@neurIST Architecture Overview

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aneurIST
Integrated biomedical informatics for the management of cerebral aneurysms

Fraunhofer Institute
Algorithms and
Scientific Computing
SCAI

Short overview

Project coordinator:
Universitat Pompeu Fabra
Contact person:
Dr.Alejandro Frangi

Timetable: from 01/06 – to 12/09
Total cost: € 17.356.730,92
EC funding: € 12.605.239
Instrument: IP
Project Identifier: IST-2004-027703

- **Partners:**
- Universitat Pompeu Fab – Grid Systems S.A. - Neuroangiografia Terapèutica S.A. - Hospital Clínic iProvincial de Barcelona (ES)
- University of Geneva – Ecole Polytechnique Federale de Lausanne (CH)
- The University of Sheffield - ANSYS Europe Ltd - NEC Europe Ltd. - University of Oxford Cancer Research - InferMed Ltd - University of Luton (UK)
- Fraunhofer Institute - Institute for Algorithms and Scientific Computing - Simulation & Design GmbH – Universitätsklinikum Freiburg (DE)
- Utrecht University Medical Center - Philips Medical Systems B.V. - Erasmus Medical Center (NL)
- Super Computing Solution s.r.l. (IT)
- Royal Institute of Technology (SE)
- ASD Advanced William Cook Europe ApS (DK)
- Institut National de la Sante et la recherche Medicale (FR)
- DAC Ireland Ltd (IE)
- Medical University of Pécs (HU)
- Universität Wien (AT)

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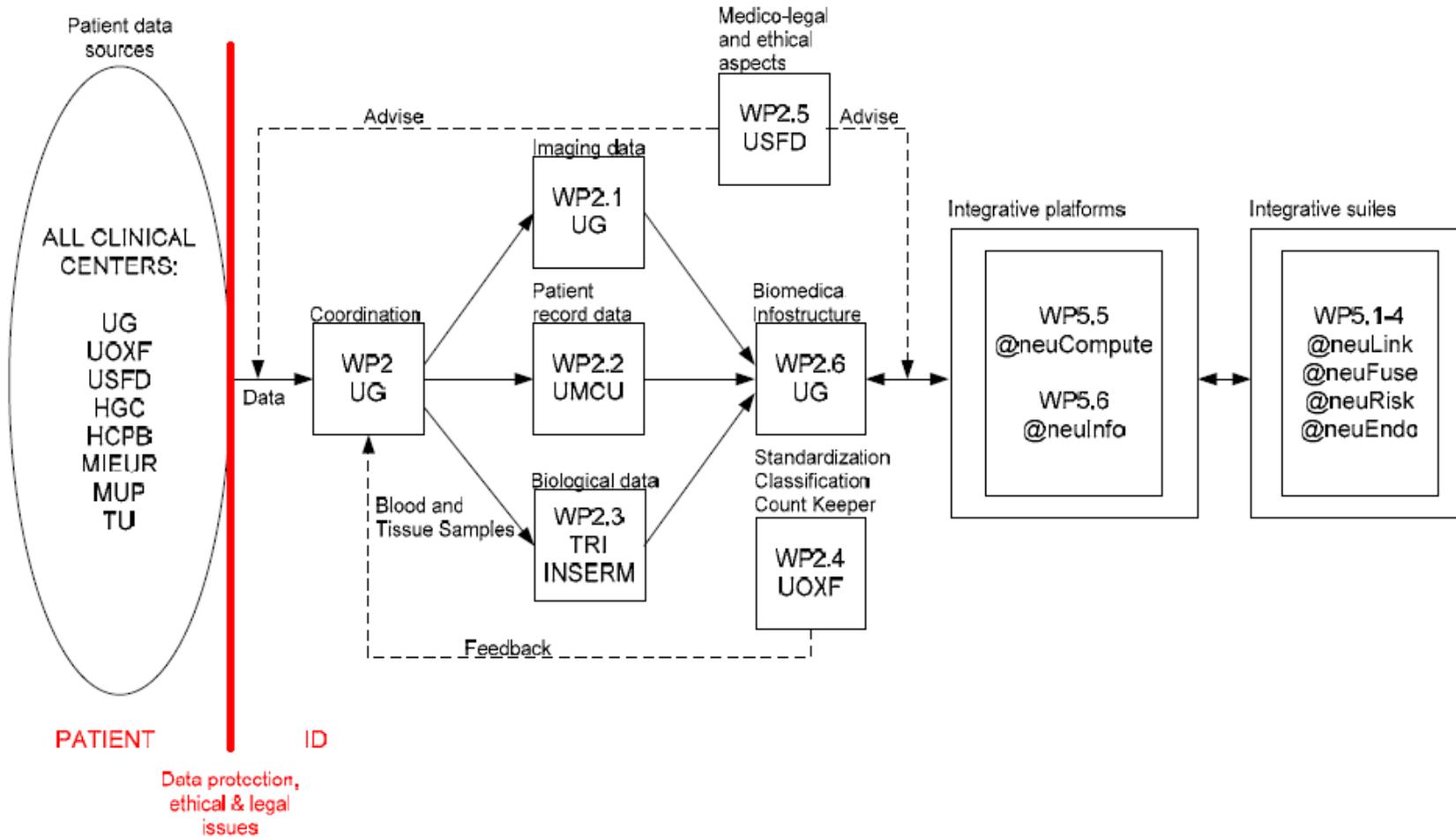Algorithms and
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Objectives of Project

