A WORLDWIDE E-INFRASTRUCTURE FOR COMPUTATIONAL NEUROSCIENTISTS

2010-06-09 Healthgrid Conference 2010
Paris, France

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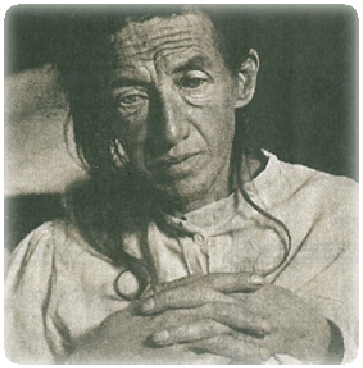
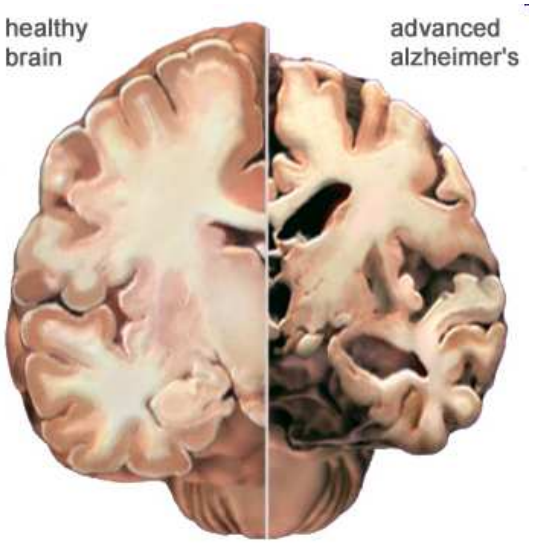
Neuroscience for Alzheimer Disease



Alzheimer's disease is a brain disorder named for German physician Alois Alzheimer, who first described it in 1906.

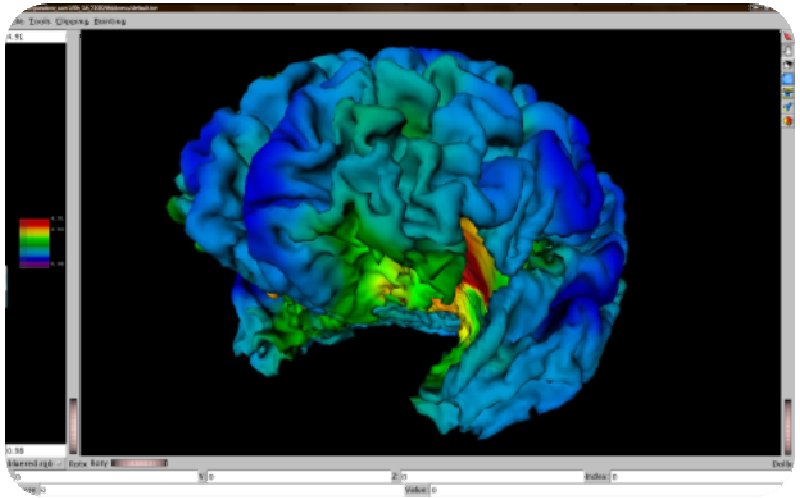


Is a progressive and fatal brain disease

Is the most common form of dementia

Has no current cure

Neuroscience for Alzheimer Disease



The scientific challenge
To find a **reliable biomarker** for monitoring the **progression of the disease**

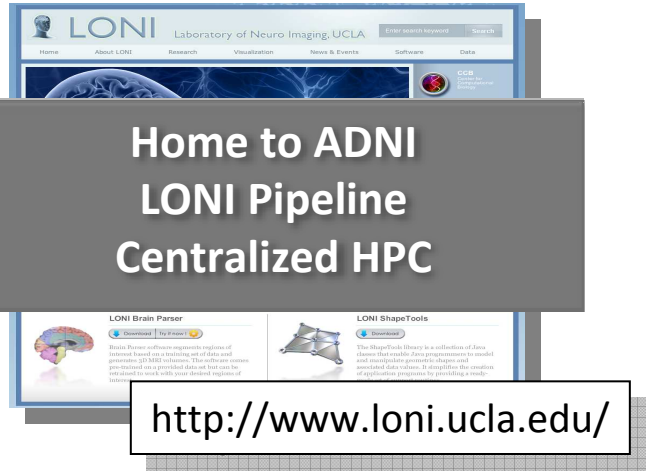
A promising candidate
Cortical thickness

