Document Title	Project Plan for Work Package 1
Work Package No. and Title	WP1 - ACCESS Simulation and Modelling
Work Package Leader	Martin Dix
Work Package Description	Within the Climate and Weather Science Laboratory, the ACCESS Simulation and Modelling work package is to build, enhance and integrate ACCESS modelling infrastructure for the preparation and run of model experiments for climate and NWP research. This document describes the implementation of the work package's software and hardware infrastructure to support the use cases and goals within a framework designed for reproducibility, traceability, ease of use, support, and the sharing of code, data and experiments.

Revision history

Date	Version	Description	Author
16 May 2012	0.1	Initial draft of the implementation plan for work package 1	Dix
25 July 2012	0.2		Pugh
12 Aug 2012	0.3		Dix
19 Sept 2012	0.4	Update following feedback	Dix
14 Feb 2013	1.0	Revised milestone dates	Dix

Release history

Date	Version	Status	Audience	Approval
25 July 2012	0.1	Development draft	Work Package Leaders	Dix
14 Feb 2013	1.0	Update draft	Project Steering Board	Dix

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WP1 - ACCESS Simulation and Modelling Service

Introduction

The Australian Community Climate and Earth System Simulator (ACCESS) is a coupled climate and earth system model developed as a joint initiative of the Bureau of Meteorology and CSIRO in cooperation with the Australian university community through the Centre of Excellent in Climate System Science (COE). ACCESS is intended to be the national climate and earth system modelling infrastructure supporting research and operational needs from short term weather prediction through to century scale climate projection.

The ACCESS system consists of modules for observation processing, data assimilation and closely coupled model components for atmosphere, ocean, land surface, sea ice, and chemical and ecosystem modelling, It is designed to support weather and climate applications across all time scales.   (See Figure 1)
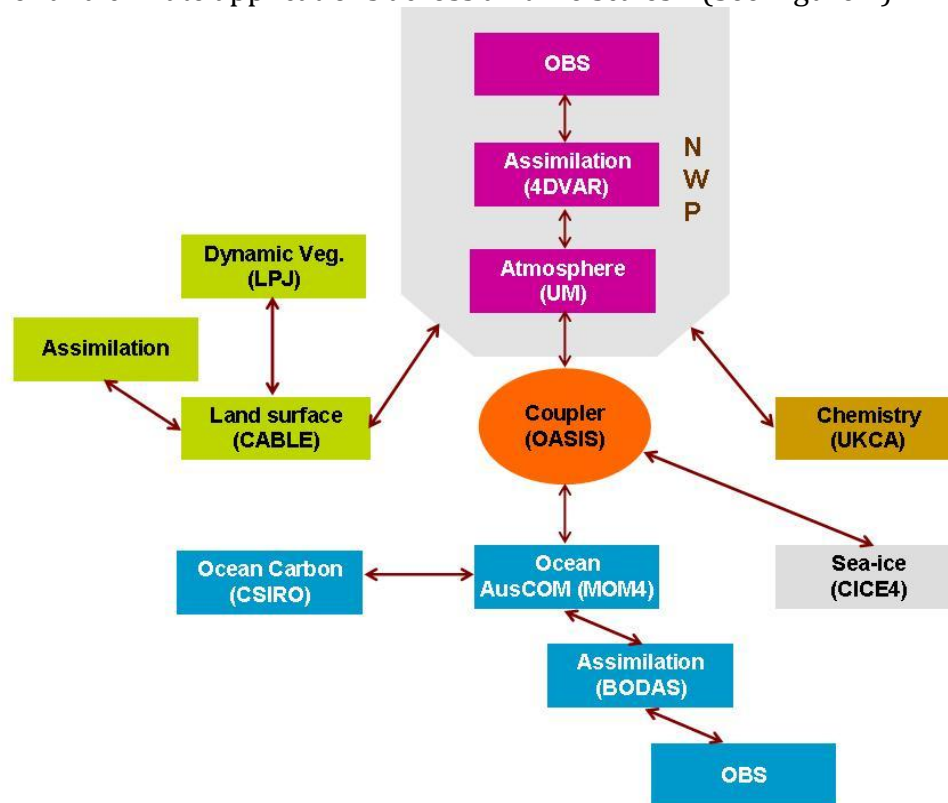

Figure 1: Schematic for the ACCESS system for climate and weather applications

The present ACCESS modelling infrastructure is based on the UK Met Office Unified Model infrastructure. This will be extended and enhanced to support the ACCESS earth system model for coupled climate and weather model applications. Substantial progress has been made towards providing and supporting a first

version of a shared infrastructure with systematic version control and documentation that can be utilised effectively by the entire ACCESS community at ANU/NCI.

This system now provides an infrastructure where researchers from different institutions are able to share model source code, experimental configurations, and data in a stable and well supported environment. The system provides the key ingredients necessary to run model simulations in a consistent and reproducible environment. These achievements have provided considerable value to those scientists who develop, run, and analyse data produced by the model.

