CASE STUDY

GÉANT
global collaboration

Sim-e-Child: Diagnosis and customised treatment in paediatric cardiology

A scarcity of relevant cases, the lack of integrated data and the limited opportunities for clinical comparison are just some of the reasons why patients with rare diseases, such as congenital heart diseases, are difficult to treat. Advances in paediatric cardiac surgery, interventional cardiology, intensive care and non-invasive imaging have led to a substantial increase in life expectancy for many patients with congenital heart disease. However, difficult challenges still persist due to the evolving nature of a child's heart and vascular system.

In order to achieve better and more reliable risk stratum, to improve and personalise therapies, and to ultimately increase the patient survival rate, there is a need for comprehensive and accurate computer models to be constructed from patient-specific data and simulated physical constraints. Sim-e-Child is working towards these goals by building on the achievements of the Health-e-Child project which was completed in April 2010 and winner of the ICT08 Best Exhibition Award.

Supporting Clinical Decisions

Sim-e-Child expands the Grid-based eHealth infrastructure developed by the Health-e-Child project and uses the high-bandwidth pan-European GÉANT research network to:

- establish a multi-site database of paediatric cardiology data, information and knowledge for translational research
- develop a grid-based platform, supporting robust search, optimisation and matching techniques for scientific simulations
- enhance and expand the Health-e-Child heart model with of the aorta, aortic and mitral valves, and blood flow dynamics.

By integrating these three elements, Sim-e-Child will provide paediatric cardiology professionals in Europe and the US with a Virtual Physiological Human (VPH) decision support system and virtual laboratory. This will enable them to construct and validate multi-scale and personalised models of a growing

In Sim-e-child we are enhancing cardiac models by utilising international collaboration beyond the European research area to validate our models on additional data. Also, the models developed in Health-e-Child are being expanded by integrating existing Siemens Corporate Research models of the aorta, aortic valve and mitral valve together with blood flow modelling and flow visualisation from the Technical University of Munich. The new and comprehensive heart model will be applied to congenital aortic heart disease and repair, thus enriching the portfolio of applications available in Health-e-Child and broadening its end-user community.

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Sim-e-Child

SIEMENS

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About the Grid e-infrastructure

The Grid is a distributed computing environment which allows the syndication of a potentially unlimited number of physically disparate computing resources into one virtual space. It constitutes a genuine alternative to supercomputers at a fraction of the cost, and is decentralized with no a single point of failure. The whole infrastructure is scalable and able to cope with more computers over time.

If the grid can be compared to the brain's grey matter in solving complex problems such as those being addressed by Sim-e-Child, it needs a responsive white matter, or conduit, to allow massive data transfers across its processing units. This is why and where Sim-e-Child benefits from the high capacity network GÉANT.

child's heart and blood vessels. Ultimately this will support their clinical decisions and allow better understanding of their patient's condition, thanks to the huge amounts of bandwidth and computing resources made available.

E-infrastructure for paediatric cardiologists

Sim-e-Child is creating the first Trans-Atlantic platform for large scale simulations in cardiology. The clinical applications are further developing the original (Health-e-Child's) grid infrastructure based on the EGI Grid middleware (the gLite technology and European Grid Infrastructure - www.egi.eu) and the enabling GÉANT network. Together they provide virtually unlimited computing power, data storage capacity and network bandwidth across continents. Drawing on these resources, the Sim-e-Child platform will be able to deliver innovative predictive disease models, complex data visualisation and knowledge discovery applications at the point of care.

Sim-e-Child's applications are based around the concept of data integration, in the way that Health-e-Child integrated the data from four European hospitals over three disease areas (cardiology, rheumatology and neuro-oncology). Sim-e-Child is further integrating the legacy cardiology data with a large number of cases from two, ongoing US multi-centre studies. This is with the support of the American College of Cardiology (Washington, D.C). and the Johns Hopkins Children's Centre (Baltimore, Maryland) in order to validate the existing models and those being developed.

As a result of the first stage of Sim-e-Child's work, the Health-e-Child Grid has now been deployed at two locations in the US at Johns Hopkins Children's Centre in Baltimore and Siemens Corporate Research in Princeton.

Sim-e-Child Partners:

Siemens AG (Germany)
Ospedale Pediatrico Bambino Gesù (Italy)
John Hopkins University (USA)
American College of Cardiology (USA)
maatG (France)
Technische Universität München (Germany)
Lynkeus (Italy).

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The world is criss-crossed with high-capacity data communications networks, connecting and serving research and academic institutions across the globe. The most advanced of these is GÉANT, serving Europe.

Separate from the public Internet for reasons of security and performance, GÉANT is designed, deployed and run by the networking organisation DANTE, and makes an enormous practical contribution to research in a wide variety of areas; establishing real-time collaboration between scientists all over the world.

Through its interconnections, GÉANT enables professionals across Europe and beyond to participate in world-class research aimed at finding effective treatments for medical disorders, cures for diseases, and to enable medical staff around the world to learn from specialists, whatever their location.

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