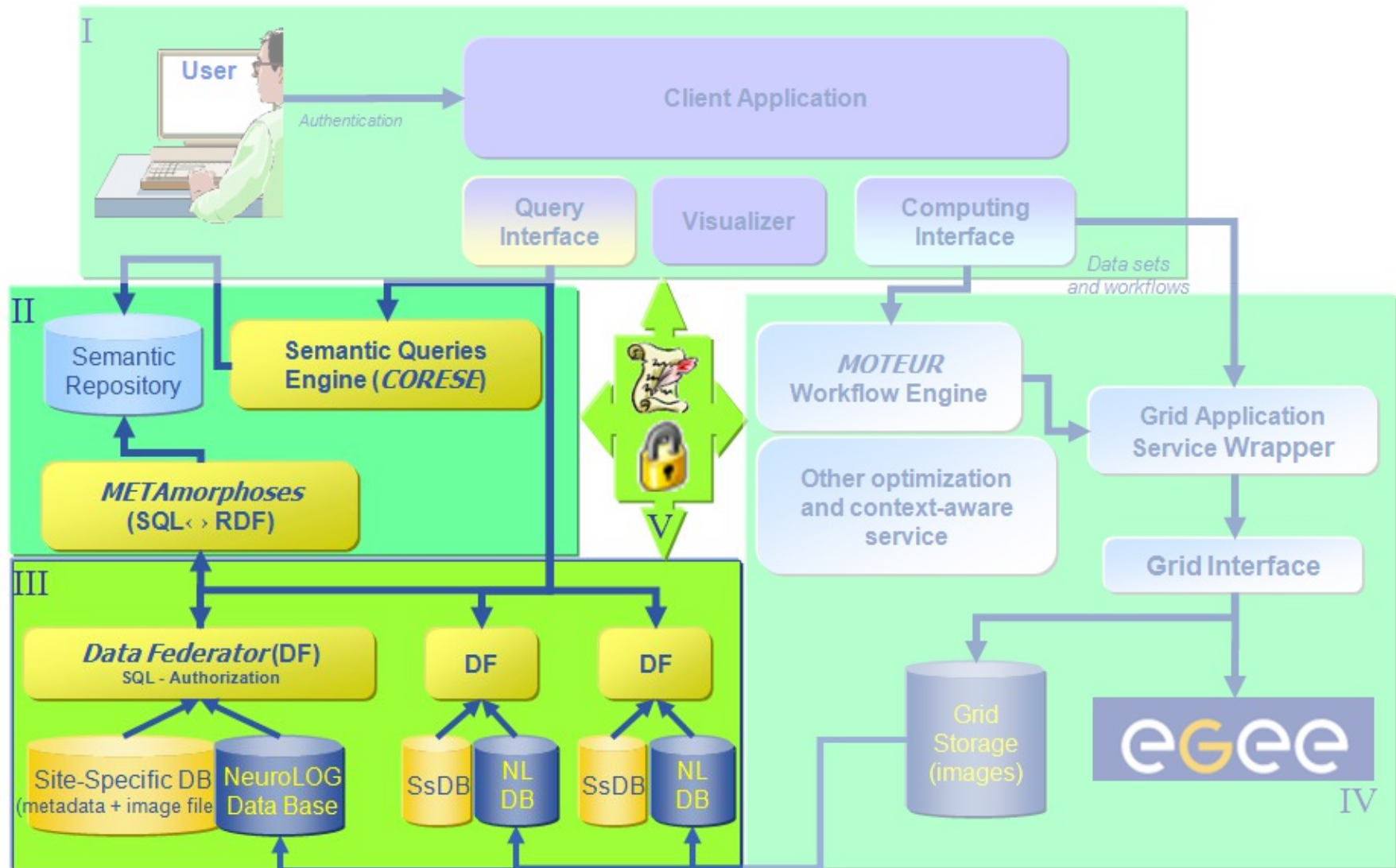
- Imaging data
 - Various MR modalities (T1, T1 Gado, T2, Flair, Diffusion, PD)
 - Processed images (Registered, Segmented, ...)
- Associated metadata
 - Studies
 - Subjects
 - Data acquisition context and provenance
 - Neurophysiological and Neuroclinical tests
 - Measurements derived from image data

Software technologies for integration of process, data and knowledge in medical imaging