Methods
Analysis of **MRI images** of the brain using sophisticated computing algorithms able to extract the cortical thickness

The issue
Computational intensive analysis – **COMPUTING RESOURCES**
Statistical power – **LARGE DATA SET**
Tools for info extraction - **ALGORITHMS**

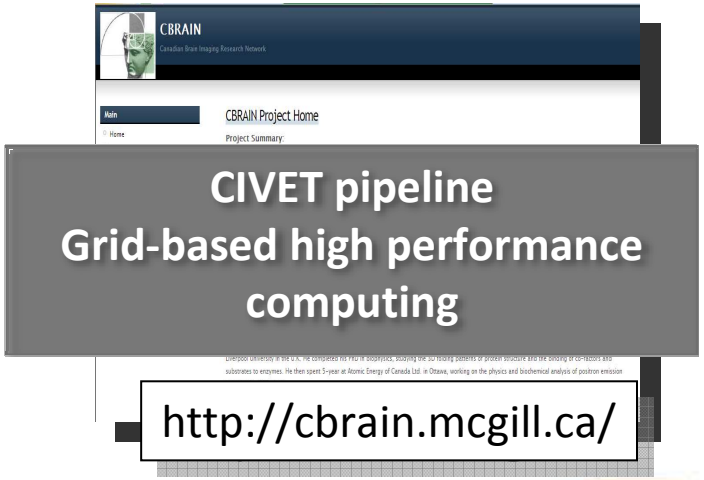
Not “only” Alzheimer

To promote interoperability among three e-infrastructures for computational **neuroscience** to converge into one unique worldwide facility



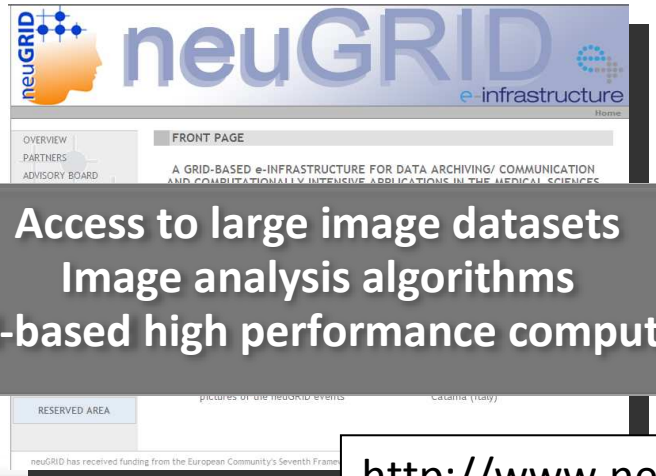
Home to ADNI
LONI Pipeline
Centralized HPC

http://www.loni.ucla.edu/



CIVET pipeline
Grid-based high performance computing

http://cbrain.mcgill.ca/



Access to large image datasets
Image analysis algorithms
Grid-based high performance computing

http://www.neuGRID.eu/

The Consortium

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Objectives

Define activities and outline technical specifications

Foster the maximum possible degree of interoperability among the 3 infrastructures