However, at this time, the shared ACCESS modelling infrastructure only properly supports atmospheric climate configurations, not the complete coupled model or NWP configurations. A main goal of the ACCESS Simulation and Modelling work package is to extend this shared infrastructure to all configurations.

The ACCESS modelling infrastructure makes use of both the ANU/NCI and BoM high performance computing systems and job schedulers. The service produces a significant amount of data from experiments ranging from short single model runs simulating only a few days to complex ensemble modelling spanning hundreds of simulated years. A better interface of the model with the data library of work package 3 will improve data management and collaboration.
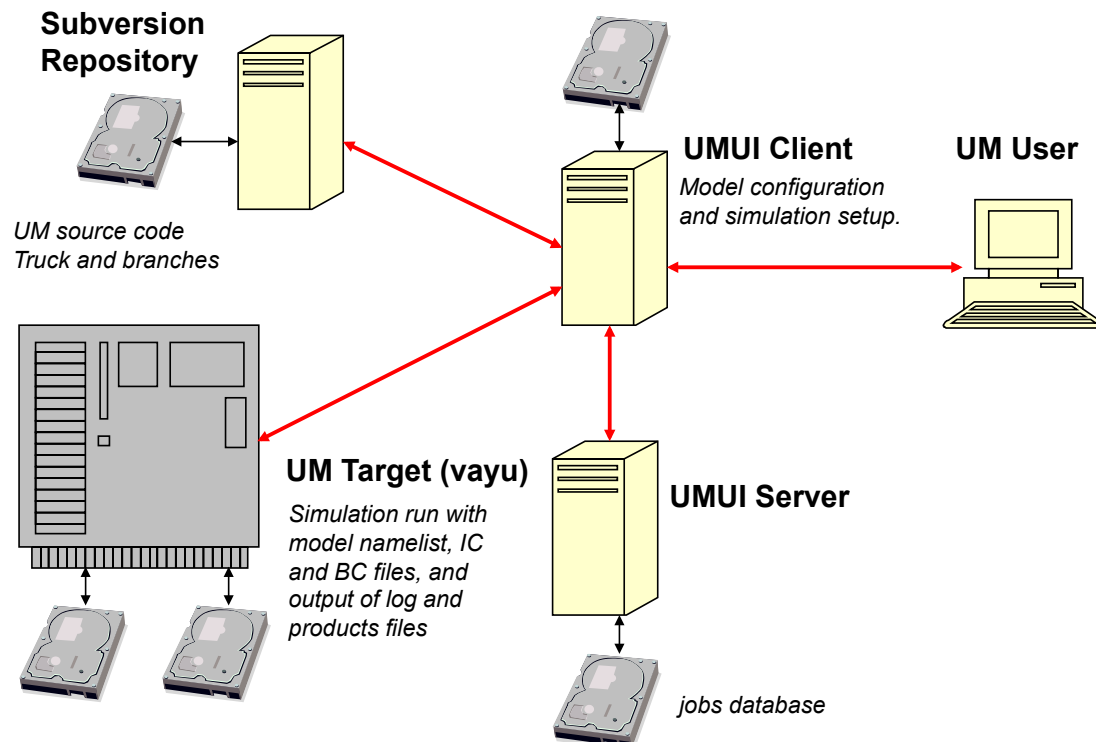

Figure 2: Diagram of ACCESS infrastructure architecture

Staff with Responsibility for Infrastructure

Staff Name	Location	Position	Duties and Roles	Funding source
Martin Dix	CSIRO, Aspendale	ACCESS IT Leader	Work package leader	In kind 0.20 FTE
Say Teong Ng	CSIRO, Aspendale	ACCESS Climate infrastructure development	ACCESS services and user interfaces	NeCTAR 1.0 FTE
Peter Uhe	CSIRO, Aspendale	ACCESS Climate infrastructure development	Post-processing integration	In kind 0.5 FTE
Ian Campbell	CSIRO, Aspendale	ACCESS Climate infrastructure development	User interfaces, post-processing integration	In kind 0.5 FTE
Hailin Yan	CSIRO, Aspendale	ACCESS Climate infrastructure development	Coupled model interface and scripting	In kind 0.15 FTE
Wenming Lu	BoM, Melbourne	ACCESS NWP infrastructure	Model preparation, scheduling and interfaces	NeCTAR 1.0 FTE
Asri Sulaiman	BoM, Melbourne	ACCESS NWP infrastructure	Model source code and build management	In kind 0.5 FTE
Zhihong Li	BoM, Melbourne	ACCESS NWP infrastructure	Data assimilation source code and build management	In kind 0.25 FTE
Yi Xiao	BoM, Melbourne	ACCESS NWP infrastructure	Data assimilation build and run management	In kind 0.25 FTE
Ilia Bermous	BoM, Melbourne	ACCESS NWP infrastructure	Model Infrastructure for high performance optimisation	In kind 0.25 FTE
Michael Naughton	BoM, Melbourne	ACCESS NWP infrastructure	Science leader	NecTAR 0.25 FTE
Robin Bowen	BoM, Melbourne	ACCESS NWP infrastructure	System environment and test case development	NecTAR 0.25 FTE In kind 0.25 FTE
Greg Roff	BoM, Melbourne	ACCESS NWP infrastructure	Test case development	NecTAR 0.25 FTE
David Smith	BoM, Melbourne	ACCESS NWP infrastructure	Test case development	NecTAR 0.25 FTE

