



BING: The Portuguese Brain Imaging Network Grid

*João Paulo CUNHA, Ilídio OLIVEIRA, José M. FERNANDES, António SOUSA PEREIRA -
Dep. of Electronics, Telecom. and Informatics / IEETA, University of Aveiro, Portugal*

Aurélio CAMPILHO - Fac. of Engineering and INEB, University of Porto, Portugal

Miguel CASTELO-BRANCO - IBILI, University of Coimbra, Portugal

Nuno SOUSA - Dep. of Health Sciences, University of Minho, Portugal

Outline

1. Where we come from: IEETA / Univ. de Aveiro
2. Brain Imaging
3. What Grids can do ?
4. The BING – Brain Imaging Network Grid

Objectives

Method (how to convince politics ;-)

Topology and Architecture

Actual state and future plans

University of Aveiro

- Established in 1973
- Bac. In Telecom. – 1st graduate course
- Modern Campus (~900.000 m², 40 buildings)
- ~12 500 students; ~900 Teachers
- Member of ECIU – Euro. Cons. Of Innovative Universities
- www.ua.pt



Dep. Electronics, Telecom. & Informatics

- ~60 PhDs
- Grad., MSc. and Ph.D. in Electronics, Telecom, Informatics.
- Close related to Industry, (PTelecom, Siemens Comm...)
- Several spin-off companies (Microl/O, BioDevices...)
- Two interface Institutes: IT and **IEETA**
- www.det.ua.pt



