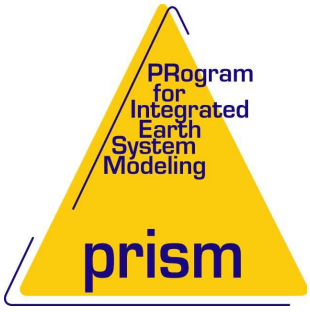
PRISM Support Initiative (PSI)



PRISM Support Initiative

3-year activity plan: 2005-2008

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PSI Management Report 1

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Contents

Chapter 1

Executive Summary

Recognising the need for a shared software infrastructure, the European Network for Earth System Modelling (ENES) organised the PRISM project, which gathered 22 partners and was funded by the European Union under the 5th Framework Programme (FP5) for 4.8 MEuros. In December 2004 at the end of its FP5 period, the project had produced a set of portable and flexible software tools for assembling, running, monitoring, and post-processing different Earth System Models.

In October 2004, a core group of PRISM participants decided to sustain the FP5 PRISM developments, investing their own resources into a shared software infrastructure, the PRISM Support Initiative (PSI). Today, the partners (CCRL-NECE, CERFACS, CNRS, ECMWF, M&D, and UK Met Office) and associate partners (MPI, SMHI, CGAM and computer manufacturers CRAY, NEC-HPCE, SGI[1]) are planning to invest a total of about 8 persons-years per year (py/y) for the next 3 years in the maintenance, support, and further development of the PRISM software. A proposal for a general structure for the PSI is described in another document[2]; more details on its general coordination and the organisation of its external relations can be found in section 2.

The current software includes the Coupler and I/O (see section 3.2), the Standard Compiling and Running Environments (see section 3.3), the Graphical User Interface and Web Services System (see section 3.4), and Diagnostic and Visualisation tools (see section 3.6). In recognition of the modellers needs, it is proposed to include additional aspects, in particular a Standard Version Control Environment (see section 3.5) and Data Management tools for data storage and archive (see section 3.6).

The tools and standards developed during the FP5 project are to be reviewed corresponding to the community needs and expectations. For this purpose, an audit will be realized in the next few months in the PRISM User community to evaluate the existing software and standards (see section 4). About 20 groups that have already used or tested the PRISM software tools will be interviewed to gather their experience, their ideas and requirements for future evolution. The results of this community review, available at the end of October 2005, may impact some of the work plans described below.

The scope of the Coupler and I/O workgroup is to maintain and support the OASIS3 coupler, widely used in the climate modelling community, finalize the development of the OASIS4 coupler, and give support to the emerging community of OASIS4 users. The OASIS3 and OASIS4 coupler are released with their respective coupling library, OASIS3 PSMILe or OASIS4 PSMILe, that can also perform I/O from/to disk files. A total of about 3 py/y is devoted to this workgroup, the main contributors being CCRL-NECE, CERFACS, and CNRS.

The Standard Compiling and Running Environments (SCE & SRE) workgroup intends to maintain the set of shell script based tools supporting the compilation and execution of coupled models, entirely developed during the FP5 project, and to extend them in terms of models, platforms, usage and functionalities. Other compiling and running environments will be reviewed to examine differences, advantages and drawbacks.

[1] Negotiations are underway with IBM and SUN.

[2] See http://cgam.nerc.ac.uk/pmwiki/uploads/PRISM/PSI_v1.0.pdf

About 1 py/y, mainly from M&D is devoted to these activities.

The main objective of the Graphical User Interface and Web Services System workgroup is to provide an efficient graphical tool for configuring coupled experiments using the OASIS3 or OASIS4 coupler, and to support a Web Services System (WSS) installation of the SCE and SRE on a Linux platform. These tools were originally based on ECMWF's PrepIFS and SMS tools, and ECMWF will provide the equivalent of 0.5 py/y for their maintenance and development.