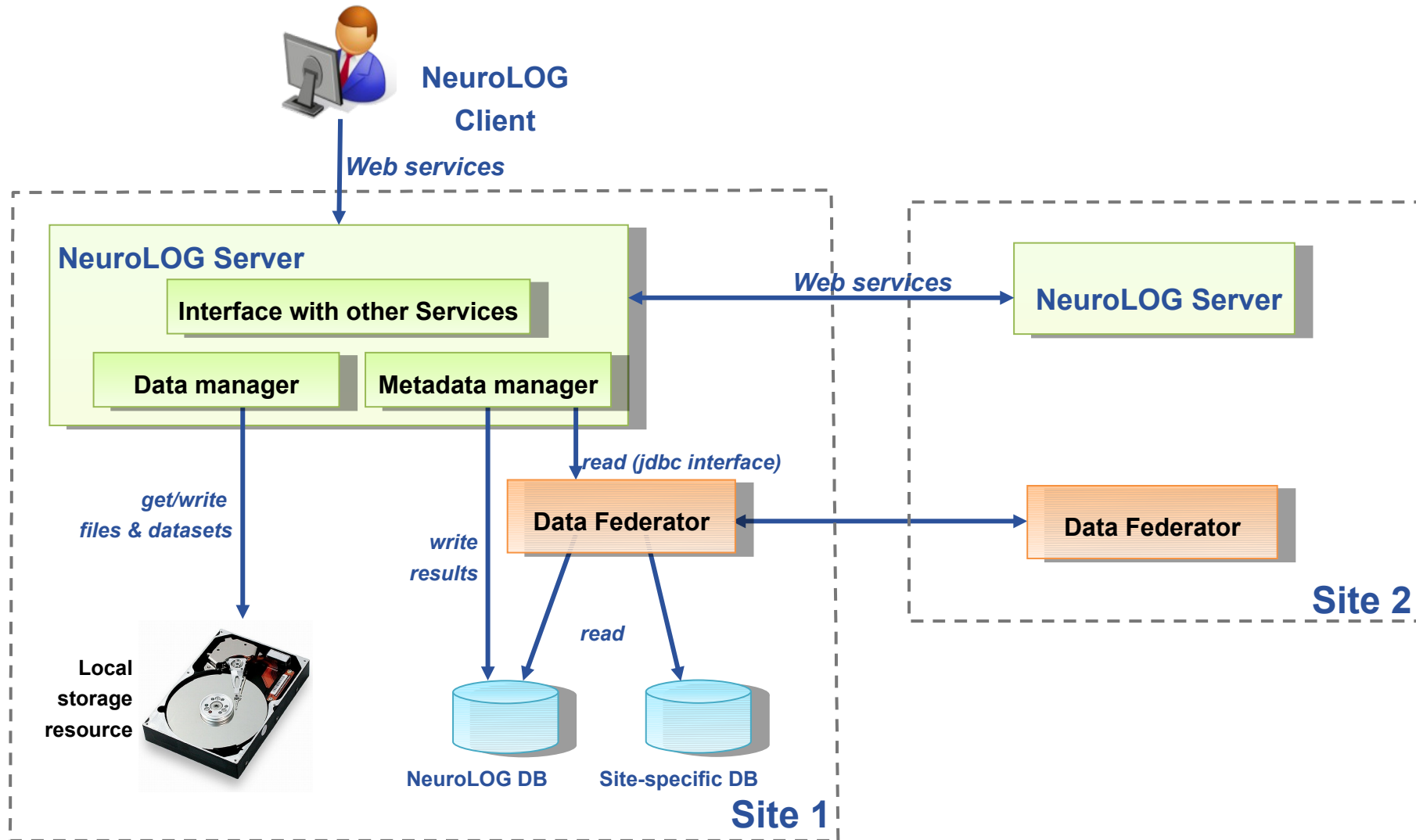
- **5 sites federated**
 - I3S (Sophia Antipolis) core technical site
 - IRISA (INRIA Rennes), collaborating with the University Hospital of Rennes
 - IFR49 (INSERM affiliated neuroscience group in Paris La Pitié Salpêtrière Hospital)
 - GIN (INSERM affiliated neurosciences institute of Grenoble, Michalon Hospital)
 - INRIA Sophia Antipolis collaborating with Centre Antoine Lacassagne (Nice)
- **Clients connect from anywhere**

