CSIRO eResearch: Building future science platforms

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INTRODUCTION

The digital revolution is transforming society including the global research and innovation system. The CSIRO eResearch program is our response to this global megatrend. The CSIRO eResearch program develops and delivers a comprehensive suite of eResearch services to support CSIRO's mission to deliver impact through the National Research Flagships. Most importantly, the CSIRO eResearch program provides a modern collaborative environment to facilitate multidisciplinary and interdisciplinary collaboration between teams of CSIRO staff and researchers located around the nation and the world that is now essential to addressing the major challenges in science and industry that impact Australia and the rest of the world.

We're developing world-class eResearch tools, advanced facilities, connecting scientists with the latest technologies and fostering international partnerships with industry and leading research institutions. CSIRO eResearch also provides a forum to inspire new project ideas and networking to create new research opportunities. CSIRO eResearch also champions the collaborative development of new eResearch services, technologies and applications for CSIRO, industry and our community.

Since its inception, CSIRO has developed and deployed new science platforms and technologies to boost CSIRO research productivity and create new opportunities that keep CSIRO researchers at the forefront of science. We've done this by supporting and evolving ideas into fully fledged facilities and services for CSIRO and the broader scientific community. CSIRO eResearch services now support the entire science workflow and facilitate collaboration between research teams from around the nation and the world. The CSIRO eResearch service consists of the following key elements:

Outreach - communicating and engaging with research staff so they can benefit from the use of advanced ICT through workshops, training and collaborative projects;
eResearch Planning - developing a roadmap for enterprise-level eResearch architecture development and assisting research groups to define their eResearch project requirements;
Research Data Services - supporting the end-to-end lifecycle of research data;

Scientific Computing & Visualisation - providing the resources that enable scientific modelling, analysis and visualisation to be carried out efficiently and effectively;

Workflow Services - supporting the use of science-related workflow tools and methodologies to boost productivity support collaboration;

Advanced Collaboration - facilitating interaction across CSIRO and with external collaborators; and

Information Services - assisting researchers with publication and information services.

We have also observed as scientific datasets increase in volume and complexity, and the pace of research accelerates, that powerful computers - and correspondingly powerful ways to use computers - have become indispensable. Super-sensitive detectors, high-throughput machines in biology and materials science and highly integrated systems, such as high-powered microscopes, radio telescopes, CT scanners at synchrotrons, genome sequencers, and industrial processes now all generate massive and complex datasets. Fortunately, the CSIRO eResearch program is building the future science platforms to support the study and exploitation of the vast and complex datasets that are now generated across many scientific domains.

In this presentation we will discuss the latest developments in the CSIRO eResearch program particularly in the areas of managing research data, big data analytics and cloud computing, accelerated computing with the latest Intel Phi hardware, and the CSIRO developed Workspace workflow tool. We will provide a broad range of examples of the application of how our eResearch capabilities lift research productivity and create new research opportunities.

ABOUT THE AUTHOR

Dr Taylor is currently CSIRO Director of eResearch & Computational and Simulation Sciences and Adjunct Professor in the School of Computer Science at ANU. I have written more than 140 articles and books on computational and simulation science, climate change, global biogeochemical cycles, air quality and environmental policy, from the local to the global scale, spanning science, impacts and environmental policy. My research has been widely cited and has also attracted widespread media attention. Prior to joining CSIRO I was Professor and Director of the Doctoral program in Environmental Management at Montclair State University and I also worked at NASA Goddard Institute for Space Studies in New York. I have also worked as a Computational Scientist and group leader both at the Mathematics and Computer Science Division, Argonne National Laboratory and at the Atmospheric Science Division at Lawrence Livermore National Laboratory. I was a Senior Fellow in the Computation Institute and a visiting Scholar in the Geoscience Dept. at the University of Chicago. I have also served on the Advisory Panel of the Scientific Computing Division of US National Center for Atmospheric Research (NCAR) and the US National Energy Research Scientific Computing Center NUGEX Advisory Committee. I currently serve on the Board of the National eResearch Collaboration Tools and Resources (NeCTAR) an Australian federal Government SuperScience initiative and on the Scientific Advisory Committee of the Victorian Life Sciences Computation Initiative (VLSCI). Dr Taylor is a Fellow of the Clean Air Society of Australia and New Zealand and a full member of the American Meteorological Society.