Table 1: Key staff from participating organisations

Objectives

Recognizing the significant constraints on research staff and infrastructure, the implementation of the laboratory is intended to reduce the time spent on infrastructure issues by users through improvements to these key areas:

1. Design and re-use of modelling and analysis frameworks and toolkits;
2. Ease of use in interface designs;
3. Integration of services; and

4. Coordination and support of research users and services.

All proposal partners will provide ongoing coordination and support based on their capabilities from helpdesk support calls to software infrastructure bug tracking to building feature requests.

Inputs

The key software technology and infrastructure to be supplied by this work package are
- Met Office technical infrastructure (UMUI, fcm, ROSE, cylc)
- ACCESS climate and NWP model configurations
- ACCESS climate and NWP run systems (scripts etc)
- ACCESS post-processing and analysis tools

Data collections supplied include
- ECMWF and BOM analyses
- High resolution datasets for generating model ancillary files (orography, vegetation etc).

Outputs

The key software enhancements developed in this work package are
- A user interface for the ACCESS coupled model (both for existing ACCESS 1.0 and 1.3 CMIP5 versions and a prototype ACCESS 2), including integration of data conversion and basic post-processing
- A system for capturing and sharing coupled model experimental configurations
- Development of NWP systems using the new Met Office technical infrastructure

Key outputs with regard to service integration are
- A library of supported and documented model experiments
- Model output integrated with WP3 data catalogue
- Model input (e.g. ECMWF and BOM analyses) available from data catalogue
- Model analysis using tools from WP2
- System documentation accessible from WP4 laboratory portal.

Outcomes

The key outcome of this work package is to enable a qualified researcher (a climate or atmospheric scientist who does not necessarily have modelling experience) to prepare and run coupled and uncoupled model experiments within a framework

designed for reproducibility, ease of use, support, and sharing of code, data, and experiments.

However, experienced users who are currently working with the existing modelling system will also benefit from these developments.

Further outcomes are the following:
- More efficient use of shared resources
- Improved control of model and data provenance
- Enhancing possibilities for joint University/CAWCR research on a wider range of modelling

PROJECT APPROACH

The virtual laboratory infrastructure is organised into three principal services, which sit on top of domain specific frameworks and toolkits, and interact with supporting facility services. Future laboratory services are envisioned and would be integrated within the existing laboratory frameworks and services.

The three principal laboratory services and one supporting service are:
1. ACCESS Modelling and Simulation Service (Green boxes)
2. Model Analysis Service (Orange boxes)
3. Community Data Portal Service (Blue boxes)
4. Website and integrated services [Cyan boxes]
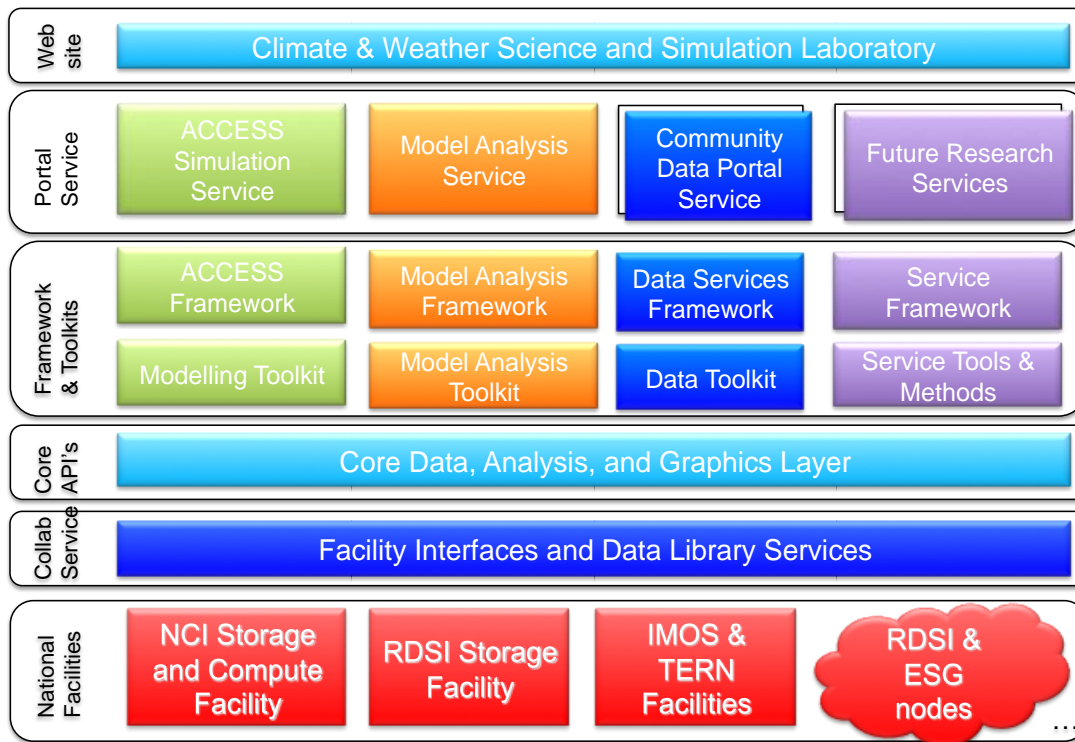
Figure 3: Diagram of laboratory services, frameworks, and integrations

