

# TIME and DIME

## Supporting Natural Resource Modelling with .NET and Alchemi

NOTE: This is not an official document. Please contact the author ([joel.rahman@csiro.au](mailto:joel.rahman@csiro.au)) if you wish to cite the information contained herein.

Researchers at CSIRO Land and Water are using Microsoft .NET to develop and utilise an application framework for the creation of environmental simulation models, named TIME<sup>1</sup>. An extension to this framework, DIME, makes use of Alchemi to allow for the parallel execution of models across a network.

TIME is an application framework, which makes use of the reflection and custom attribute capability of .NET to support advanced 'model processing tools', such as numeric optimisers, model integration tools and user interface generators<sup>2</sup> (Rahman, et. al, 2004). TIME's ease of use and ease of learning are its principle advantages over other modelling frameworks. These advantages stem directly from the ability to write generic tools that interpret custom attributes and other reflected metadata, in order to reduce the number of tasks (such as IO or user interface development) that a model developer must undertake. TIME underpins the modelling effort of the Cooperative Research Centre for Catchment Hydrology, which uses TIME to deliver major components of the Catchment Modelling Toolkit<sup>3</sup> to community and industry stakeholders in Australia. TIME is in use by a growing community of model developers and researchers.

DIME is an extension to TIME that will allow the distribution of model execution using the Alchemi API. DIME is being developed by students from the University of Canberra's Software Engineering program and has three scheduled incremental releases in 2004. DIME addresses the problem of long runtimes, particularly during the numeric optimisation and sensitivity analyses of model parameters. Alchemi was chosen for the ease with which it allows .NET components to be distributed, both on local and wide area networks.

DIME has been designed as a bridge between TIME and Alchemi, requiring minimal changes to the underlying TIME framework. DIME components act as Proxies for equivalent components from the TIME framework. For example, the TIME component ModelRunner is responsible for executing a single simulation run of a model using reflection to feed data to the model from a variety of sources. DIME provides a grid-enabled proxy for ModelRunner, GridModelRunner, which implements a common interface, IModelRunner, and inherits from GridThread. This enables GridModelRunner to be substituted for the original, non-grid component, and allows applications to be easily reconfigured for standalone or grid execution.

---

<sup>1</sup> <http://www.toolkit.net.au/TIME>

<sup>2</sup> Rahman, J.M., Seaton, S.P. and Cuddy, S.M., Making frameworks more useable: using model introspection and metadata to develop model processing tools, Environmental Modelling & Software 19 (2004) 275-284

<sup>3</sup> <http://www.toolkit.net.au>

TIME and DIME will continue to play a pivotal role in a large investment in environmental modelling within Australia. Both systems contribute to the uptake of environmental models by stakeholders and decision makers, by making it easier to perform complex modelling operations, and by streamlining the process of incorporating new scientific understanding and data into modelling systems.

For more information, contact:

- Joel Rahman, Project Leader, CSIRO Land and Water, [joel.rahman@csiro.au](mailto:joel.rahman@csiro.au)
- Geoff Davis, Student Project Leader, University of Canberra / CSIRO Land and Water, [geoffrey.davis@csiro.au](mailto:geoffrey.davis@csiro.au)