IEETA-Resources

- Located in the campus of the University of Aveiro

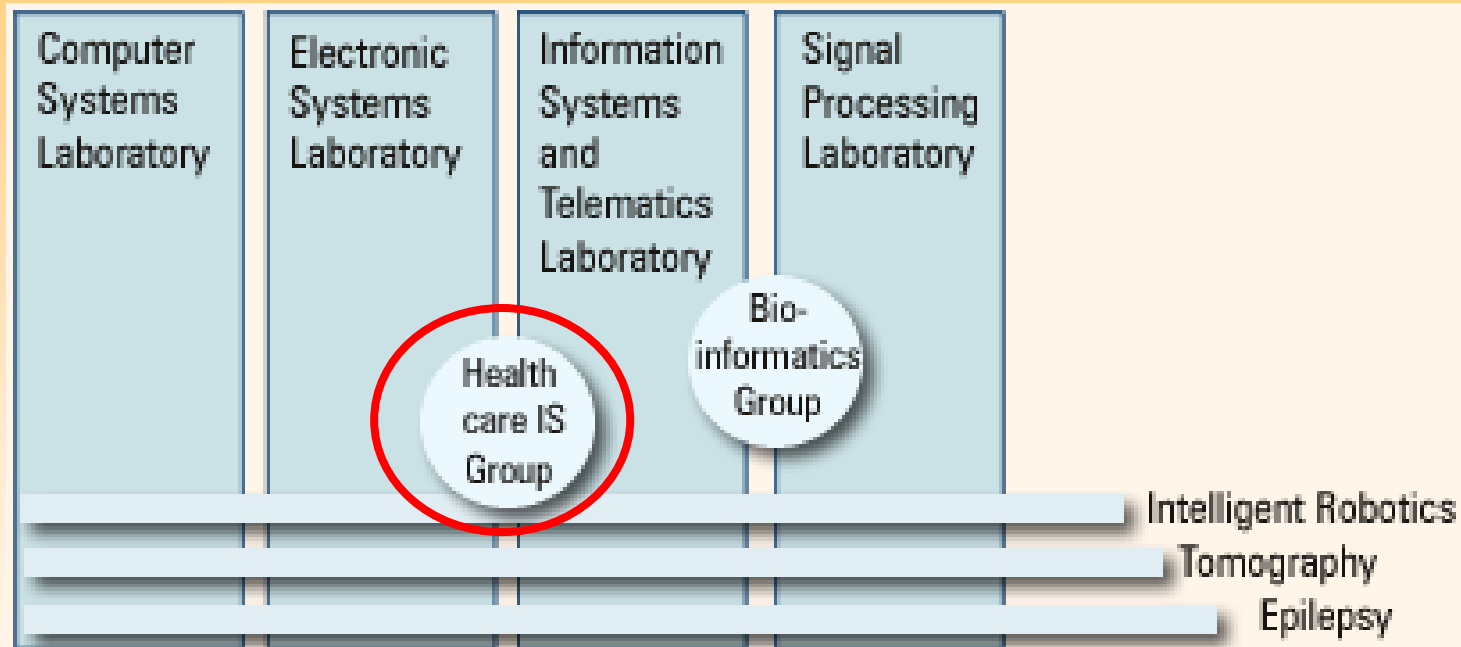


- Human Resources: ~100 people; ~40 PhDs, ~30 PhD students, ~20 MSc students, ~10 Research grants, 5 adm. staff
- Fundamental and applied R&D in Electronics and Telematics (Biomedical has been major target)
- Several Scientific Prizes:
 - IBM Award (2)
 - EFNM - "Marie Curry Prize"
 - EUREPA – European Epilepsy Accademy
 - LPCE - "Tecnifar Prize"(2)
 - etc.

www.ieeta.pt



IEETA-Organização e actividades





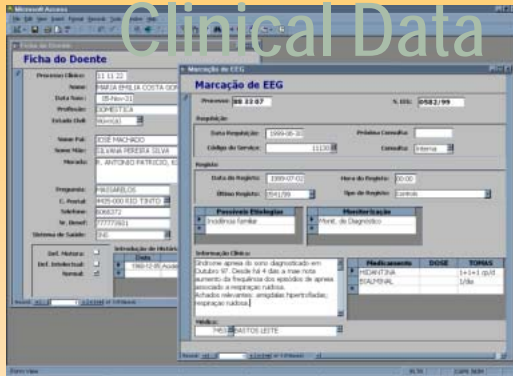
... coming back to the theme...

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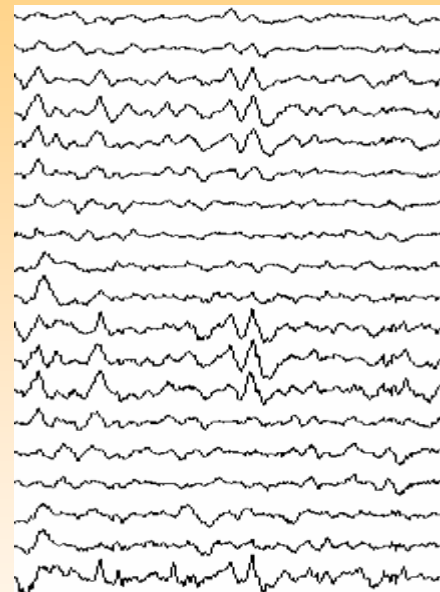


Brain Imaging: Multimodal and multimedia

Clinical Data



Bio-sinais (21 – 128 canais)
(EEG, ECG, etc.)



