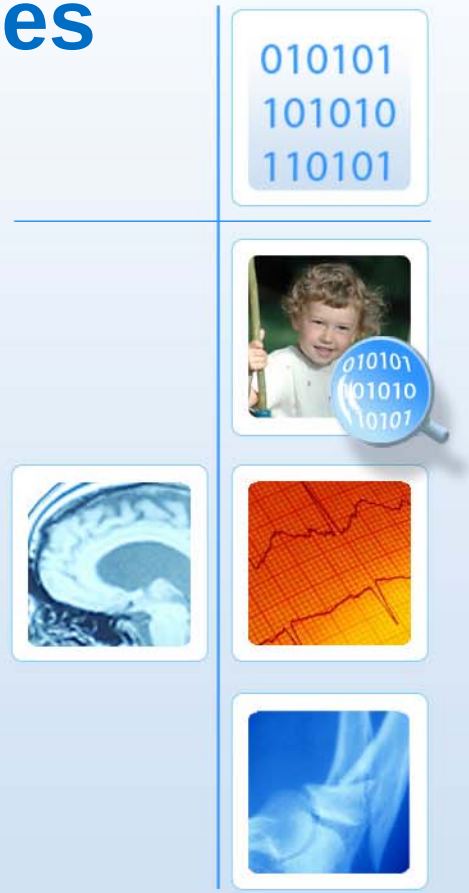
Health-e-Child

Medical Imaging Use Cases in Health-e-Child



EGEE 2006

Martin Huber

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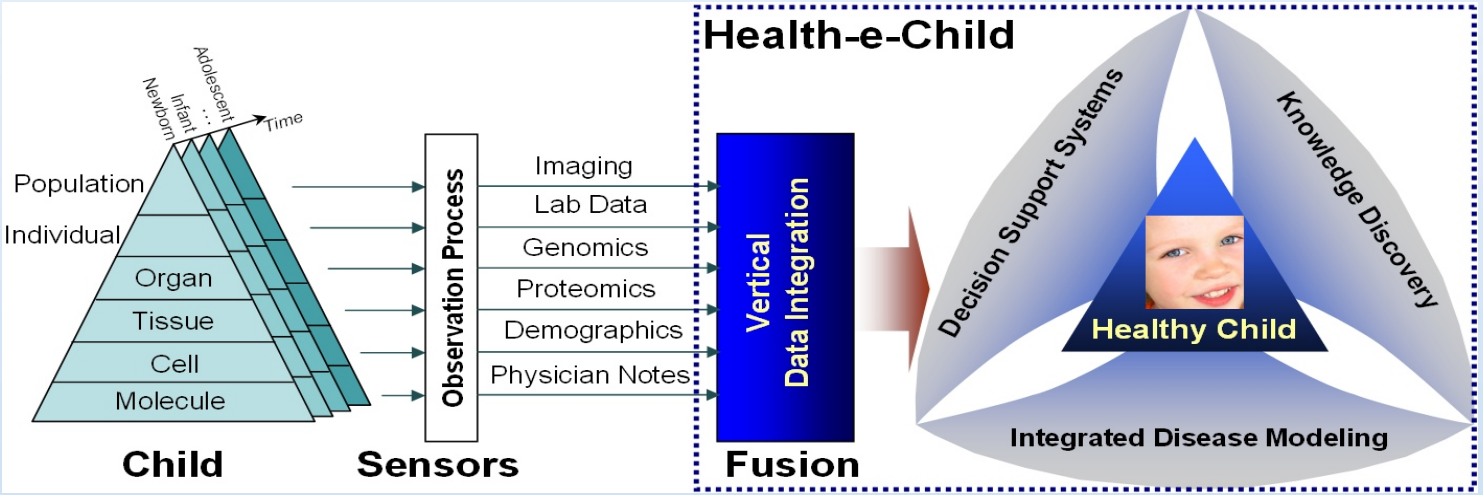
Health-e-Child - Overview and Objectives

- Establish horizontal, vertical, and longitudinal integration of data, information and knowledge
- Develop a GRID-based biomedical information platform, supported by sophisticated and robust search, optimisation, and matching techniques for heterogeneous information,
- Build enabling tools and services that improve the quality of care and reduce its cost by increasing efficiency
  - Integrated disease models exploiting all available information levels
  - Database-guided decision support systems
  - Large-scale, cross modality information fusion and data mining for knowledge discovery



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Facts

- Coordinator: Siemens AG, Dr. Jörg Freund
- Partner: 14 European companies, hospitals, institutions
- Timetable: 01-Jan-06 to 31-Dec-09 (4 years)
- Total cost: 16.7 Mio. €
- EC funding: 12.2 Mio. €

- Web page: http://www.Health-e-Child.org

- Instrument: Integrated Project (IP) of the Framework Program FP6
- Project Identifier: IST-2004-027749

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Clinical Aspects – Focus on Pediatrics

- **Diseases**
  - Heart diseases (*Right Ventricle Overload, Cardiomyopathy*),
  - Inflammatory diseases (*Juvenile Idiopathic Arthritis*), and
  - Brain tumours (*Gliomas*)
- **Clinical Institutions**
  - I.R.C.C.S. Giannina Gaslini, Genoa, Italy
  - University College London, Great Ormond Street Children's Hospital, London, UK
  - Assistance Publique Hopitaux de Paris – Necker, Paris, France
- **Clinical Departments**
  - Cardiology
  - Rheumatology
  - (Neuro-)Oncology
  - Radiology
  - Lab (Genetics, Proteomics, Lab)
  - Administration
- **Modalities / Data Sources**
  - Imaging (MR, echo, CT, x-ray)
  - Clinical (Patient information, Lab results etc)
  - Genetics & Proteomics