The Standard Version Control Environment workgroup will review and develop standard procedures and tools for version control. The workgroup will focus on the development of tools to support software development and source and configuration management, and will define related policies and procedures to manage access control. These tools will be available for the development of the PRISM software but also for the development of the component models at the different institutions. A related issue that still has to be clarified is the role of the PSI repository: while a preliminary central repository for software tools and adapted models has been set-up during the FP5 PRISM project, it is still to be decided, in interaction with the PRISM User Group, if the PSI will support a repository (a) distributing the software tools only, or (b) the software tools with examples of (frozen) coupled climate models, or (c) the software tools with evolving state-of-the-art versions of climate component models from participating institutions. A total of about 1 py/y, mainly from the UK MetOffice, will be devoted to this workgroup.

The main objectives of the Data Management, Visualisation and Diagnostic workgroup are to support and extend the model data manipulation tools developed during the FP5 project for visualisation and diagnostics, but also to address data storage and archiving structures. Harmonisation on data and metadata structures and formats is required for networking with related but geographically distributed archives. A total of 1 py/y, mainly from M&D will be attributed to these tasks. Existing cooperation with BADC and MetOffice will be continued.

Finally, some efforts will also be devoted in organizing the interaction between the PRISM Team of software tool developers and the PRISM User Groups (PUG) including the model developers, as described in section 4.

The standardisation and portability of software used in the climate modelling community have already risen due to the exchanges favoured through the PRISM FP5 project and now maintained by the PSI. This also ensures that key European groups are involved in related international discussions on ESM software infrastructures. While the levels of commitment in the different tools are relatively balanced, it is recognized that the PRISM Team is currently maintaining and developing an important set of software tools with relatively limited amount of resources. This is the direct consequence of the PSI structure, which, as of today, merely combines different individual interests and voluntary efforts (e.g. CERFACS and CCRL-NECE interest to develop the Coupler and I/O, M&D interest to support the SCE & SRE, etc.). It is therefore probably not possible, even if it could be desirable, to concentrate the efforts of developments on a subset of tools in order to increase in particular the level of acceptance of these tools and related standards. However, the counterpart of this limitation is the PSI unique characteristic of being a distributed network of experts, maintaining strong links with the local community of users and thereby ensuring wide and rich interactions of local expertise for the long term benefit of all participating institutions.

Chapter 2

PSI General Coordination

The proposed PSI Coordinator is Eric Guilyardi (to be confirmed by the Steering Board on May 30th 2005).

2.1 Scope

1. Steering Board (SB) activities
   - Help Chair prepare for the SB meetings
   - Act as secretary to those meetings
2. Resource to coordinate non-technical activities such as:
   - General PSI coordination including internal communication (wiki, e-teleconferencing,...)
   - Coordination of bids for external funding
   - Outreach, community umbrella, relations with other projects (ESMF, FLUME, etc)
   - External communication (web site,...)

2.2 Tasks for 2005-2008

- 2005:
  1. Finalize set up of PSI (structure, SB) by summer 2005
  2. Ensure PRISM development priorities are agreed
  3. Ensure PRISM User Group is launched and audit is performed
  4. Establish community umbrella under WCRP jointly with ESMF
  5. Look out for FP 6 funding (ITS ?)
  6. Clarify links with ENSEMBLES, MERSEA, COSMOS
  7. Participate in FP 7 set-up and priorities
  8. Advertise PRISM (seminars, ...)
- 2006-2008:
  1. Assist SB activities
  2. Seek new partners
  3. Establish contact with IGBP
  4. Organise proposal for FP 7 funding

2.3 Milestones

- May 30th 2005: first SB meeting
- Autumn 2005: last FP 6 funding deadline (ITS)

2.4 People involved

- CNRS (E. Guilyardi): 0,3 py/y
- CGAM (R. Hatcher, K. Bouton): 0,15 py/y

Chapter 3

Developments of PRISM software tools

3.1 Introduction

Different software tools for Earth System Modelling are maintained, supported, and developed by the PRISM Team, subdivised into 5 workgroups, coordinated by the PRISM Team Technical Coordinator (TC). Sophie Valcke from CERFACS currently acts PRISM team TC (0,5 py/y).