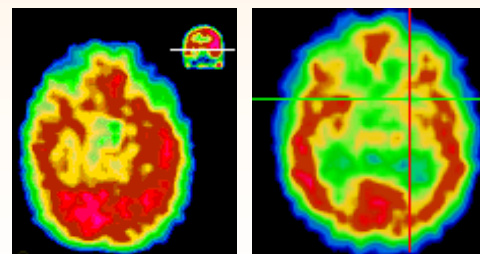
Video



Rad

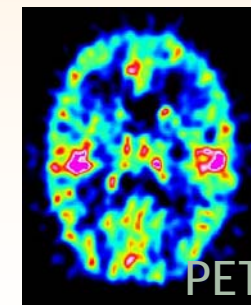


SPECT

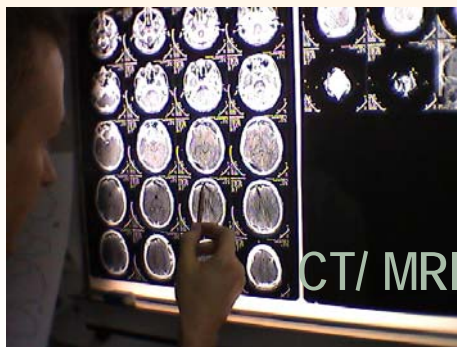


Ictal

Interictal

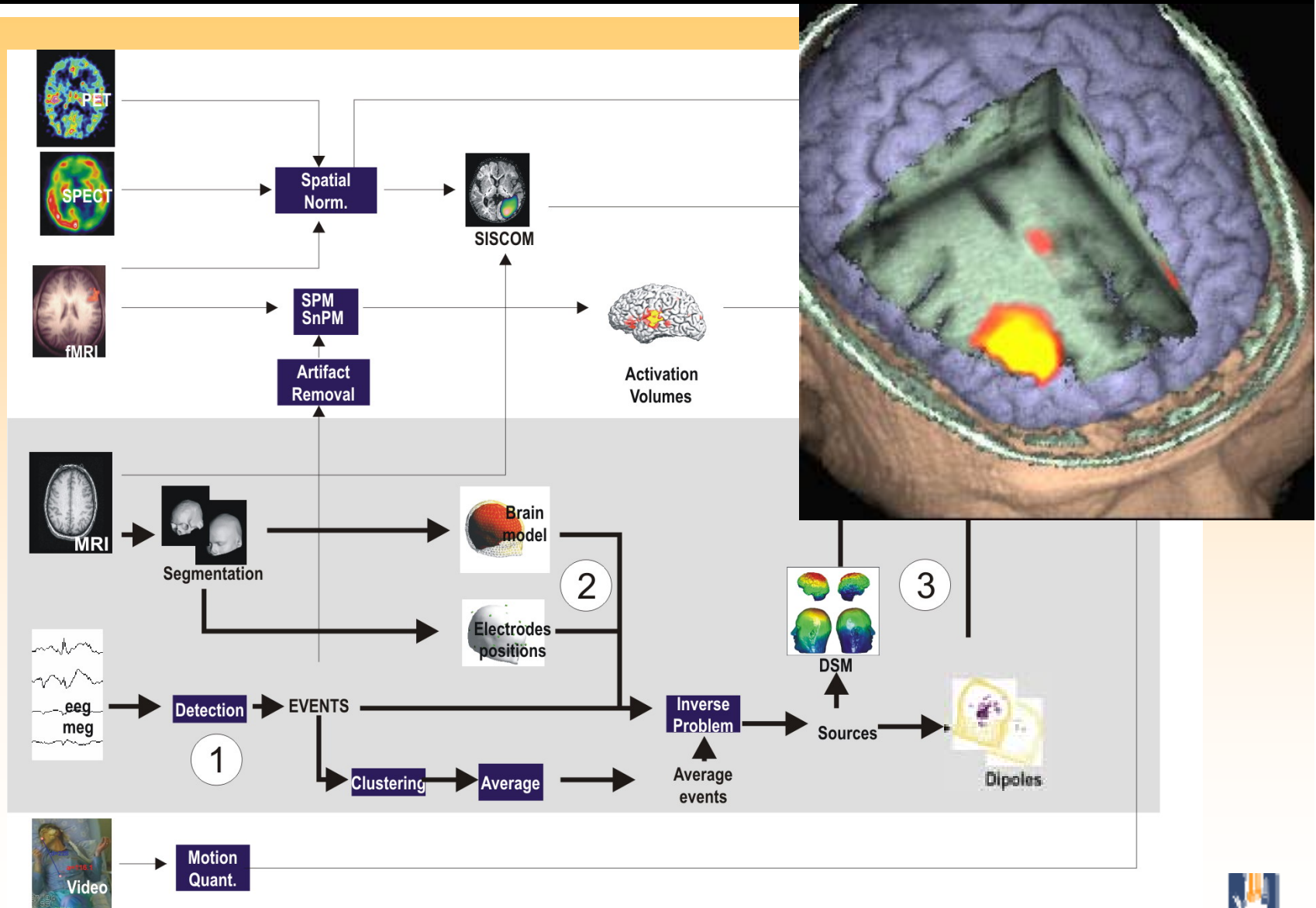


