Workspace: scientific workflow platform

Paul Cleary, Matt Bolger, Lachlan Hetherton, Ben Morris, Chris Rucinski, David Thomas, Damien Watkins
CSIRO, Clayton, firstname.lastname@csiro.au

OVERVIEW
Workspace is a powerful software platform designed to address two specific user scenarios:

- Scientists who want to create and share scientific workflows in one coherent, easy to use environment where much of the “heavy lifting” has already been developed and proven over a number of years
- Developers who want to make their software available as internal or commercial products, plugins or components that can be freely mixed with capabilities from collaborators or customers

The plug-in based framework addresses the needs of both groups through the following four key focus areas.

ANALYSE
Workspace users can combine operations into workflows of arbitrary complexity by using either the built-in operations for common tasks such as File I/O, Visualisation, Network access or write their own operations to provide custom functionality using the built-in code wizards and documentation. Users can then execute workflows in interactive, batch or standalone application modes, interacting with and visualising workflow results while they are running. The Workspace framework makes it very easy to mix and match existing and new capabilities within an easy to use drag and drop GUI environment in a highly scalable way.

Figure 1: Create, modify, execute and visualise workflows interactively

COLLABORATE
Workspace is an ideal vehicle for enabling collaboration. Users can share and reuse entire workflows, share and reuse software capabilities via plug-ins and easily “mix and match” capabilities from any number of collaborators. User can also create “custom interfaces” to make shared workflows and plug-ins even easier to use. Workspace plug-ins are cross platform and the build system used to compile them is the same on all three supported platforms. The technical requirements for plug-in developers are low, with the target minimum knowledge being that of a self-taught C or C++ programmer making adoption easy for non-experts.

Figure 2: Data Acquisition using technologies from multiple CSIRO groups
COMMERCIALISE
Workspace supports commercialising software; users can create standalone compiled applications, share plugins as libraries or command line tools and easily create native release packages on all major desktop platforms.

Figure 3: Commercial semi-autogenous grinding (SAG) mill simulation software

EVERYWHERE
A major goal is that Workspace be applicable to many different scientific domains and can run on all main platforms (Windows, Mac and LSB Linux). Currently Workspace is used in a number of different projects dealing with Image Processing, Disaster Management, Human motion, Plant Industries and more.

Figure 4: Flood inundation Modelling

EXAMPLE APPLICATIONS
A NetCDF Viewer built using Workspace that is used to visualise Plant Genomic, Meteorological and Maritime data.

Figure 5: A Custom Application – NetCDF Viewer
ABOUT THE AUTHORS

Paul Cleary is a Chief Research Scientist at CSIRO and specialises in the development and application of particle based computational methods and the development of software and visualisation tools. These include the DEM and SPH methods which are now used extensively for simulating industrial, biomechanical / biomedical and geophysical / geotechnical flow problems involving combinations of particulates, fluids and bubbles. He is broadly acknowledged as a leading developer of the SPH and DEM numerical methods and is the architect and primary software developer of both the CSIRO DEM and SPH software. He is also the leader of the Workspace development program which is building and deploying a sophisticated general purpose workflow engine that enables efficient inter-connection and interoperability of heterogeneous software pipelines and their migration into commercialisable products.

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