- Each year 3 million women and 2.5 million men die from strokes worldwide. Hemorrhagic stroke occurs when a blood vessel, typically an aneurysm, bursts inside the brain.This often leads to severe disabilities or death. Despite considerable advances in treatment, when such ruptures occur, morbidity and mortality is exceptionally high (about 33% each). Currently treatment of cerebral aneurysm is offered to almost all patients because there is insufficient evidence to support a non-intervention decision.

- The basic thesis of @neurIST is that the process of cerebral aneurysm diagnosis, treatment planning and treatment development is compromised by the fragmentation of relevant data.

- To address this problem, @neurIST will develop an *IT infrastructure for the management and processing of heterogeneous data associated with the diagnosis and treatment of cerebral aneurysm and subarachnoid haemorrhage*. The data that will be considered ranges from the molecular level, to cellular, tissue, organ, and patient level and finally to the population level.

- @neurIST will transform the management of cerebral aneurysm by providing new insight, personalised risk assessment and methods for the design of improved medical devices and treatment protocols.

Data flow

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Application packages (Integrative suites)

- *@neuLink* will create an IT environment for the identification of genes associated with the disease and for the integrated analysis of genetic epidemiology and clinical data.

- *@neuFuse* will provide an open source environment to fuse diagnostic and modelling data into a coherent representation of the patient's condition.

- *@neuRisk* will produce a personalised risk assessment by integrating all available information.

- *@neuEndo* will deliver an innovative IT system to support the design of implantable devices and intervention planning by simulation of the structural, haemodynamic and biological response to intervention.

Integrative platforms

- **@neuInfo** will enable access to clinical and epidemiological data distributed in public and project-specific protected databases. It provides complex data querying and mediation functionality for the @neurIST Grid infrastructure. Different data sources can be searched using a query user interface providing a semantically unified view on an abstract data model that is linked to the actual physical data sources, allowing direct navigation through application specific knowledge domains like risk assessment, epidemiology and case history.

- **@neuCompute** will provide @neurIST with distributed computing capabilities ensuring secure data transport. This integration of computing resources will support computationally demanding tasks such as complex modelling and simulation demanded by the integrative suites @neuRisk, @neuLink, @neuEndo and @neuFuse. A focus will be placed on interoperability and integration, leveraging on existing technologies.