PET



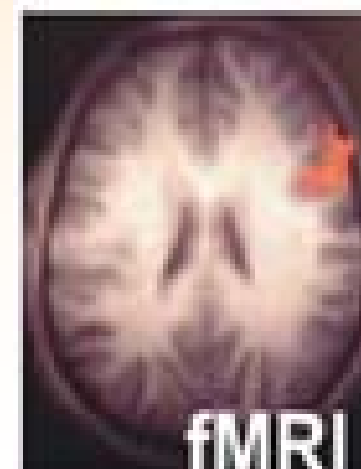
CT/ MRI

Brain Imaging – Data Fusion

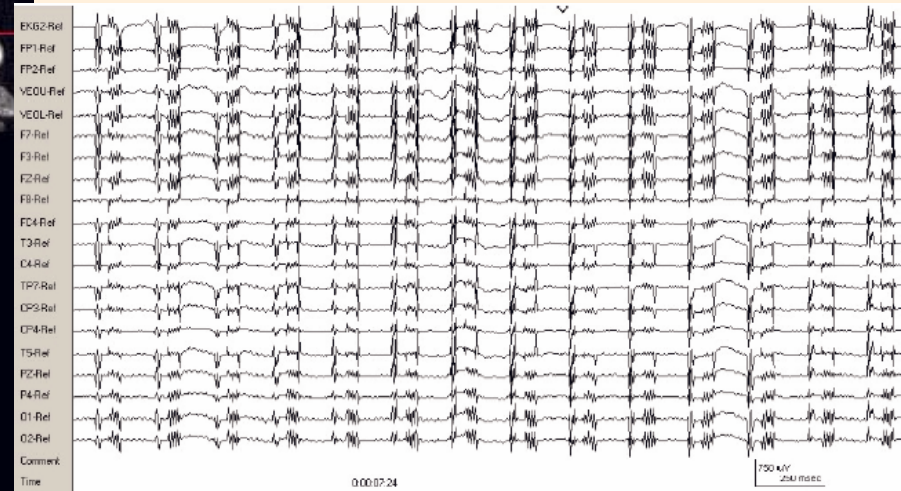
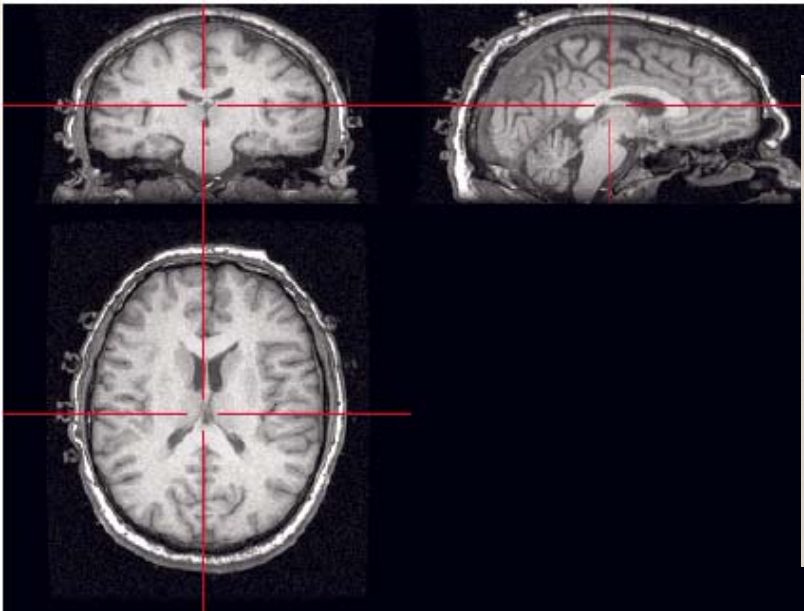