Lay the foundations for a larger effort to achieve full interoperability

Implementation

WP1 - Requirements alignment

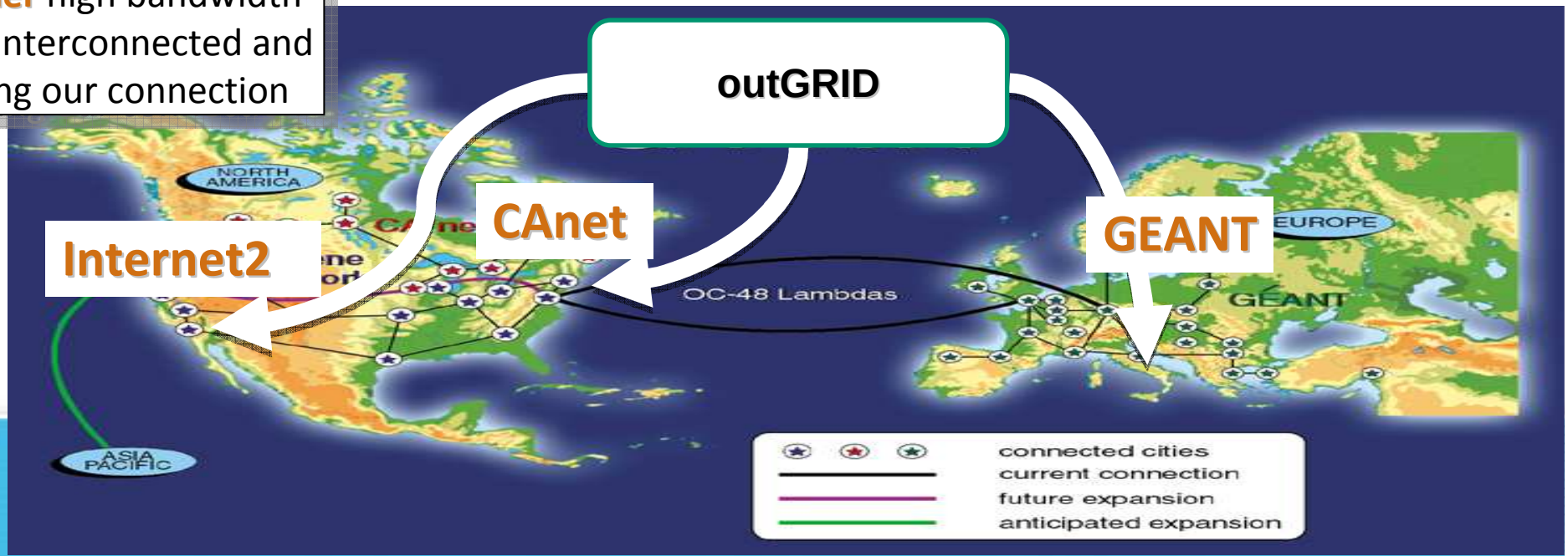
WP2 - Estimate integration effort and promote interoperability

WP3 - Dissemination

WP4 - Affect policy making

WP5 will manage the whole project

key enabler high bandwidth networks interconnected and supporting our connection



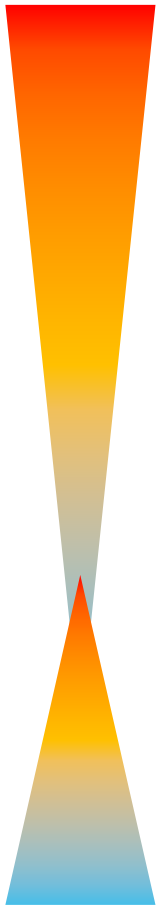
Interoperability Definition

http://en.wikipedia.org/wiki/Interoperability

In outGRID, interoperability is defined at two levels

Syntactic Interoperability is required for infrastructures to communicate and understand each others

Semantic Interoperability refers to the understanding and treatment of exchanged data



Base Communication
- Physical
- Network
- Security
- Infrastructure

Data Exchange
- Data Backend
- Metadata
- Backend

Control Exchange
- Resource
- Management

Data Semantic
- Metadata
- Structure
- Provenance
- Structure

Control Semantic
- Workflow
- Management

Visual Semantic
- Graphical User
- Interfaces

Interoperability – Preliminary Synthesis

Similarities

Syntactic

- Virtually running on the same network
- All use Distributed Computing Infrastructures (DCI)
- Data exchange protocols and standards are compatible
- Control exchange protocols and standards are compatible

Semantic

- Software architectures are compatible (all based on Component & Connector paradigm)
- Data (files) storage structure/standards are compatible
- Graphical user interfaces are compatible (mix of JAVA and Web technologies)