Day-to-day coordination is based on telephone and e-mail exchanges; a wiki[1] has also been set-up and is currently maintained by CGAM. Monthly phone conferences and bi-annual meetings are also organized to ensure this coordination. The Technical Coordinator writes the minutes of these meetings which also constitute monthly reports to the Steering Board.

An important part of the PRISM software tools are built on the outcome of the PRISM FP5 project: this is the case for the Coupler and I/O (see section 3.2), the Standard Compiling and Running Environments (SCE & SRE, see section 3.3), the Graphical User Interface and Web Services System (GUI & WSS, see section 3.4), and the Data Diagnostic and Visualisation tools (see section 3.6). In addition, it is proposed to include a Standard Version Control Environment (SVCE, see section 3.5) and new Data Management tools, in particular regarding data storage and archive (see section 3.6). Aspects that must be covered in all developments such as standard definition process, quality control, portability, and performance, are not allocated to any particular workgroup. These aspects must be considered by each workgroup and coordinated by the PRISM Team TC when needed.

[1] A wiki is a web application that allows users to add content, as on an Internet forum, but also allows anyone to edit the content. The name was based on the Hawaiian term *wiki wiki*, meaning "quick" or "informal".

3.2 Coupler and I/O

Lead: CERFACS (S. Valcke)

3.2.1 Scope

The OASIS3 and OASIS4 couplers and associated coupling libraries are software allowing synchronized exchanges of coupling information between numerical models. The coupling library can also perform input and outputs from/to disk files (I/O).

The main objectives of the Coupler and I/O workgroup are maintain and support the OASIS3 coupler, continue the development of the OASIS4 coupler and give support to the groups that started using OASIS4.

3.2.2 Summary of current achievements

The OASIS3 and OASIS4 couplers, developed in the framework of the EU FP5 PRISM project, are software allowing synchronized exchanges of coupling information between numerical models representing different components of the climate system ([1], [2]).

OASIS3 is the direct evolution of the OASIS coupler developed since more than 10 years at CERFACS. Portability and flexibility are OASIS3 key design concepts. At run-time, OASIS3 acts as a separate mono process executable, which main function is to regrids the coupling fields exchanged between the component models, and as a library linked to the component models, the OASIS3 PRISM Model Interface Library (OASIS3 PSMILe). OASIS3 supports 2D coupling fields only. To communicate with OASIS3, directly with another model, or to perform I/O actions, a component model needs to include few specific PSMILe calls. OASIS3 PSMILe supports in particular parallel communication between a parallel component model and OASIS3 main process, based on Message Passing Interface (MPI), and file I/O, using the GFDL mpp_io library. OASIS3 has been extensively used in the PRISM demonstration runs and is currently used by approximately 10 climate modelling groups in Europe, USA, Canada, Australia, India and Brasil.

As the climate modelling community is progressively targeting higher resolution climate simulations run on massively parallel platforms with coupling exchanges involving a higher number of (possibly 3D) coupling fields at a higher coupling frequency, a new fully parallel coupler OASIS4 has also been developed within PRISM. The concepts of parallelism and efficiency drove OASIS4 developments, at the same time keeping in its design the concepts of portability and flexibility that made the success of OASIS3. During the run, OASIS4 Driver extracts the configuration information defined by the user in XML files and organizes the process management of the coupled simulation. OASIS4 Transformer performs, in a fully parallel mode, the regridding of the coupling fields. OASIS4 supports 3D and 2D coupling fields. To interact with the rest of the coupled model, the component models have to include specific calls to the OASIS4 PRISM System Model Interface Library (OASIS4 PSMILe), which, at runtime performs fully parallel MPI-based exchanges of coupling data including automatic repartitioning, either directly or via additional Transformer processes, and file I/O using the GFDL mpp_io library. OASIS4 portability and scalability have been demonstrated with different ”toy” models and OASIS4 has also been used to realize a coupling between the MOM4 ocean model and a pseudo atmosphere model.