Brain Imaging – Functional MRI (fMRI)

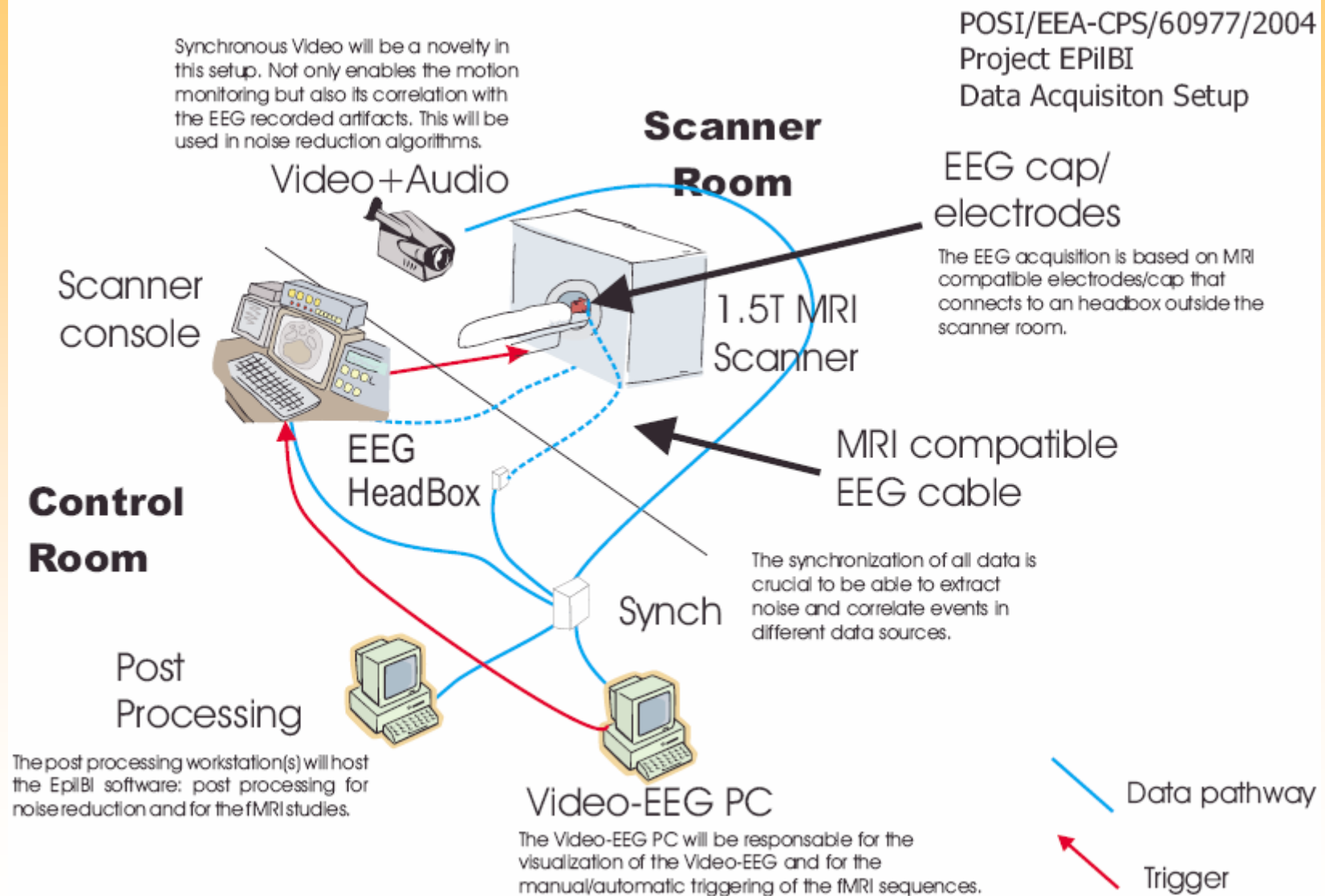
- Brain activity produces a hemodynamic response of the activation areas
- MRI can detect variations of oxygen attached to blood where it's being more used (activated)—BOLD effect