Differences

Syntactic

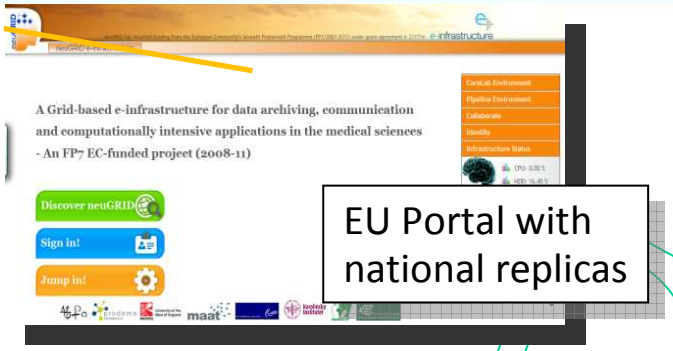
- Security infrastructures have to be aligned

Semantic

- File metadata structures/standards are specific/ad-hoc (except LORIS stuff)
- Provenance data structures/standards are specific/ad-hoc
- Resource management layers are different (some use abstraction standards)
- Workflow specification/execution formats are different (some use standards)

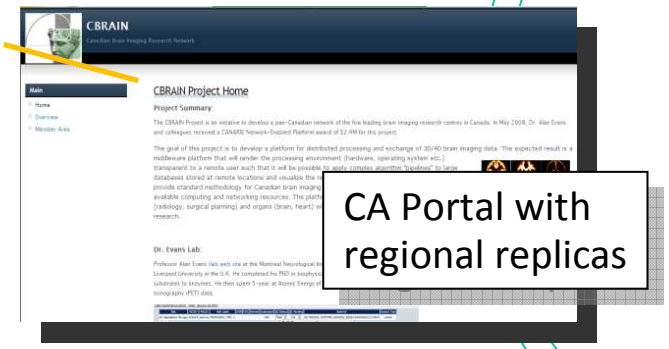
Infrastructures
International Portfolio

neuGRID Community



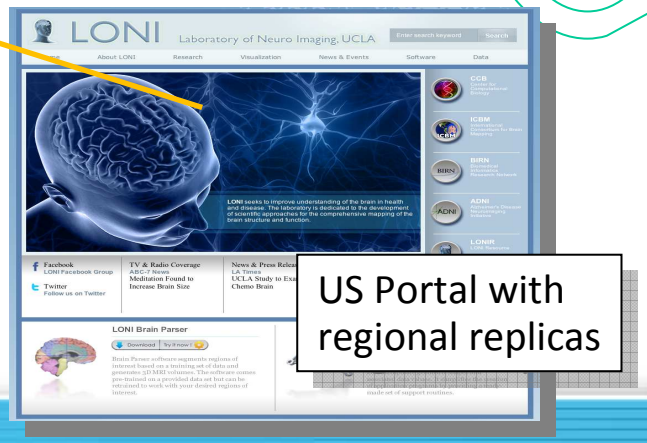
EU Portal with national replicas

CBRAIN Community



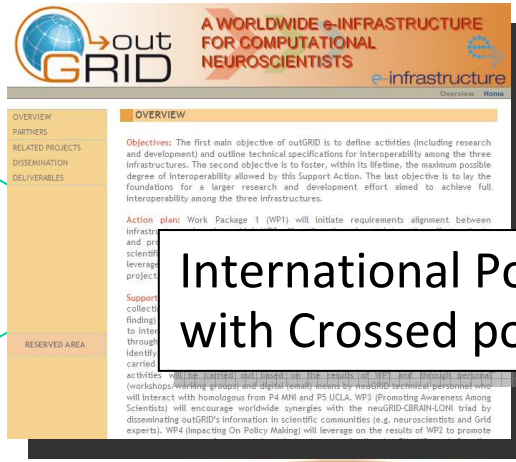
