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## Set for Britain 2011 Topic: **A thorough investigation of Cloud Computing: Sustainability Modelling and Enterprise Portability for Industry and Academia**

### **Background**

Cloud Computing (CC) has transformed the way many organisations work. It offers a variety of benefits including cost-saving, agility, efficiency, resource consolidation, business opportunities and green IT. This brings technical and business challenges in many organisations. To address increasing requirements from Industry and Academia, there are two major areas need to be addressed: (i) the organisational sustainability and measurement of Return on Investment (ROI); and (ii) enterprise portability, so that the entire applications and services can moved from desktops to clouds, and between different clouds, with ease and convenience.

### **Sustainability Modelling**

The ROI measurement is a systematic and innovative methodology based on (i) Nobel-prize models such as the Capital Asset Pricing Models, CAPM (Sharp, 1990); (ii) the use of economic and statistical computation for data analysis; (iii) 3D Visualisation to present cloud business performance and finally (iv) a unique way to use Quality Assurance (QA) to improve the quality of data and research outputs. This leads to the development of Sustainability Modelling (SM) which is designed to measure cloud business performance. Using SM has the following two advantages: (i) it allows performance reviews at any time; and (ii) it provides strategic directions and added-values for adopting the right types of cloud business for sustainability.

There are extensive case studies to support SM. Data from Apple/Vodafone, NHS, SAP, Oracle, Salesforce, VMware, HP, KCL, Universities of Southampton and Greenwich, and a number of Small and Medium Enterprises (SME) are presented and analysed in the form of statistical computing and 3D Visualisation. ROI results and discussions have proven to be valuable not only for publications but also for collaborators.

### **Enterprise Portability**

Portability involves moving entire applications from desktops to clouds and between different Clouds in a way which is transparent to users so they may continue to work as if still using their familiar systems. Two domains are used for demonstration; Finance and Health.

**Finance:** The Financial Software as a Service (FSaaS) is our proposal for dealing with issues caused by the global economic downturn. FSaaS is designed to improve the accuracy and quality of both pricing and risk analysis. Different models are explained, and Monte Carlo Methods (MCM) and Black Scholes Model (BSM) are chosen for investigation. Simulations and experiments are performed on different clouds to demonstrate enterprise portability. This work is in collaboration with IBM US and Commonwealth Bank Australia, with published results.

**Health:** Dynamic 3D modelling and simulations with DNA, genes, proteins, tumour and brain images have been used to demonstrate portability in Clouds, and results will be discussed along with Cloud Storage as another area to demonstrate portability. There is collaboration with KCL, NHS and University of Oxford.

### **Future Work**

The Cloud Computing Business Framework (CCBF) is proposed to help deal with Sustainability and Portability, with research questions and objectives identified. This includes publication of more ROI studies and portability demonstrations in Finance and Health. The CCBF works with another model, Reference Model for Cloud (RMC), to review the technical implementations and case studies. Results from this research will be very useful for e-Research, Cloud, Web Services, Education, Finance and Health Communities.