

# The Virtual Physiological Human building on Bio- Medical Informatics

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# Challenges for European Health Delivery Systems

- **Ageing** population
- Rising **costs** of healthcare, especially long-term care
- Growing **expectations** of citizens
- Improving Patient **safety**
- Addressing **mobility** of patients
- Support to **healthier lifestyle** (health promotion)

# Our WIN<sup>3</sup> strategy for eHealth

- For improvement of quality of care
- For increase of productivity
- For economic development

## **Borderless Information Space facilitating**

**→ mobility of patients**

**→ mobility of professionals**

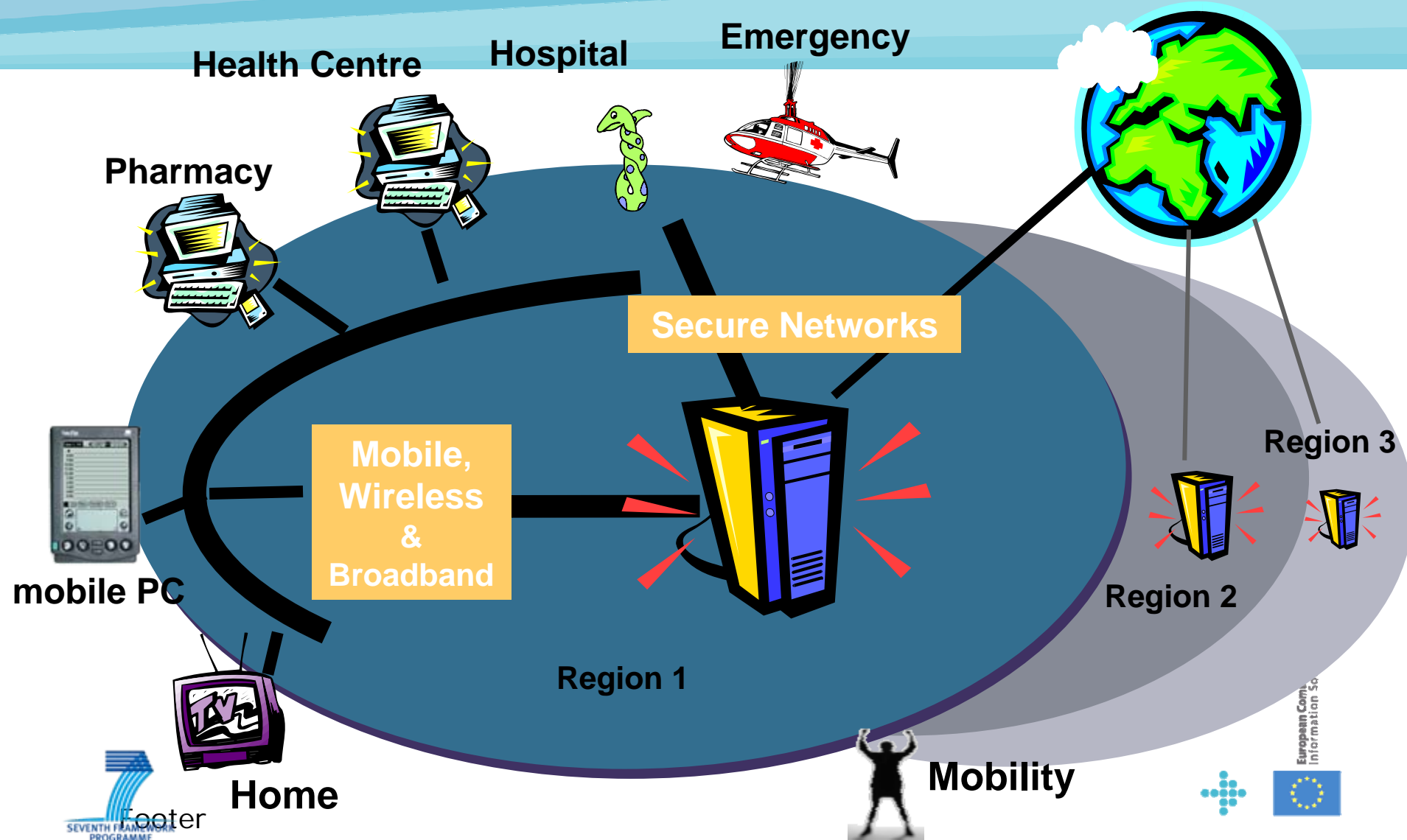
**→ free movement of eHealth products and services**