A web interface will provide a common entry point to the laboratory's documentation and community research content and services. A common software layer below the service frameworks will provide for data interoperability and metadata standardisation, core analysis and graphics tools and libraries. Under this software layer is the laboratory services and facility interfaces to the storage infrastructure, compute infrastructure, and communications layers.

Staged Implementation Plan

The Work Package 1 project schedule has three phased releases. The table below outlines the high-level work tasks to be achieved in each release.

	WORK PACKAGE 1 – ACCESS MODELLING AND SIMULATION SERVICE
Phase 1 (Oct 2012 - May 2013)	1. (Oct 2012) Implementation Plan 2. Verification and validation infrastructure • Decide on configurations of interest for supported test cases. • Investigate options for a system to capture complete experimental state 3. Design coupled model user interface, including choice of subset of model parameters to be exposed and technology to be used 4. Determine requirements for model data interoperability for integration with data library services 5. (Apr 2013) Phase 1 testing and release 6. Support and training
Phase 2 (Mar - Aug 2013)	1. Verification and validation infrastructure • Set up library of supported test cases • Set up system for capturing complete coupled model experimental state 2. User interface • Extend existing atmospheric model user interface so it can control a complete ACCESS coupled model experiment (using the CMIP5 versions ACCESS 1.0 & ACCESS 1.3). Not all namelist variables of AusCOM, CICE and CABLE will be explicit in the UI, just those that CAWCR experience has shown to be commonly varied. 3. NWP research systems • An NWP suite control system[1] will be installed at NCI. • The full research NWP suites (OPS + VAR + model with suite control) will be installed at NCI. 4. Integration with data library services 5. (Jun 2013 and Sept 2013) Phase 2 testing and release 6. Support and training
Phase 3 (Sep 2013-Mar 2014)	1. Supported verification and validation experiments • Provide system and user support • Keep up to date with new source code versions 2. Complete coupled model user interface development • Integration of data conversion and post-processing in UI • Develop interface for a prototype "ACCESS 2" climate model using latest Met Office infrastructure release 3. NWP research systems • Develop NWP research systems based on latest Met Office infrastructure release • Make systems available for general use. 4. Modelling system integration with data library services 5. (Dec 2013) Phase 3 testing and release 6. (Mar 2014) Final testing and release 7. Support and training

Table 2: Work package project phases

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[1] BOM use SMS for operational suite control but are investigating use of cylc for research. The BOM research choice is most appropriate for NeCTAR.

Milestones and Timelines

Table 3: Milestones and acceptance tests

No.	Key Deliverables for each milestone	Acceptance Criteria	Date
4	Documentation describing WP1 implementation plan. Test cases for experiment library selected. Scope of coupled model user interface defined.	WP1-D1 (Project plan and use cases) WP1-D2-0 (Test cases selected) WP1-D3-0 (Define coupled UI scope)	28 Feb 2013
8	Prototype of the coupled model infrastructure for existing ACCESS climate configurations (ACCESS 1.0 and 1.3). Method of capturing experiment configuration determined. Requirements for model data interoperability defined.	WP1-D2-1 (Method of capturing…) WP1-D4-1 (Prototype of ACCESS infra..) WP1-D6-1 (Model data interoperability)	28 Feb 2013
12	Initial release of the ACCESS modelling infrastructure. Initial experiment library set up and documented.	WP1-D2-2 (First release of std tests) WP1-D4-2 (Release of ACCESS infra..)	31 Mar 2013
17	Initial release of coupled model user interface. Workflow scheduling working at NCI. NWP suite installed.	WP1-D3-1	1 Jun 2013
21	Coupled modelling suite and user interface complete. Workflow scheduling working at NCI. NWP suite installed. Experiment database for coupled model complete.	WP1-D2-3	1 Aug 2013
25	Release of latest Met Office infrastructure used in NWP configurations. Modelling simulation service available for general users.	WP1-D5-1	1 Dec 2013
	Release of model infrastructure for prototype "ACCESS2"	WP1-D4-3	1 Dec2013
30	Final release of the ACCESS modelling service for NWP, coupled modelling, and experiment library	WP1-D2-3, WP1-D3-2	31Mar 2013