Software technologies for integration of process, data and knowledge in medical imaging

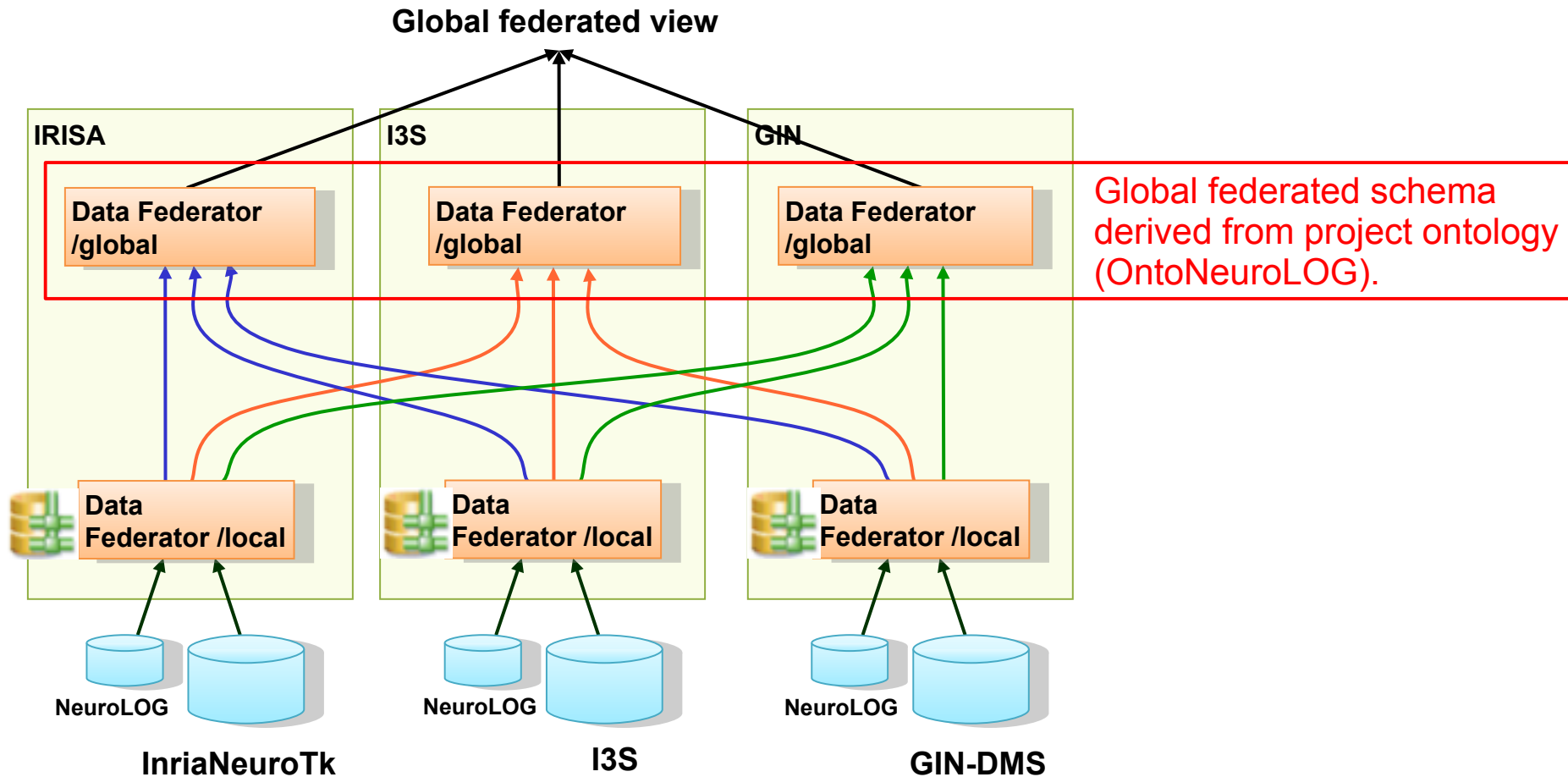


NeuroLOG Data & Metadata management design

Software technologies for integration of process, data and knowledge in medical imaging