# Strategic Directions

- **Mix of policy and research actions:**
  - Shift from hospital-centred to person-centred systems
  - Shift from reactive to proactive (preventive) healthcare
  - Policy instrument:
    - Action Plan for a European eHealth Area  
COM(2004) 356
  - Research instrument:
    - Seventh Framework Programme for Research (FP7)

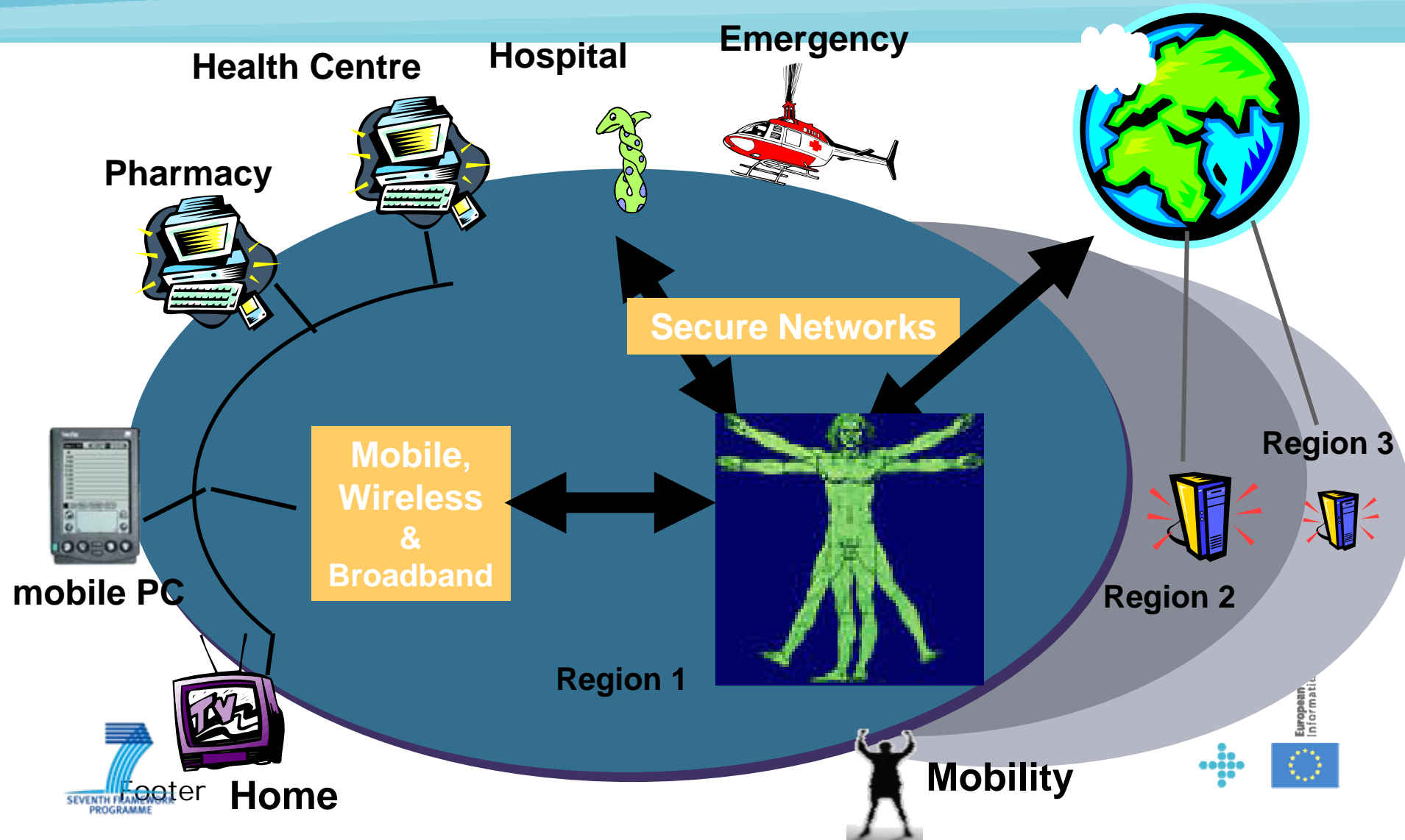
# Past Activities:

## Connecting the points of care (Regional) Health Information Networks



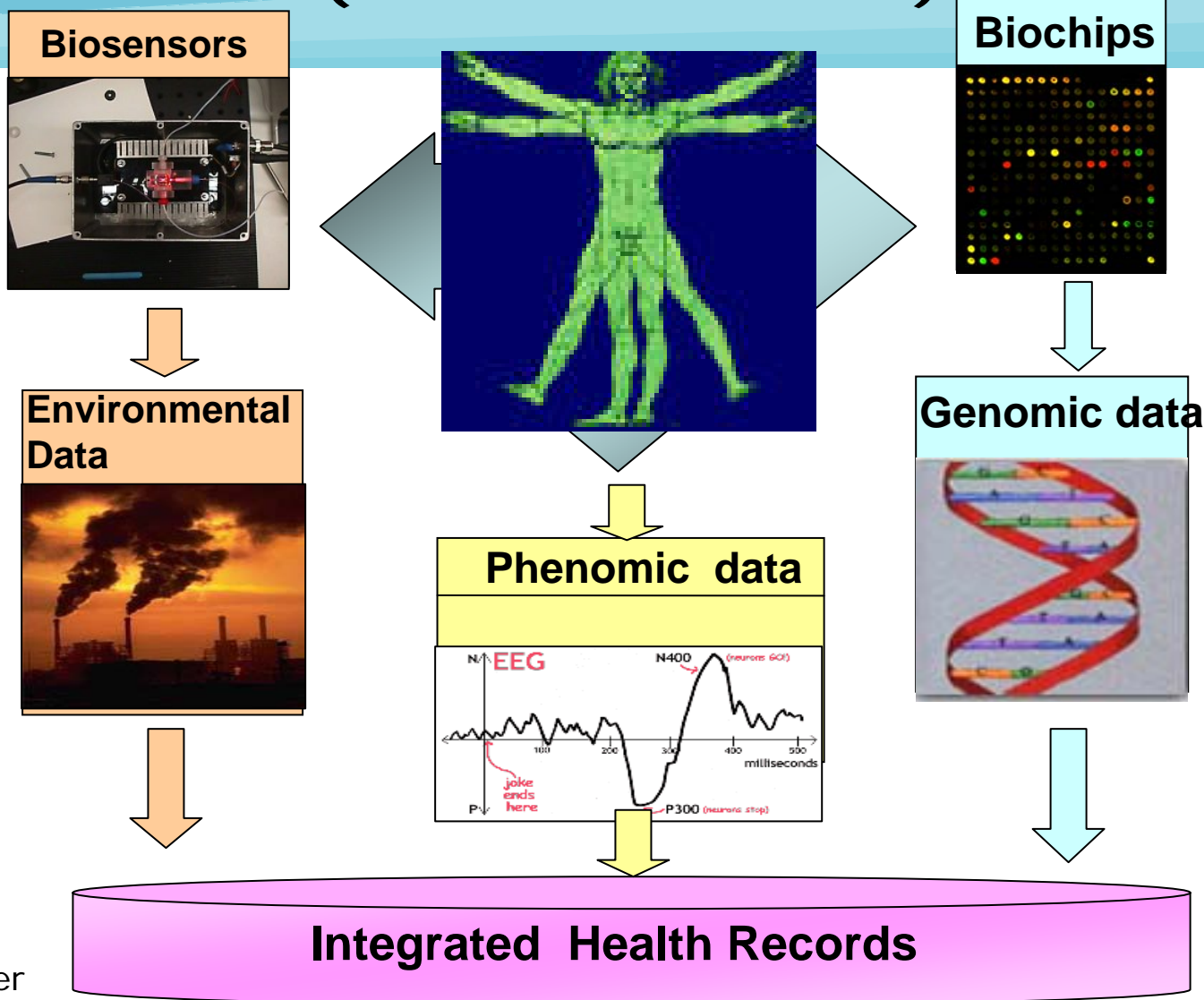
# Current focus

## Connecting individuals with Health Information Networks



# Future plans

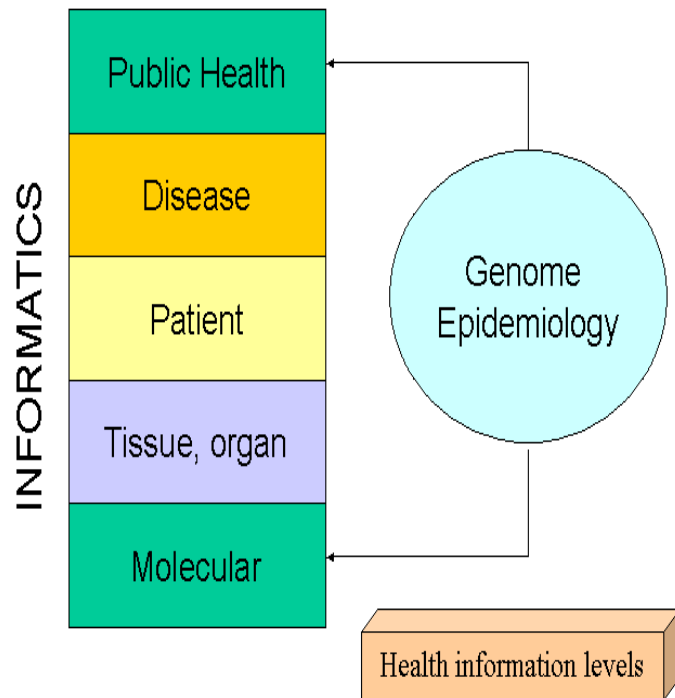
## Towards full picture of individual's health status (Molecular Medicine)



# Research Directions in FP7

- **Three main R&D directions part of Challenge 5:**
  - **Personal Health Systems (objective 5.1; call 1)**
  - **Patient Safety (objective 5.2; call 1)**
  - **Virtual Physiological Human (objective 5.3; call 2)**

# The Virtual Physiological Human (Predictive medicine)



- 1. Integrating** information relating to disease from the level of molecule, cell, organ, organism, population