Table 3: Milestones and acceptance tests

Key Deliverables and Acceptance Criteria

ID	Key Deliverables	Acceptance Criteria
WP1-D1	**Implementation Plan**	Documentation describing WP1 implementation plan
WP1-D2	**Model Experiment Library**	Library of standard test cases that covers surveyed range of user community interest.
WP1-D2-0	**a.** Survey of standard use cases from user community	Documented use cases for model experiment library. COE agreement on breadth of coverage.
WP1-D2-1	**b.** Method of capturing model experiment configuration	Documented method and plan for capturing model experiment configuration.
WP1-D2-2	**c.** Phase 1 standard test cases	First release of standard test cases. A qualified researcher can copy a standard test case

		and run the simulation. WP1-U1
WP1-D2-3	**d.** Phase 2 standard test cases	Second release of standard test cases. A qualified researcher can copy a standard test case, run the simulation and can test that results satisfactorily reproduce the benchmark results. WP1-U1
WP1-D3	**Coupled Model User Interface**	Functioning user interface allows a qualified researcher to configure and run a coupled model experiment. User interface input can be saved in experiment database and retrieved or copied at later time
WP1-D3-0	**a.** Define user interface scope	Document the scope of the user interface (which model parameters are included) and the technology to be used.
WP1-D3-1	**b.** Standard coupled model	**Use Case WP1-U3**: A qualified researcher can load a reference ACCESS CMIP5 coupled model experiment from the supported experiment library, undertake a test run and compare results against the archived standard.
WP1-D3-2	**c.** Standard coupled model	**Use Case WP1-U2**: Using the coupled model UI, a qualified user can modify a standard experiment (e.g. to use only natural forcing or only anthropogenic forcing) and perform a simulation.
WP1-D4	**Updated Met Office Technical Infrastructure**	Implemented and used in NWP experiment configurations and demonstrated in NWP model simulation use-case. WP1-U4,5
WP1-D4-1	**a.** Prototype of the ACCESS modelling infrastructure	Draft documentation and prototype of modelling infrastructure for ACCESS1.0 and 1.3.
WP1-D4-2	**b.** Release of the ACCESS modelling infrastructure	Final documentation and release of ACCESS modelling infrastructure (Use cases **WP1-U1-3).**
WP1-D4-3	**c.** Update of the ACCESS modelling infrastructure	Draft documentation and prototype of updated Met Office technical infrastructure
WP1-D4-4	**d.** Release of the updated ACCESS infrastructure	Final documentation and release of updated Met Office technical infrastructure and prototype ACCESS2 UI. **Use case WP1-U7**
WP1-D5	**NWP Research Systems**	Non-BOM users can run weather application system at NCI
WP1-D5-0	**a.** Document standard use cases from user community	Documented use cases for model experiment library
WP1-D5-1	**b.** Standard test cases from the NWP use cases	First release of standard test cases. A qualified researcher can copy a standard NWP test case and run the simulation and can reproduce the archived results. **Use case WP1-U4**
WP1-D5-2	**c.** NWP model experiment	**Use Case WP1-U5**: A qualified researcher can configure a high resolution limited area forecast experiment over Australia, matching the operational ACCESS city system. Initial and boundary conditions will be available within the laboratory.
WP1-D6	**Model Framework**	Functioning interface with scientific workflows, Data Services Framework and Data Library Services, and ability to re-publish all resulting model products.

WP1-D6-1	**a.** Model data interoperability defined	Documented model data interoperability such as CF meta-data conventions for model products.
WP1-D6-2	**b.** Phase 1 integration with services	Integration demonstrated in a model simulation run from NWP or Climate use-case. The data will get registered in the data catalogue, and will be discoverable in a web interface.
WP1-D6-3	**c.** Phase 2 integration with services	Integration demonstrated in a model simulation run from NWP or Climate use-case. The data will get registered in the data catalogue, and will be discoverable in a web interface. **Use case WP1-U2, 3**
WP1-D6-4	**d.** Phase 3 integration with services	Integration demonstrated in a model simulation run from NWP or Climate use-case. The data will get registered in the data catalogue, and will be discoverable in a web interface.
WP1-D7	**Model Toolkit**	Functioning model toolkit addressing typical scientist needs in model preparation and post-processing.
WP1-D7-0	**a.** Model toolkit functions defined	Draft document of model toolkit functionality and interaction with library data catalogue.
WP1-D7-1	**b.** Phase 1 release of model toolkit	Demonstrated in a model's pre- and post-simulation data processing for NWP and Climate use-case.
WP1-D7-2	**c.** Phase 2 release of model toolkit	Demonstrated in a model's pre- and post-simulation data processing for NWP and Climate use-case.
WP1-D7-3	**d.** Phase 3 release of model toolkit	Demonstrated in a model's pre- and post-simulation data processing for NWP and Climate use-case.
WP1-D8	**Support and Training**	Delivered through documentation, scheduled training sessions and helpdesk support (including training support staff)
WP1-D8-1	**a.** Phase 1 support services and training	Report on scheduled training sessions and helpdesk support. Demonstrate new support services.
WP1-D8-2	**b.** Phase 2 support services and training	Report on scheduled training sessions and helpdesk support. Demonstrate new support services.
WP1-D8-3	**c.** Phase 3 support services and training	Report on scheduled training sessions and helpdesk support. Demonstrate new support services.