CA Portal with regional replicas

LONI Community



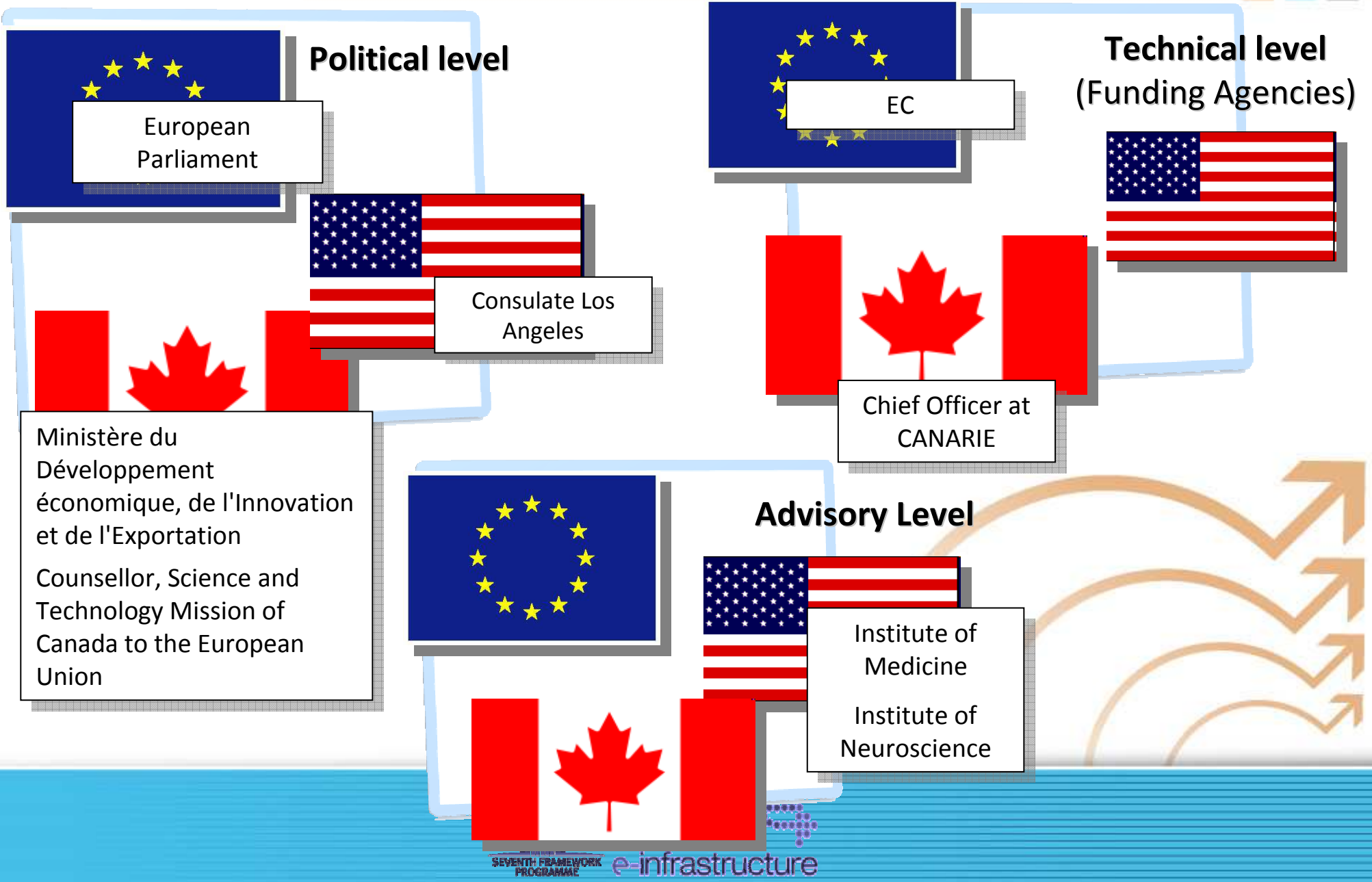
US Portal with regional replicas

Filtered Portfolio according to agreements and interoperability level



International Portal with Crossed portfolios

Political Contacts



Expected Impact

1. Lead to a **Worldwide e-Infrastructure** integrating the best from recognized facilities in the field
2. Pioneer a **global network** for and made of top **neuroscientists**
3. **Impact** and **drive** ongoing developments of three International and leading initiatives
4. Exemplify convergence and exercise interoperability of e-Infrastructures **ultimately encouraging others**