- 2. Modelling and simulating** disease related processes and human physiology
- 3. Predicting risks** and developing more effective treatments or prevention programmes

# The Virtual Physiological Human - concept

Basis is the International physiome project  
[www.physiome.org](http://www.physiome.org)

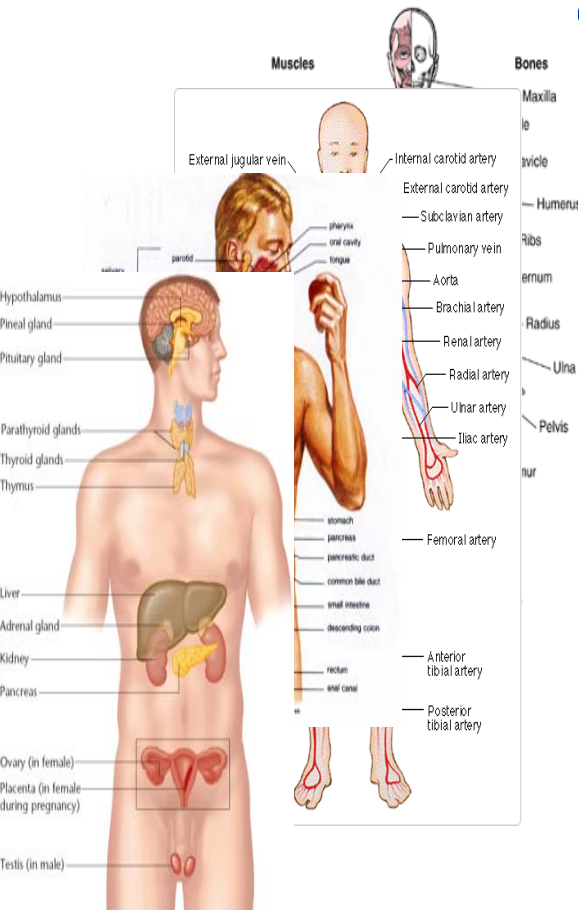
The Virtual Physiological Human is a methodological and technological framework that once established will enable the investigation of the human body as a single complex system.

The VPH research roadmap developed by project STEP [www.europhysiome.org](http://www.europhysiome.org)

New basis for:

Personalised (Patient-specific) healthcare solutions

Early diagnostics & Predictive medicine



# The Virtual Physiological Human - technology

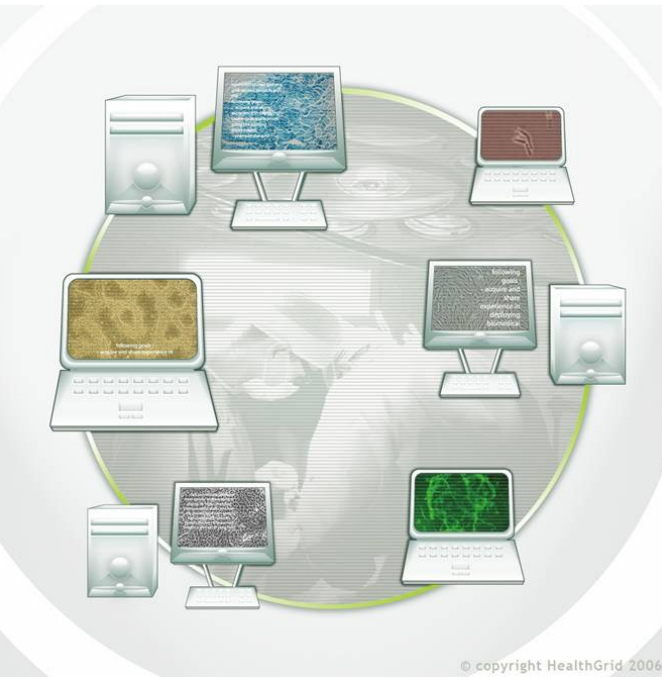
In ICT terms:

Computational framework for multi-scale in-silico model(s) of the human physiology and a toolbox for simulation and visualisation.

Patient specific model from bio-signals and (multimodal) images including molecular images

Technologies involved:

–Data mining, knowledge discovery tool, semantic integration, databank, biomedical imaging, modelling, simulation and visualisation techniques, HealthGrid (infrastructure and tools)

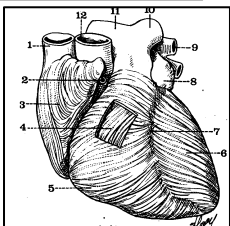
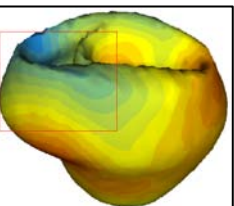


# FP6 activities in VPH

- 2005** 1<sup>st</sup> workshop on VPH resulting in a 1<sup>st</sup> white paper  
[http://europa.eu.int/information\\_society/activities/health/docs/events/barcelona2005/ec-vph-white-paper2005nov.pdf](http://europa.eu.int/information_society/activities/health/docs/events/barcelona2005/ec-vph-white-paper2005nov.pdf)
- 2006** FP6 research projects:  
AneurIST (neurovascular pathology)  
ImmunoGrid (immune system physiology)  
LHDL (musculoskeletal system physiology)  
STEP (A strategy for the Europhysiome)
- 2006** Conference on "ICT for BIO-medical sciences"  
[http://europa.eu.int/information\\_society/events/ict\\_bio\\_2006/index\\_en.htm](http://europa.eu.int/information_society/events/ict_bio_2006/index_en.htm)
- 2006** 2 STEP conferences (May – November) on the VPH  
[http://www.biomedtown.org/biomed\\_town/STEP/Reception/step\\_definitions/STEPConference2](http://www.biomedtown.org/biomed_town/STEP/Reception/step_definitions/STEPConference2)
- 2007** April: STEP roadmap  
[http://www.biomedtown.org/biomed\\_town/STEP/Reception/step\\_presentations/RoadMap/plfng\\_view](http://www.biomedtown.org/biomed_town/STEP/Reception/step_presentations/RoadMap/plfng_view)