Table 4: Key deliverables and acceptance criteria

Project Schedule and Timelines

The project's high-level tasks are shown below for each phase with their respective time lines indicating the amount of time for each task, and the respective month to start and end each task.

WP1 - Phase 1 Tasks (Oct 2012-May2013)	2012 Apr-Sep	2012 Oct	2012 Nov	2012 Dec	2012 Jan	2012 Feb	2012 Mar	2013 Apr	2013 May
1.1 Implementation Plan		▓		▓	▓				
1.2 Verification and validation infrastructure			▓	▓	▓	▓	▓		
a. Decide on configurations of interest, get consistent documentation			▓	▓	▓	▓	▓		
b. Investigate options for a system to capture complete			▓	▓	▓				

WP1 - Phase 1 Tasks (Oct 2012-May2013)	2012 Apr-Sep	2012 Oct	2012 Nov	2012 Dec	2012 Jan	2012 Feb	2012 Mar	2013 Apr	2013 May
experimental state			▓	▓	▓				
1.3 Design coupled model user interface		▓	▓	▓	▓	▓	▓		
1.4 Determine requirements for model data interoperability for integration with data library services					▓	▓	▓		
1.5 Phase 1 update							▓	▓	▓
1.5 Phase 1 testing and release								▓	▓
1.6 Support and training								▓	▓

Table 5: Work package 1 - phase 1 tasks

WP1 - Phase 2 Tasks (Mar 2013 – Aug 2013)	2012 Dec	2013 Jan	2013 Feb	2013 Mar	2013 Apr	2013 May	2013 Jun	2013 Jul	2013 Aug
2.1 Verification and validation infrastructure		▓	▓	▓	▓	▓	▓		
a. Setup library of supported test cases		▓	▓	▓	▓	▓	▓		
b. Set up system for capturing complete coupled model experimental state		▓	▓	▓	▓				
2.2 User interface - ACCESS coupled model experiment		▓	▓						
• Extend existing atmospheric model user interface		▓	▓						
2.3 NWP research systems									
a. The suite control system used by BOM research will be installed at NCI.	▓								
b. The full research NWP suites (OPS + VAR + model with suite control) will be installed at NCI.			▓	▓	▓				
2.4 Integration with data library services					▓	▓			
2.5 Phase 2 update							▓	▓	▓
2.6 Phase 2 testing and release							▓	▓	▓
2.7 Support and training								▓	▓

Table 6: Work package 1 - phase 2 tasks

WP1 - Phase 3 Tasks (Sep 2013-Mar2014)	2013 Sep	2013 Oct	2013 Nov	2013 Dec	2014 Jan	2014 Feb	2014 Mar
3.1 Supported verification and validation experiments • Provide system and user support • Keep up to date with new source code versions	▓	▓	▓	▓	▓		
3.2 Complete User Interface development	▓						
3.3 Met Office technical infrastructure update • Develop NWP research systems based on latest Met Office infrastructure release	▓						
3.4 NWP research systems c. Make systems available for general use.	▓			▓			
3.5 Modelling system integration with data library services	▓	▓	▓				
3.6 Phase 3 testing and release				▓			
3.7 Final testing and release			▓	▓			
3.8 Support and training		▓	▓	▓	▓	▓	▓

Table 7: Work package 1 - phase 3 tasks

Quality Control

A user-defined set of use-case scenarios and acceptance tests will be developed and met for each phase and milestone. The Project Manager and Work Package Leader will ensure user sign-off is obtained at each stage.

A role of the CoE CSS staff and community reference group is to review the work performed by work package teams and to provide feedback on the implementation with regards to fit-for-purpose, ease-of-use, and runtime issues as well as participation in user support.

These tools will be part of the regular work-flow within CAWCR and co-invested post-project maintenance will ensure quality of services and software is maintained.

Risk and Issue Analysis

The virtual laboratory project will employ the Bureau's project risk and issue management practices to document the uncertainty and dependencies in the project plan, the consequence on project deliverables, and mitigation strategies should the risk or issue arise. Risk management is an integral part of our process that facilitates effective and efficient planning and decision-making by explicitly addressing uncertainty.

The project manager and work package leaders will maintain a risk and issue management document throughout the project and periodically update the document as needed. These documents will be provided to the Project Steering Board during the life of the project.

The specific risks and issues for WP1 are shown in the table. For a more detailed risk analysis see the work package risk register document.