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Using GRID services in HeC

- 3 hospital nodes only
- Upper limit of imaging data (over project duration):
  - 3 diseases X 300 cases X 2 modalities X 300 images
  - i.e. some 540000 DICOM images, 270GB (about the weekly output of 3 modern CT scanners!)
- Image processing mainly serves feature extraction for decision support systems and knowledge discovery
  - Automatic segmentation of right ventricle to determine volume, ejection fractions etc for cardiac MR and ultrasound images
    - database guided techniques with explicit offline training phase
    - Expected running time <10 seconds on standard PC
  - Brain tumour segmentation/registration to determine volume, location etc
    - Expected running time <15 minutes on standard PC
  - Volume of synovial fluid in wrist MR scans
    - Expected running time <1 minute on standard PC
- Building disease models is difficult to distribute / parallelize
- BUT
  - Scalability both with regards to nodes and number of of diseases/clinical studies is system requirement
  - Assessment, comparison, refinement and training of algorithms and models may become computationally costly

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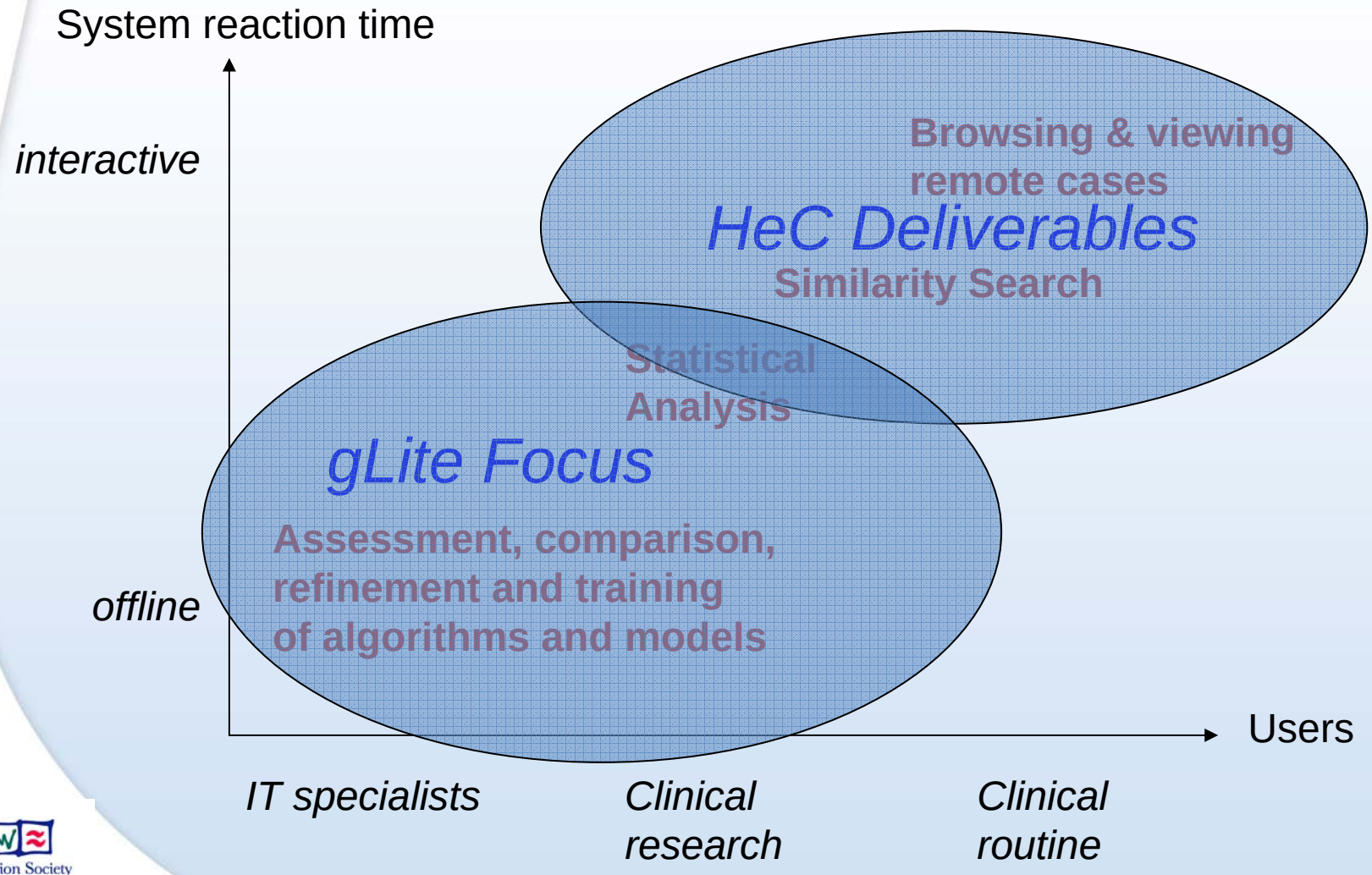
Medical Imaging Applications



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Wish list for GRID infrastructure

- For all use cases
  - Native support of DICOM SCP and DICOM storage
    → basically all medical imaging client applications connect to DICOM servers, browse and view DICOM studies
  - Security, access rights management
  - Build in solution for (pseudo)anonymization
- Use Case “viewing remote cases”
  - Interactive (PACS guarantees loading times <5s!, state of the art thin client PACS solutions use streaming technologies)
    → necessary for acceptance by physicians
- Use Case “distributed similarity search”
- Use Case “assessment, comparison, refinement and training of algorithms and models”
  - Tbd after identification of concrete use case

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