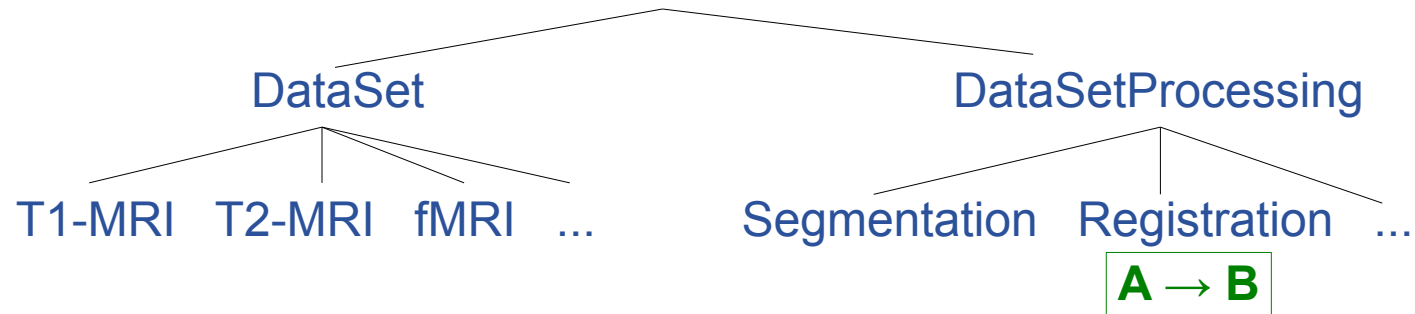


- **Data Federator: relational data mapping and federation tool (Business Object / SAP)**



- **Application ontology (called OntoNeuroLOG)**
 - Based on a common modelling framework
 - 3-level structure
 - one Foundational ontology: i.e. DOLCE
 - Several Core ontologies
 - Several Domain ontologies
- **Major concerns**
 - Re-use of existing ontologies (when applicable)
 - Documentation
- **Implemented in OWL-Lite**
- **Derived relational schma**