Risk ID	Description of Risk	Existing Controls Description (status)	Assessed Risk (**post**-control)
WP1-01	Loss of key staff leading to inability to meet milestones	Attempt to broaden team skills (**on-going**)	Significant
WP1-02	Reassignment of key staff to cover others areas in BOM or CSIRO due to other priorities	Ensure recognition by program management. Negotiate options. (**on-going**)	Moderate
WP1-03	Dependence on Met Office infrastructure developments. Delays could impact ability to meet milestones	Close collaboration with Met Office on testing and development (via TIDG).. (**on-going**)	Low
WP1-04	Change of alignment with Met Office technical development plans. At the moment there's an alignment between WP developments and work planned for Met Office TIDG as part of licence	TIDG work still under negotiation. Planning must take NeCTAR commitments into account. (**on-going**	Moderate

Risk ID	Description of Risk	Existing Controls Description (status)	Assessed Risk (**post**-control)
	agreement. If TIDG plans changed, existing resources could not meet both commitments.		
WP4-05	ANU/NCI provisioning of service node and storage. WP requires certain services from NCI to be able to meet milestones for development, uptake and utilisation and training.	Software development can proceed using vayu but usage for research is limited. Training would need to be delayed. (**on-going**)	Low
WP1-06	Dependency on WP3 data services for catalogue interface.	Liaise with other WP to ensure requirements are identified. (**on-going**)	Low
WP1-07	Dependency on WP4 integration services	Close communication with other WP leaders and teams through regular meetings and workshops. (**on-going**)	Low
WP1-08	Virtual Lab unable to satisfactorily meet use cases reducing utilisation and uptake.	Work closely with user community through COE to identify priority requirements. Regular feedback from release of prototypes for testing. (**on-going**)	Moderate

Table 8: Summary of the WP1 risk table

Standardisation and Interoperability

Project work will be aligned with Met Office technical infrastructure developments and Bureau research and operational systems. Interoperability will be maintained with Bureau and other community computing frameworks. Data will be written using CF and CMIP5 metadata conventions to support wide community use and to interoperate with the other work packages. We will use the NCI cloud services and standard database packages and revision control systems.

SERVICE AND SUPPORT

Schedule for Staged Deployment of Services

Milestone No.	Name of Service/Deliverable	Date of deployment for pilot use	Start date of trial period for production service	Date of deployment as production service
12	Model Simulation Service, ACCESS Experiment Library	31 Mar 2013	29 Nov 2013	31 Mar 2014
21	Model Simulation Service, ACCESS coupled modelling	1 Sep 2013	29 Nov 2013	31 Mar 2014
25,30	Model Simulation Service, ACCESS NWP system	1 Sep 2013	29 Nov 2013	31 Mar 2014

Table 9: Staged deployment of WP1 laboratory services

Operations and User Support

The development team will maintain and operate the software services during the development period (until end of 2013). Support staff in the later operational period will be determined at the end of the development phase. All services will run at NCI and the underlying infrastructure will be supported by NCI.
Operations support will be integrated with the NCI help service and ticketing system with the development team providing specialised support where required.

Software components like fcm, Rose, cylc etc are open source and supported by their own developers. All have a user community outside this project so we will not need to be primarily responsible for them.

Sustainability and Service Levels

The work package builds on tools that will be used operationally by the Met Office and Bureau of Meteorology and are expected to be well supported over the life of the laboratory. These are open source so can be extended and customised as required.

Services will use the NCI cloud infrastructure and will be monitored for availability, with a documented procedure for responding to issues. Development will take place in a separate environment so as not to affect normal usage.

The participant organisations will ensure laboratory services and software are operating for the life of the laboratory, and strive to achieve availability for at least 90% of the time.

Intellectual Property (IP), Licensing, and Access

Use of the Met Office Unified Model is subject to a research use licence agreement and this will also be required to use ACCESS within the virtual laboratory. Presently CAWCR and COE users are covered by the existing agreements. The Bureau of Meteorology is also authorised to issue a sub-licence to other Australian universities. The existing user interface is also covered by this licence. User authentication will be required to access material protected by this licence.

Use of the CABLE land surface component may require a separate research use agreement.

The new Met Office user interface components (FCM, Rose) are released under an open source licence, as is cylc, and all user interface components developed here would be similarly licenced.

Communications and Engagement

We will use a variety of communications mechanisms to engage with the user community. These include
- Virtual laboratory wiki and website
- Help desk support
- Meeting presentations, including AMOS 2013 and annual COE workshops
- Surveying priorities of potential users
- User training

Utilisation and Uptake

The utilisation and uptake by the research community will be measured through a number of methods such as number of laboratory users, web statistics, data access statistics, training participants.