# Focus of Call 2 Objective 5.3

## Images



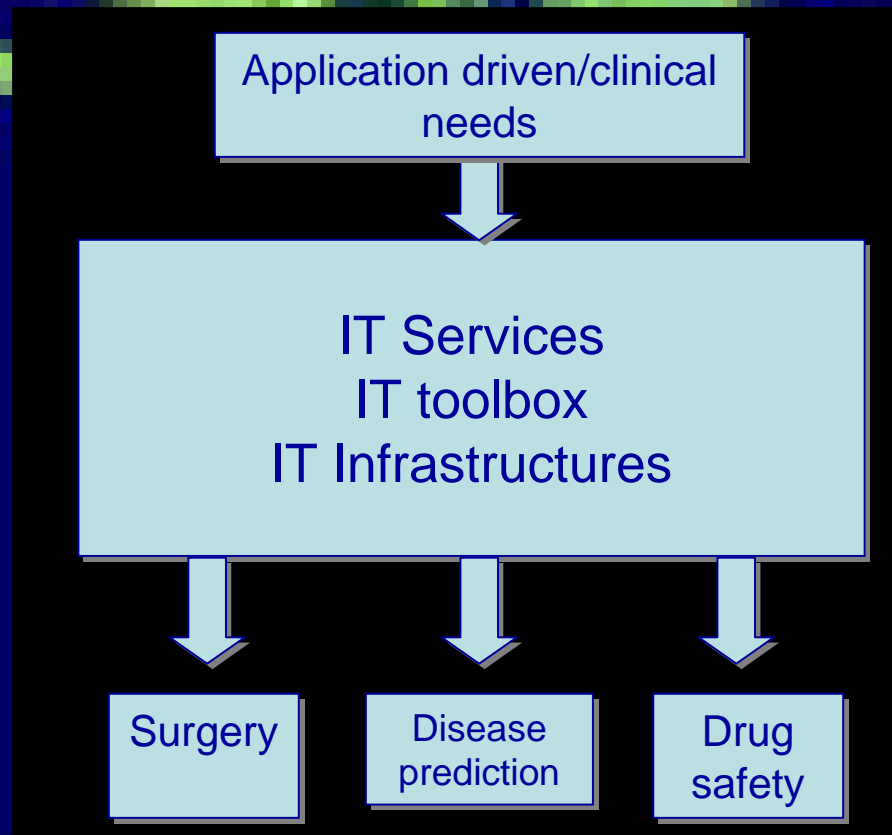
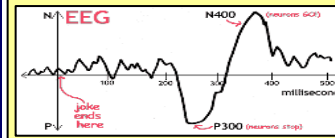
## Genomic data



## Medical/clinical Data

## Scientific Data

## Phenomic data



# Objective 3.5.2.1 – Virtual Physiological Human

- **Technical focus on:**

- a) **Patient-specific modelling and simulation**

- **Target:** molecular, cell, tissue, organs or systems
    - Modelling & simulation of organs/systems targeting specific clinical needs.
      - Go **beyond the state of art** of available models
      - Models should be **multilevel** when appropriate
    - Better understanding of the functioning of the organs
    - New insight into the response to physiological changes

# Objective 3.5.2.1 – Virtual Physiological Human

- **Technical focus on:**

- b) Data integration and knowledge extraction**

- Target: creation and formalisation of **patient specific knowledge** from multi-level integration of biomedical data
- Requirement: open distributed health infrastructures and tools
- Focus:
  - **Coupling scientific research data** with clinical/empirical databases
    - Linking genotype data (genetic markers, pathways) with phenotype data (clinical data)
  - **Image processing** assessing disease evolution/presence
    - Data mining and image processing across many biological levels

# Objective 3.5.2.1 – Virtual Physiological Human

- **Application focus on:**
  - a) **Patient-specific modelling and simulation & b) Data integration and knowledge extraction to be demonstrated on c) following clinical applications:**
    - **Medical simulation environments for surgery**
      - Environment used for simulation, training and planning of surgeries
    - **Prediction of disease** or early diagnosis (patient specific)
      - knowledge and predisposition obtained from lab tests, biomedical imaging (imaging bio-markers and other data)
    - **assessment of efficacy/safety of drugs**
      - Use patient specific computational models to assess the drugs.
      - Alternative screening for clinical trials

# Objective 3.5.2.1 – Virtual Physiological Human

## d) Integrating action (NoE):

- in multilevel modelling and simulation of human physiology
  - sharing of knowledge
  - multidisciplinary training programmes
  - reusable software tools

## e) Coordination & Support Actions

1. Enhancing security and privacy in modelling and simulation addressing
  - patient data processed over distributed networks
  - use of genetic data
  - Trustworthy environment
2. International cooperation on health information systems based on Grid capabilities

# Objective 3.5.2.1 – Virtual Physiological Human

- **When :**                    **Call 2**
  
- **Instruments (Draft not yet agreed):**
  - (a-c)    **CPs 62M€ (minimum 22M€ for IP and Minimum 22M€ for STREPs)**
  
  - (d)        **Integrating action: NoE max 8M€**
  
  - (e)        **Coordination & Support Actions: CSAs  
Max 1M€ per action**

# To find more on ICT for Health / eHealth?

- Research and Policy site

[http://ec.europa.eu/information\\_society/ehealth](http://ec.europa.eu/information_society/ehealth)



- Health Research Newsletter (monthly issues)  
including key Policy information every quarter

[http://ec.europa.eu/information\\_society/activities/health/research/newsletter/index\\_en.htm](http://ec.europa.eu/information_society/activities/health/research/newsletter/index_en.htm)



European Commission

Thank you for your attention

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