Interoperability cookbook

Delivered public to the community to examplify such a convergence between e-infrastructure

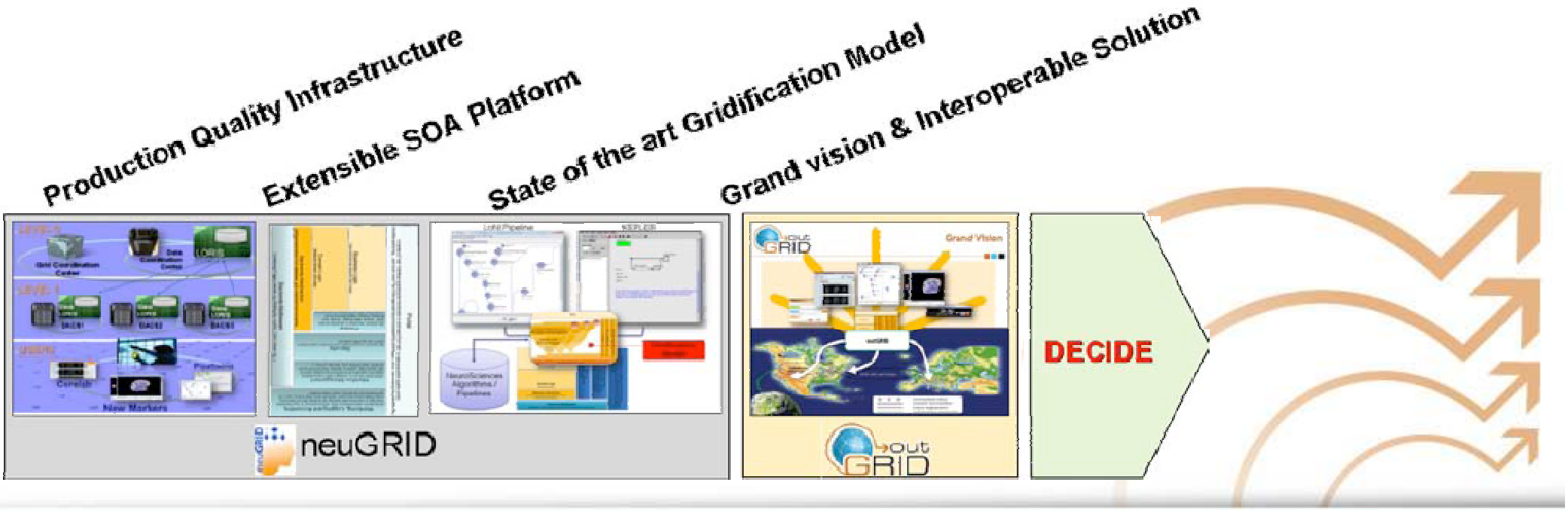
A WORLDWIDE E-INFRASTRUCTURE FOR COMPUTATIONAL NEUROSCIENTISTS

What's coming next?

EU FP7 - DECIDE

DECIDE - Diagnostic Enhancement of Confidence by an International Distributed Environment

DECIDE aims to design, implement, and validate a Grid based e-Infrastructure relying on the Pan-European backbone GEANT and the NRENs. Over this e-Infrastructure, a service will be provided for the computer-aided extraction of diagnostic disease markers for Alzheimer's disease and schizophrenia from medical images.



CA NEP2 - GBRAIN

GBRAIN - Global Brain Imaging Research Network

Description: McGill will develop a high-bandwidth international network to connect brain researchers from around the world. This network will allow real-time, joint exploration of large brain datasets, resulting in improved medical research in Canada and abroad.

canarie

Canada's Advanced Research and Innovation Network
Le réseau évolué de recherche et d'innovation du Canada

FACTS AND CONTACTS

FACTS

Start date: 01.11.2009
Duration: 24 months
Funding from the EC: € 440.000
Web site: www.outGRID.eu

CONTACTS

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THANK YOU!

This project has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement n°246690