Brain Imaging: fMRI-EEG



Brain Imaging - Video-EEG-fMRI online integration



What Grids can do ?

- fMRI can produce enormous quantity of data
 - 16 x 64x64 volumes each 3 seconds
 - 5 min. = 100 volumes
- fMRI analysis can demand large CPU usage
 - Multi-voxel measures: $N=(16 \times 64 \times 64) \times (16 \times 64 \times 64) = \sim 4.3$ million (approach presented tomorrow)
- MRI+fMRI + EEG of a patient can constitute big datasets
- Grid can provide both CPU and storage in a seamless platform to a BI VO

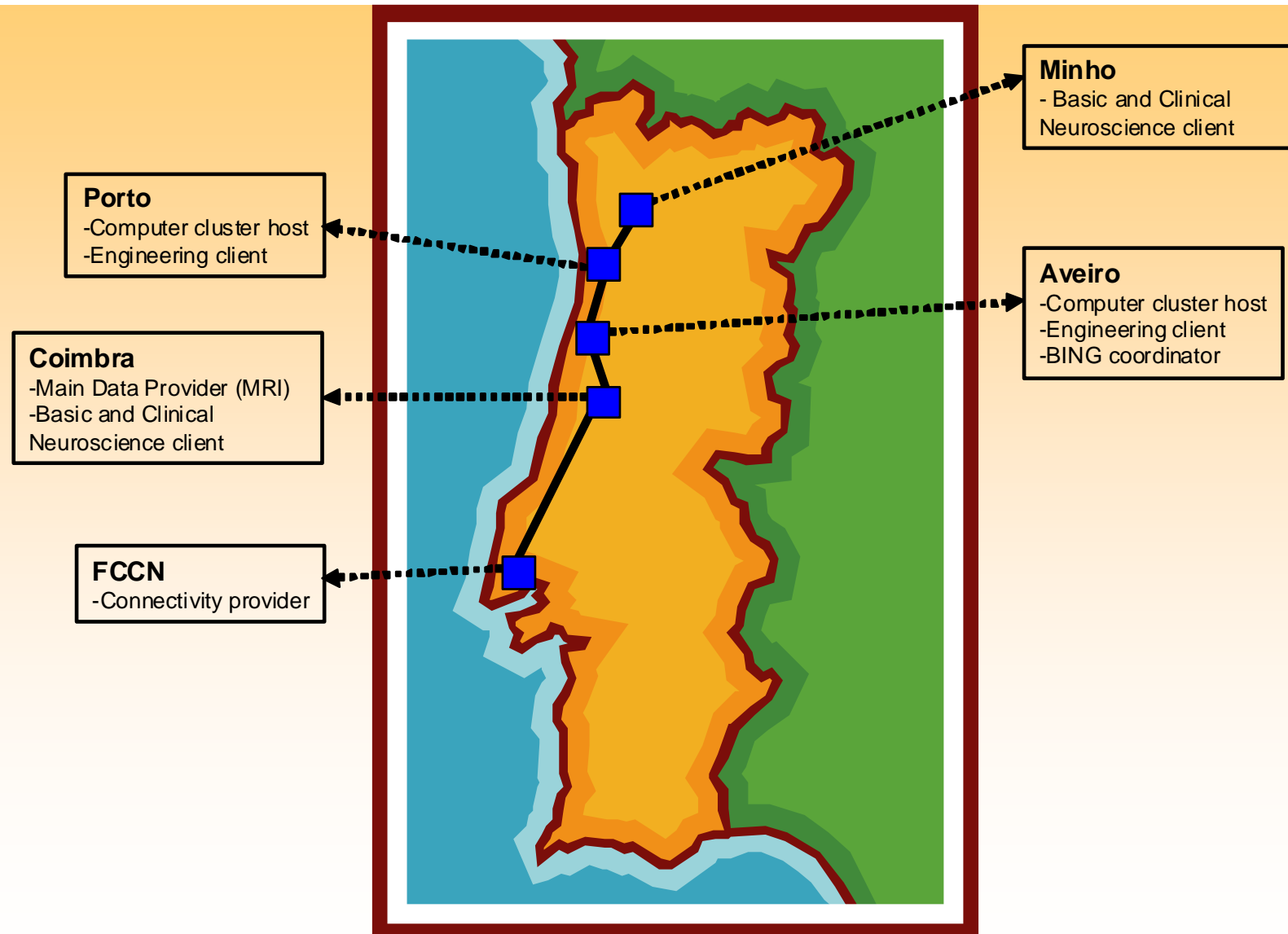
BING - Objectives

- High speed IT infrastructure, storage and CPU
- “neuroscientist-friendly” web portal (called **BrainImaging.pt**)
- Encourage scientific collaborations among participants
- Establish standards for multi-vendor biomedical data exchange between participants

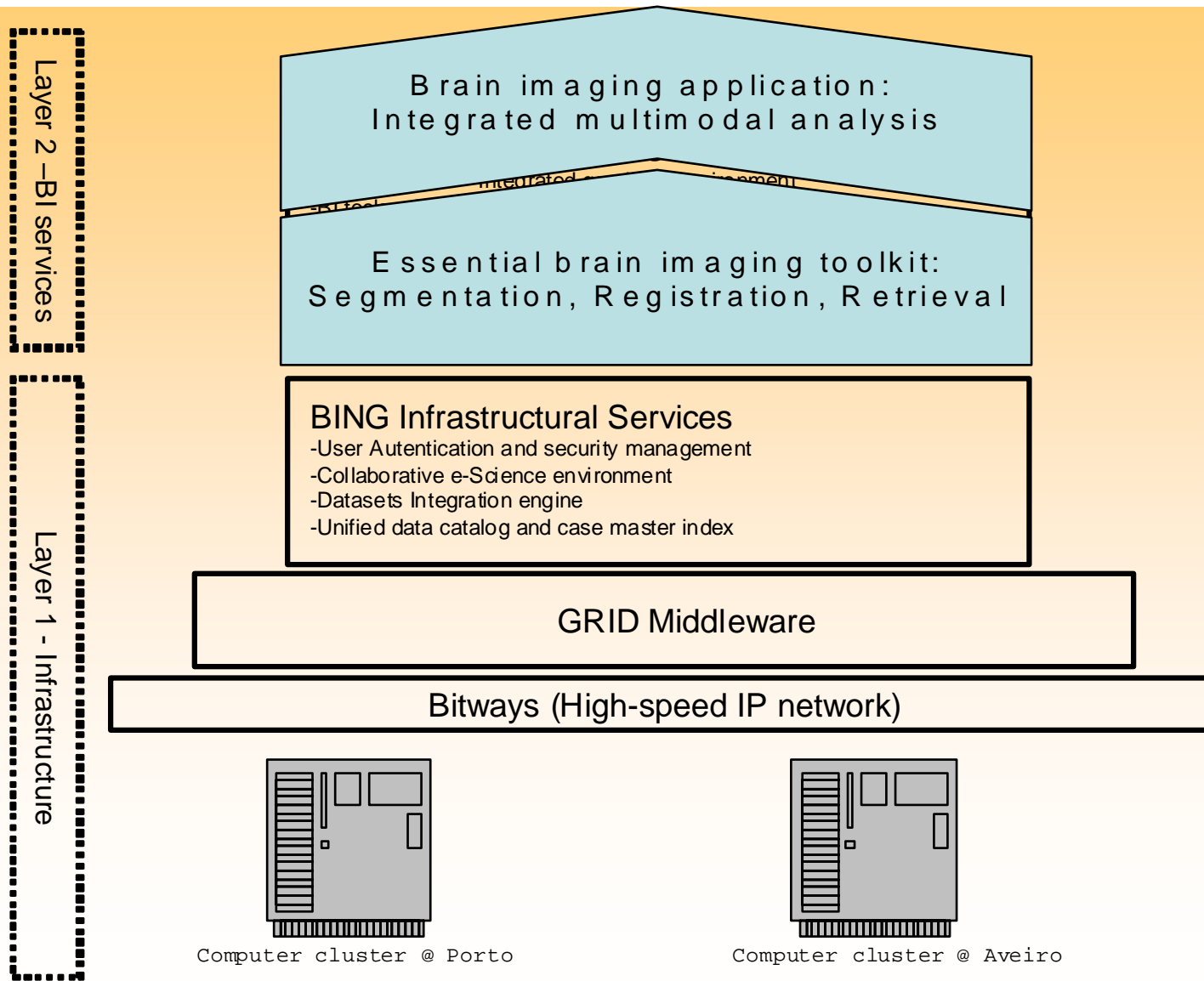
BING – Method (how to convince politicians ;-)