Architecture I
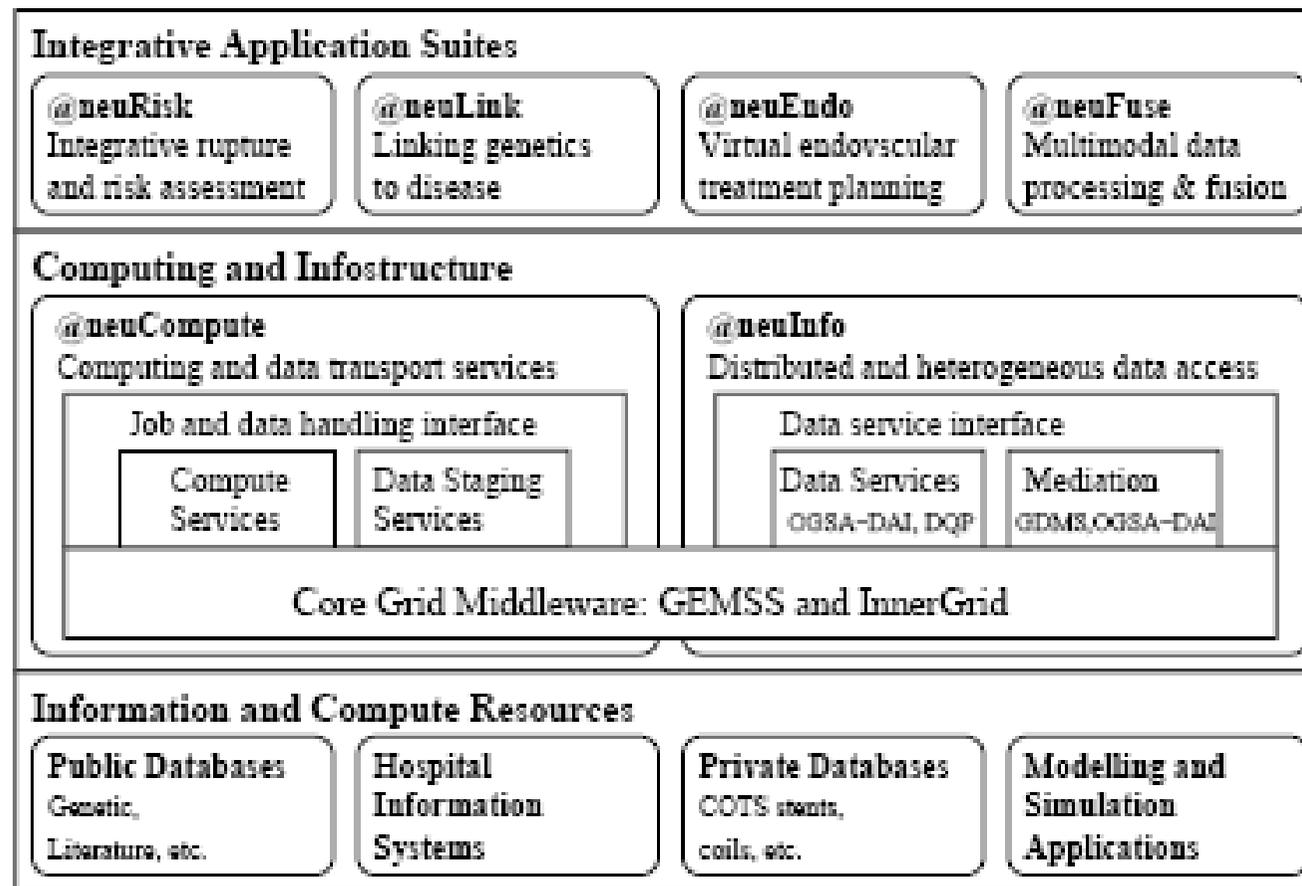
Overview of @neurIST Infrastructure.

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The central role of Global semantics

- **Clinical Medicine**
  - **patient-related data**
- **Molecular Biology**
  - **from public databases**
- **Diseases**
  - **from UMLS**
- **Risk factors**
  - **Draws on Diseases, Clinical Medicine and Molecular Biology**
- **Epidemiology**
  - **from findings and public databases**
- **Simulations**
  - **computed**