

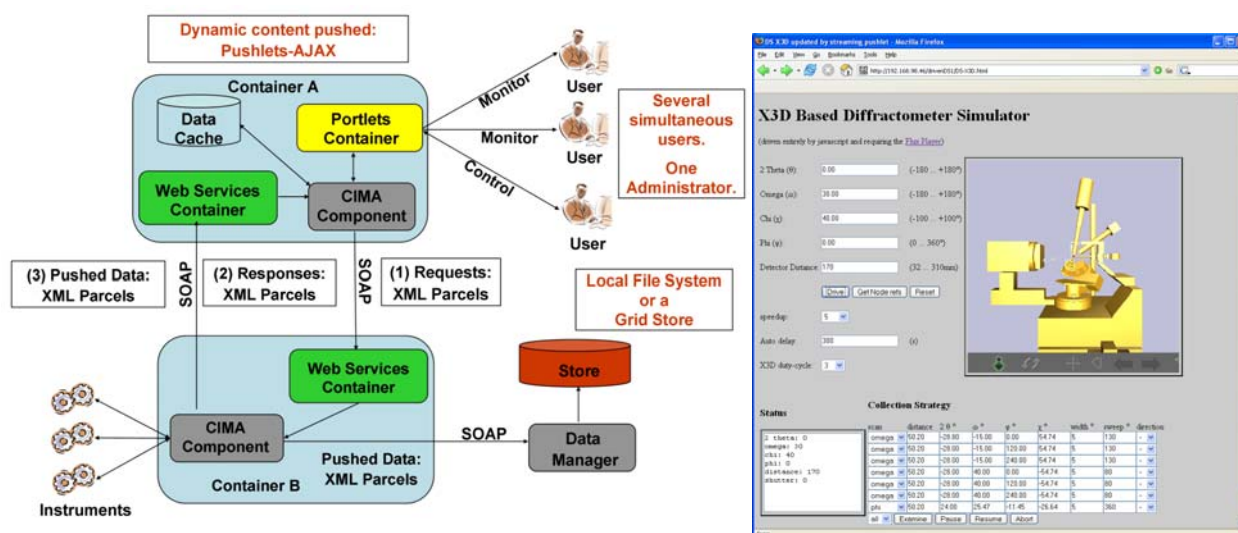
## The Rising Power of the Web Browser: Web Services Based Collaborative Remote Instrument Control and Monitoring

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A remote resource access system built on Web services<sup>1</sup> offers a flexible and secure means of integrating multiple functions and applications, regardless of location, in a way that is difficult or impossible to achieve using the remote-desktop approach exemplified by VNC<sup>2</sup> or NX.<sup>3</sup> We are participating in a collaborative endeavour with others in the ARC Molecular and Materials Structure Network (MMSN), to develop a Web services based portal system for access to remote instruments and their data. A GridSphere portal system is being developed<sup>4</sup> that utilises and extends the pioneering Common Instrument Middleware Architecture (CIMA) model for Web services based remote instrument access middleware.



Our focus has primarily been on developing and extending the CIMA model to enable instrument control, in addition to instrument and data monitoring. Significant enhancements have accordingly been made to CIMA, which we have embedded as a core component in a scalable and extensible two part portal system. Web 2.0 technologies have been used to provide a dynamic and responsive Web browser interface to the instrument. In particular, AJAX<sup>5</sup> enables the refresh of specific sections of the browsers display, rather than the whole page. In dynamically 'pushing' data to a client browser, Pushlets<sup>6</sup> overturn the notion of a browser being solely intended to 'get' information from the Web. Features of the instrument control portal service include an X3D<sup>7</sup> XML based virtual instrument representation for data collection simulation, and as at least a partial solution to the 'dark laboratory' problem. The browser driven system is being further augmented with embryonic tools for collaborative data browsing and evaluation. The portal services complement and may be used in conjunction with the JAINIS system being developed at James Cook University for Grid enabled data access and management. The system has been designed to be applicable to conventional labs or major facilities.

(1) (a) Web Services: <http://www.w3.org/2002/ws/>

(b) Web Services Definition Language: <http://www.w3.org/TR/wsdl>

(2) Virtual Network Computing; <http://www.realvnc.com/>

(3) NoMachine (NX); <http://www.nomachine.com/>.

(4) I.M. Atkinson, D. du Boulay, C. Chee, K. Chiu, T. King, D.F. McMullen, R. Quilici, N.G.D. Sim, P. Turner, M. Wyatt. (2006) *CIMA Based Remote Instrument and Data Access: An Extension into the Australian e-Science Environment*. Proceedings of IEEE International Conference on e-Science and Grid Computing (e-Science 2006). December 2006. Amsterdam, The Netherlands.

(5) Asynchronous JavaScript Technology and XML (AJAX):

[java.sun.com/developer/technicalArticles/J2EE/AJAX/](http://java.sun.com/developer/technicalArticles/J2EE/AJAX/)

(6) Pushlets: [www.pushlets.com/site-main.html](http://www.pushlets.com/site-main.html)

(7) X3D: <http://www.web3d.org/>