Dezineforce – pioneering cloud computing

Cloud computing is now a popular way for companies and individuals to enjoy wide access to computing, data handling and storage at affordable prices.

Research at the University of Southampton created the concept as a way for design engineers in the aerospace, defence, energy, civil engineering, automotive and other industries to use massive amounts of computing power for complex and essential calculations without the expense of setting up their own systems. Its founders Professors Simon Cox, Andy Keane and Professor Sir Nigel Shadbolt launched Dezineforce in 2007; it was sold to Microsoft in 2011.

Sophisticated computer simulations are used in many industries to reduce the high costs of prototyping and experimentation and to provide better and faster answers to complex problems.

Exciting advances in computing technologies at the start of the 21st century promised much for UK industry. However gaining access to massive amounts of fast computing power came at a cost. Using high-performance computing at that time involved major investment by large firms in their own bespoke systems, smaller companies found it very difficult to do likewise. EPSRC realised there was a crucial need both to reduce the expense and aid collaboration between companies and commissioned research from the UK's leading universities.

Underpinning research for the initiative was carried out through two major research collaborations. They identified the need to improve access to technology for computer aided engineering (CAE) projects in industry and cut the cost for users. New easy-to-use systems now allow design engineers without specialist computing expertise to use the latest high-performance computing facilities to perform their advanced calculations in an affordable way.

Research at Southampton was aided by the GEODISE eScience project, funded by the Engineering and Physical Sciences Research Council (EPSRC) between 2001-05 and the Microsoft Institute for High Performance Computing from 2005. This multi-disciplinary collaboration with industrial partners including Rolls-Royce, BAE Systems and Microsoft brought together the UK's leading specialists to tackle the issue and come up with solutions.

Southampton researchers provided their expertise on engineering, optimisation, semantic technologies and distributed computing and data handling. The University of Oxford worked on fluid dynamic solvers and the University of Manchester on knowledge systems.

This research carried out through GEODISE resulted in the development of new design search and optimisation tools to enable teams of engineers to access high performance computing by working in virtual organisations using widely distributed software, sophisticated analysis codes, computing power and databases, all from a conventional

CAD workstation. 'Grid' computing was an early form of cloud computing now widespread across the business and consumer sectors; this breakthrough in advanced functionality was accompanied by easy-to-use tools that used the widely used Matlab and Python technical computing environments and were tested in industry by novice users.

The capability to run these distributed computing jobs efficiently was developed by the Microsoft Institute for High Performance Computing at Southampton.

Dezineforce's work also had a fundamental impact on the cost of engineering software. Many customers now want to rent software by the hour or for a specific project. New flexible packages pricing structures have been developed so companies can make the most of the new systems. This introduced a new concept to computing in 2007 – the idea that design engineers could remotely upload the tools they need to run complex simulations using massive amounts of computing power.

While many smaller companies took advantage of these opportunities, this flexibility is also valued by larger concerns. Consulting design engineers Arup used Dezineforce to design a specialist cooling system for a 65,000 seater sports stadium in the Middle East; saving both time and money for their clients. Another project with Intelligent Fluid Solutions used simulations to come up with the best lay-out for wind turbines.

Through their teaching and outreach activities, Southampton researchers continue to inspire the next generation of engineers. They are also developing a way to use the popular Raspberry Pi teaching computer to inspire people to build the next wave of cheap cloud supercomputers.