Exploitation of Switched Lightpaths for e-Health

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Outline

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- e-Diamond use cases
- NeuroGrid use cases
- Status & Conclusions

Introduction

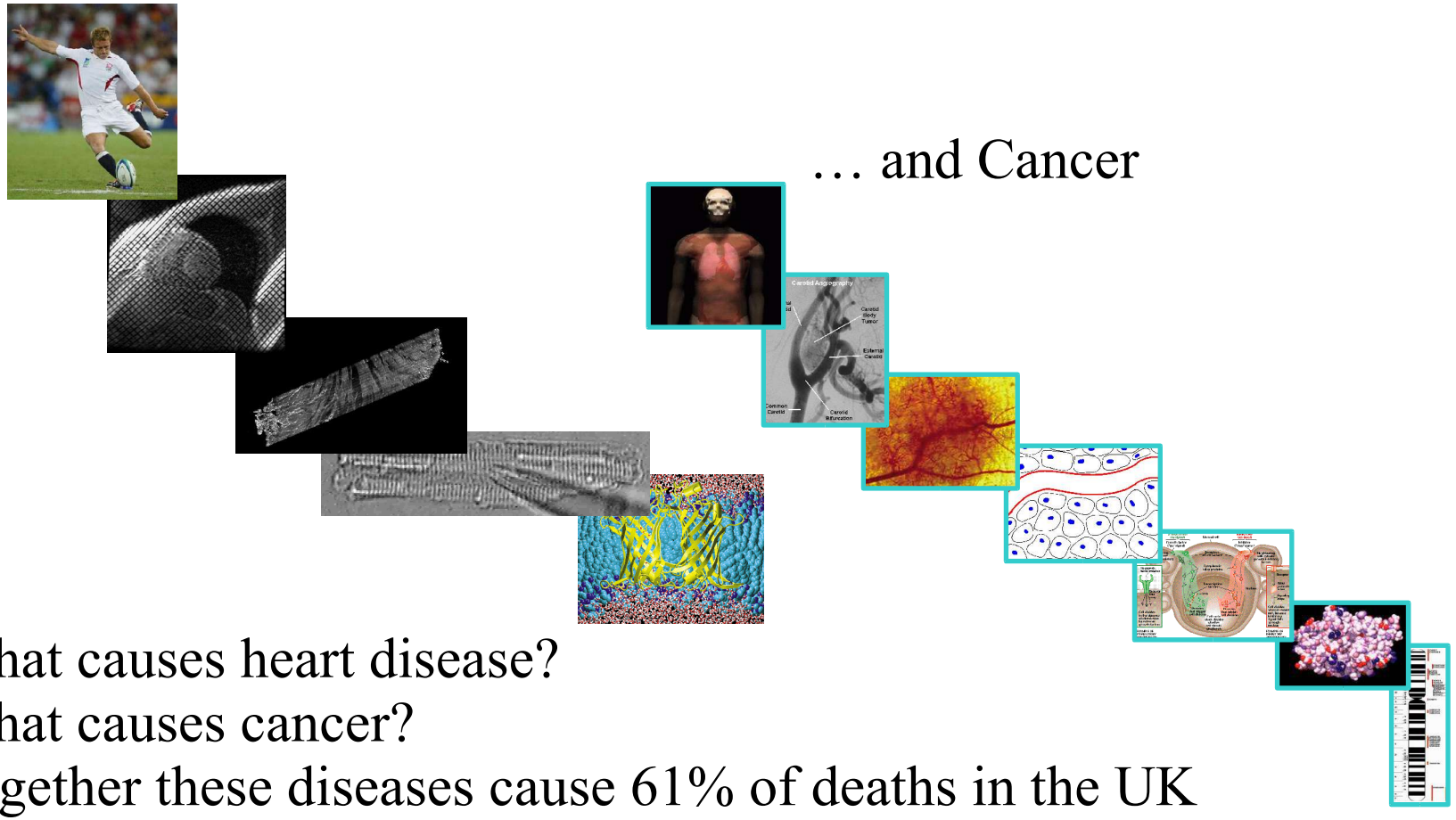
- ESLEA project aims to pioneer the use of the UKLight switched lightpath network with high-demand applications from a number of e-Science domains
- e-Health, given its strength within the e-Science community, is an important domain
- e-Health includes non-functional concerns (e.g. security, QoS) making it an appropriate candidate for validating and demonstrating the benefits of such networks

Switched Lightpaths

- When all the packets in a large flow go to the same end point, circuit switching is economically favourable to packet switching
- Switched lightpaths provide hard QoS guarantees
- Applications need to make reservations in advance

Integrative Biology
UK - NZ Partnership

Multiscale Modelling of the Heart



… and Cancer

What causes heart disease?
What causes cancer?
Together these diseases cause 61% of deaths in the UK

Integrative Biology
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Simple data transfer