- Use of the ACCESS model requires a registration process at NCI, so users can be easily counted and trends over time measured.
- The experiment database keeps track of all experiments developed and run so number of users and experiments can be tracked over time.
- web statistics (e.g. show number of visits to the virtual laboratory, the number of unique visitors, the quantity of activity within any service portal, and the number of data access requests).
- training participants (e.g. measure the number of training participants, the percentage of training participants using the system after training)
- data access statistics (e.g. the amount of data growth and published model data collections in the data library)
- laboratory usage and content creation

Constraints and Dependencies

The following significant licencing constraints have been identified:
- Constraints from licensing UK Met Office Unified Model software
- Constraints from licensing issues from CSIRO for CABLE.

The climate and weather science laboratory in general and the ACCESS Simulation and Modelling service in particular is critically dependent on compute and storage infrastructure provided by ANU/NCI.

The following significant project dependencies have been identified for WP1 service integration with the other laboratory services:

Work Package	Capability Required	Date first required	Milestone or Deliverable dependent on capability
WP3 – NCI	Facility services and APIs for user and project account authentication and	1 Mar 2013	Milestone no. 12, 17

Work Package	Capability Required	Date first required	Milestone or Deliverable dependent on capability
	information.		
WP3 – NCI VM provision	VM to support model UIs and job submission/control	1 Mar 2013	Milestone no. 12, 17
WP2 – workflows WP3 – OGC data services	WP1 data product compliance with CF meta-data conventions	1 Mar 2013	Milestone no. 25
WP4	Website framework		Milestone no. 12, 30 Deliverable no. WP1-D2

Table 10: Project dependency on other work packages

Up to March 2012, the Bureau of Meteorology has had the right to sublicense the Unified Model software to Australian Universities for research use, and this has been extended until the end of 2012. In February 2012, the Bureau was notified that the Met Office is going to change the Collaborative Agreement with the Bureau, and the Met Office indicates that it will be to our benefit. Therefore the authority to sublicense the Unified Model software is not expected to change. For proper risk management, this change has been noted.

External Party	Capability Required	Date first required	Milestone or Deliverable dependent on capability
UK Met Office	Stable release of new UM technical infrastructure	1 Dec 2012	Milestone no. 17, 25
UK Met Office	BoM's authority to sublicense Unified Model software for research use in Australia	1 Dec 2012	Milestone no. 17, 25

Table 11: External Party capability and dependency

Project Resource Requirements and Dependency

Resource	Capability Required	Date first required	Deliverable No. dependent on capability
User and project accounts	Project and staff accounts for WP1 at NCI	4 Oct 2012	All
File storage	Permanent file storage for ACCESS infrastructure and ancillary data files and source code repository	4 Oct 2012	All
SVN service	SVN service and storage for source code repository.	4 Oct 2012	All
Trac service	Trac wiki service and storage for bug/feature tracking	4 Oct 2012	All
Experiment database service	Database service to contain a catalogue of WP1 experiments	28 Feb 2013	WP1-D2
ACCESS service	Virtual host for ACCESS user interface and	31 Mar 2013	WP1-D3, D4, D5

Resource	Capability Required	Date first required	Deliverable No. dependent on capability
production server	X-Windows/VNC service Disk space requirement for source code extraction		
ACCESS service development server	Host for development of ACCESS services. Separate host required to reduce risk of development work interfering with existing services.	4 Oct 2012	WP1-D3, D4, D5
Scheduling service	SMS or cylc monitoring service to support ACCESS model experiments	31 Mar 2013	WP1-D3, D4, D5
Compute	HPC infrastructure for the WP1 simulation service including job scheduler. (Note that users bring their own project CPU and storage allocations)	4 Oct 2012	WP1-D3, D4, D5
RDSI data storage and request service	Dependency on NCI facility services to provide RDSI file storage and request service.	1 July 2013	Not required for deliverables but enhances usability and value of the service

Table 12: Project resource requirements and dependency

Out of scope

Access via a data catalogue to BOM analyses, model boundary conditions and other model output is required by WP1. However setting this up is the responsibility of the BOM NCI transfer project rather than this work package and is out of scope here.

Glossary for WP 1

ACCESS: Australian Community Climate and Earth System Simulator – modelling system suitable for climate and NWP applications. ACCESS1.0 and 1.3 are particular coupled model configurations used in CMIP5. In this document ACCESS2 refers to a prototype of the next standard coupled model configuration.

Ancillary file: Met Office term for an external model data file, e.g. land surface properties, aerosol emissions

CABLE: CSIRO land surface scheme – currently used in ACCESS1.0 and 1.3 configurations.

CMIP5: Coupled Model Intercomparison Project 5 – International project to coordinate the model input to the IPCC 5th Assessment

Cylc: A new application for control of an NWP suite developed by NIWA. Met Office intending to adopt this

ESG: Earth System Grid

FCM: Flexible Configuration Manager – Met Office tool for source code control and building models

NWP: Numerical Weather Prediction – process of generating forecasts with a model

ROSE: New Met Office model user interface tool, replacing UMUI

SMS: Application for control of an NWP suite, used operationally by BOM

svn: Source code revision control system

UM: Met Office Unified Model – the atmospheric model component of ACCESS.

UMUI: Unified Model User Interface – current UI for the UM