- Bottom-up approach
- Beginning 2004: Group of young BI researchers (from Boston to Helsinki – and Portugal) proposed the creation of a BI centre in Portugal
- A set of 32 projects were designed to use a fMRI-EEG system and computational neuroscience resources
- FCT answered as a special tender
- Sept. 2005 – formal external evaluation (panel of 3 eminent EU researchers)
- Sept. 2006 – protocol and contract signed

BING – Topology



BING – Proposed Architecture



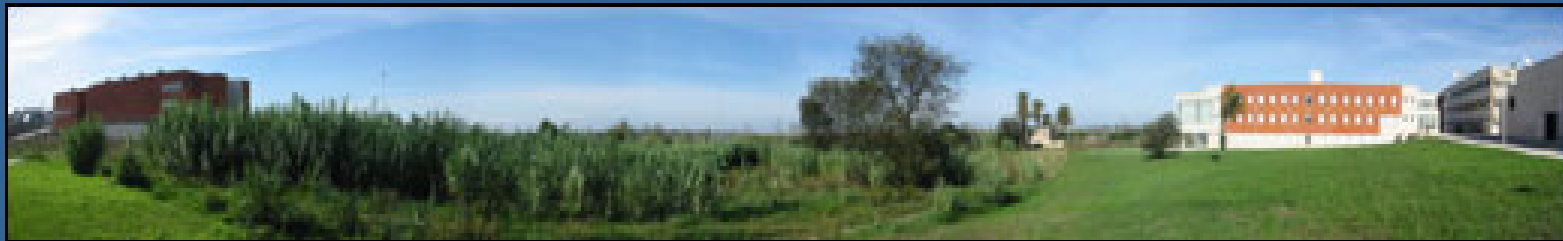
BING – Actual state and future developments

- 4.3 million € financed (81.3%) for the setup and 5 years exploration costs
- Dark fibre Gbit network in position in Aveiro and Porto but still delayed on other partners.
- Porto cluster installed (IBM eServer: 36 CPU, 2TB) and small cluster in Aveiro available.
- International tender for the 3T MRI machine to be opened soon
- New project (no infrastructure) approved – ~120 k€
- Target BING operation: end 2008



Thank you !

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IBERGRID

1st IBERIAN GRID INFRASTRUCTURE CONFERENCE

Santiago de Compostela (Spain) May 14 - 16, 2007