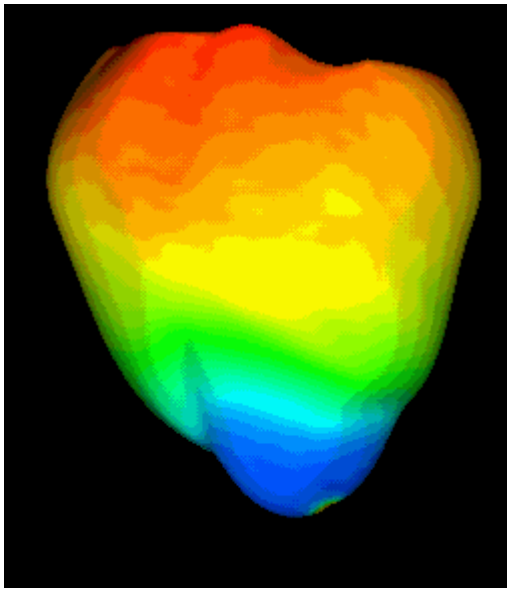
- Simulation runs produce TBs of data
- Computation facility is HPCx

- Data storage factility is RAL-NGS
- Potential for 50-fold increase in throughput with UKLight compared to JANET

Integrative Biology
UK - NZ Partnership

Real-time visualisation

- Visualisation geometry also computed at RAL
- Real time visualisation made feasible by streaming data over UKLight due to bandwidth guarantees
- And hence allow computational steering for more efficient use of computational resources



Integrative Biology
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Distributed simulation

- Equations governing the electrical activity are coupled to those governing the mechanical pumping action
- Whereas the former are best solved on an MPI architecture, OpenMP is best for the latter
- UKLight could provide a sufficiently low latency link between MPI and OpenMP facilities e.g. HPCx and CSAR to investigate this approach
- Requires co-scheduling of all 3 resources

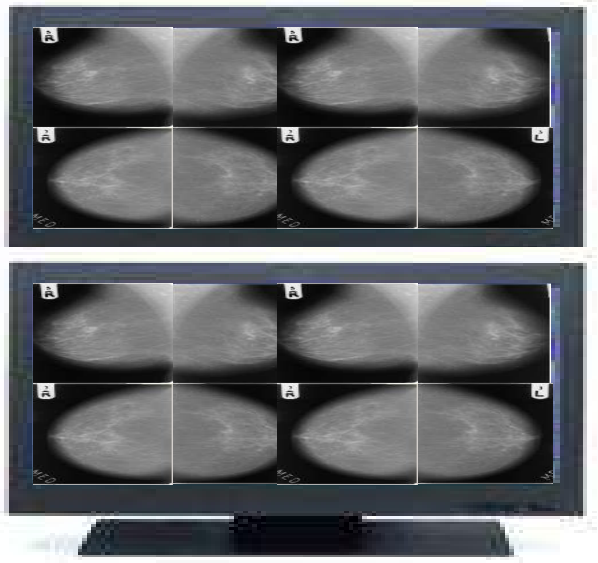
Remote reading

- Breast cancer screening using digital mamograms
- Analog mamograms sent by mail to remote sites
  - For second opinion
  - For 'load balancing' – shortage of UK radiologists
- Digital mamograms sent over swiched lightpaths
  - Improved response time & better patient care
- Typical radiologist reads 100GB worth of mamogram data per hour

Improved radiologist assessment

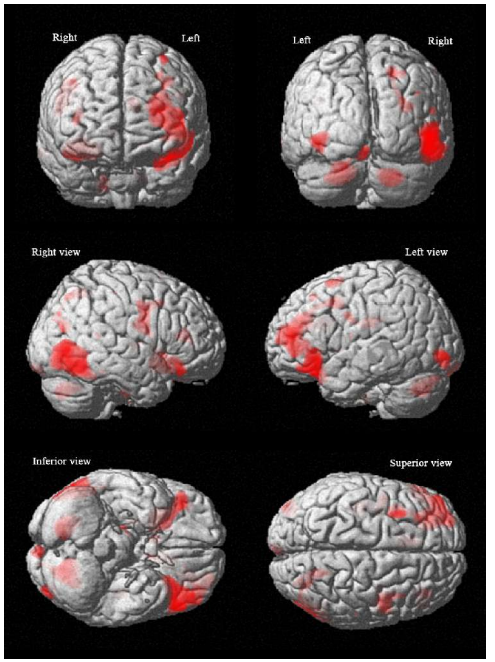
- Ability of each radiologist to read a mamograms correctly is assessed from time to time
- Currently set of mamograms is predetermined
- With switched lightpaths mamograms could be loaded from a training data base

This would allow the set of mamograms to be determined on-the-fly to hone into problem areas, thus improving the strength of assessment



Distributed image processing

- Analysis of neurological images involves applying sequences of image processing algorithms
- Analysis typically applied to large batches of high resolution images
- Different algorithms applied at different locations
  - Intellectual property restricitons
  - Specialised hardware
- Switched lightpaths would provide ideal transport



Status and Conclusions

- Feasibility of data transfer use case established
  - The many parties required to achieve implementation have given go-ahead
  - Waiting for eHealth link set up at RAL
- Implementation of NeuroGrid and e-Diamond use cases not intended within ESLEA time frame
  - But show the potential of switched lightpaths within eHealth domain