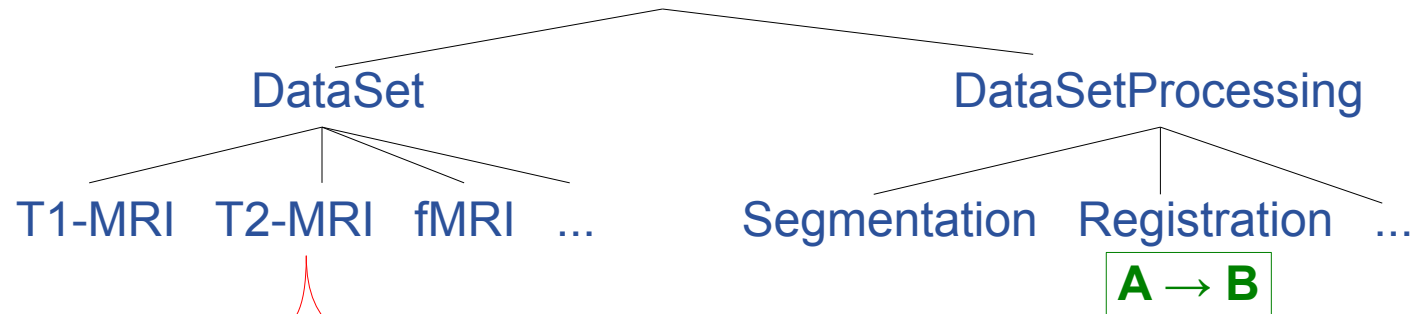
- **Ontology**
 - Concepts & **Rules**



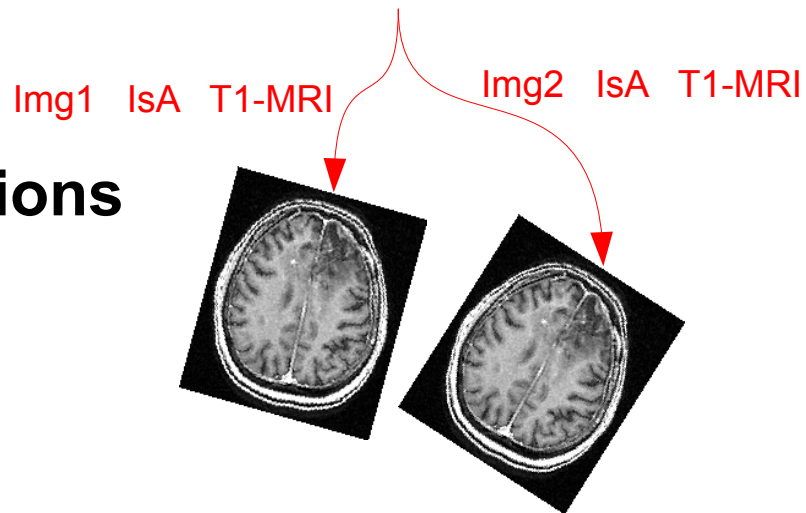
- **Annotations**

- **Processing**

- **Ontology**
 - Concepts & **Rules**



- **Annotations**



- **Processing**

- **Ontology**
 - Concepts & **Rules**



- **Annotations**

Img1 IsA T1-MRI

Img2 IsA T1-MRI

- **Processing**

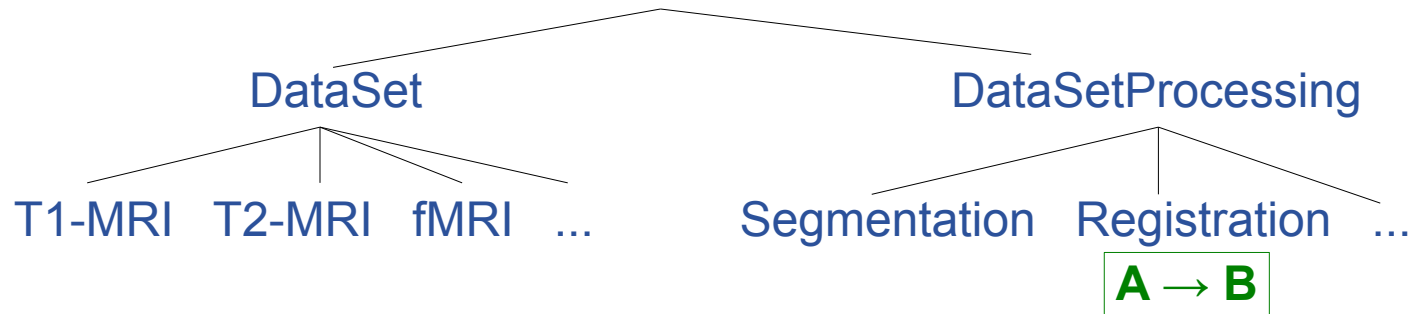
Tool1 HasInput T1-MRI

Tool1 IsA Registration

A → B

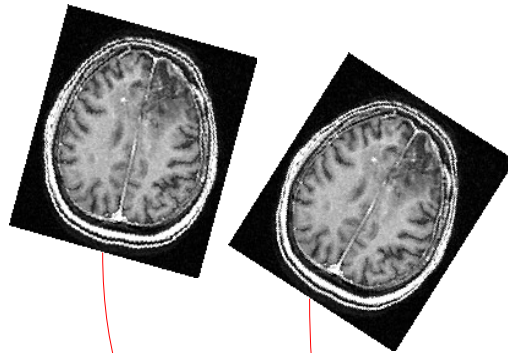
Tool1 HasOutput Transfo

- **Ontology**
 - Concepts & **Rules**



- **Annotations**

Img1 IsA T1-MRI
Img2 IsA T1-MRI



Tool1 HasInput T1-MRI
Tool1 HasOutput Transfo
Tool1 IsA Registration



- **Processing**

Img1 IsProcessedBy Tool1
Img2 IsProcessedBy Tool1



Tool1 Produced Transfo1
Transfo1 IsA GlobalTransfo

- **Use of a commercial data federation tool**
 - Strong stopper for new comers
 - Caused platform stop after the end of the project
 - Need an open-source solution
- **Limited impact of the platform**
 - Prototype platform, now stopped
 - ANR grant renewal failed (Health Technologies call)
 - Non-trivial user interface to be defined to query the federation
- **Data federation feasibility**
 - Need to cope with site failures
 - Data access control is a tough problem
 - Evolutions of the ontology / federation schema are very costly
- **Source data sets integration**
 - Costly data importation process (data documentation and curation phases)

- **Readiness to adopt semantic data**
 - Semantic query language is foreign to users
 - Inference capabilities are not well-understood
 - Can native semantic data be used or is it necessarily derived from legacy relational databases?
- **What ontologies to use?**
 - And what foundational ontology to derive from?