The OASIS4 PSMILe Application Programming Interface (API) was kept as close as possible to OASIS3 PSMILe API. This should ensure a smooth and progressive transition between OASIS3 and OASIS4 use in the climate modelling community.

3.2.3 Tasks for 2005-2008

For OASIS3:

- Provide user support
- Include minor improvements and bug fixes and release new versions when needed.

For OASIS4:

1. High-priority developments
   - Evaluate tools other than CVS for OASIS4 source management and software development in interaction with SVCE workgroup.
   - Regridding:
     - Validate interpolations currently implemented (2D and 3D nearest-neighbour, bi/trilinear)
     - Implement 2D1D interpolation
     - Implement bi/tricubic interpolation
     - Implement 2D conservative regridding
   - Improve Transformer efficiency
   - Implement parallel IO mode (use of parNetCFD)
   - Adapt OASIS4 to PRISM SCE
2. Medium-priority developments
   - Develop, release and support an example coupled model, based on pseudo component models
   - Develop new PSMILe routines to access SCC and SMIOC information directly by the model
   - Develop new PSMILe routine to access calendar information directly by the model
   - Support calendars other than proleptic Gregorian
   - Support bundles, subgrids, vectors, and bundle of vectors
   - Add coherence checks in the Driver
   - Implement non-blocking sending and receiving routines
3. Low-priority developments
   - Support types of exchange dates other than fixed frequency
   - Test use of ESMF calendar tool
   - Support stand-alone models
   - Add monitoring functions
   - Implement additional regridding schemes (3D conservative remapping, user-defined 3D and 2D remapping, 1D)
   - Support coupling field combinations
   - Support unstructured grid
   - Support grid evolving with time (horizontally and/or vertically)
4. Provide user support
5. Development of XML standard for code description and configuration, in interaction with PRISM User Group and international community (ESMF, etc.)

3.2.4 Milestones and deliverables

OASIS3:

1. August 2005: release new version containing actual minor improvements and bug fixes.
2. August 2006: release new version containing actual minor improvements and bug fixes.
3. August 2007: release new version containing actual minor improvements and bug fixes.

OASIS4:

1. March 2006: release new version containing high-priority developments (see above)
2. March 2007: release new version containing medium-priority developments (see above)

3.2.5 People involved

- CERFACS (S.Valcke): 0,1 py/y until August 2005, 0,4 py/y after that
- CCRL-NECE (R. Redler, H. Ritzdorf): 0,8 py/y
- CNRS (J.Ghattas): 1 py/y
- NEC-HPCE (T. Schoenemeyer): 0,2 py/y
- SGI (R. Vogelsang): support and bug fixing for mpp_io
- SMHI (U. Hansson, Ralf Döscher): 0,2 py/y
- CRAY (C. Henriet): 0,125 py/y

3.2.6 Interactions with other PSI activities

- SCE & SRE workgroup: adaptation of OASIS4 to PRISM SCE
- GUI & WSS workgroup: interaction for GUI development
- SVCE: Evaluation and use of tools other for OASIS4 source management and software development

3.2.7 Particular issues

During the first year, the community of OASIS4 users will be restricted to the GEMS community (3D coupling between atmosphere and atmospheric chemistry models), to SMHI (regional coupling), and to IFM-GEOMAR (OASIS3 and OASIS4 interfcacing in OPA9 and use of OASIS4 with pseudo models to interpolate high resolution data onto high resolution model grids). After that, OASIS4 will be released to a larger community.

3.3 Standard Compiling and Running Environments (SCE & SRE)

Lead: M&D (S. Legutke)

3.3.1 Scope

The scope of this workgroup is to maintain the Standard Compiling and Running Environments (SCE & SRE) developed within PRISM, and to extend them in terms of models, platforms, functionalities, and ease-of use.

3.3.2 Summary of current achievements

The SCE/SRE have been developed to provide a software infrastructure to the European Earth system modeling community for compiling and executing coupled models.

The environments are used presently by scientists and programmers at: Max Planck Inst. for BGC, Jena, D; Max Planck Inst. for Met., Hamburg, D; Inst. for Oceanogr., GEOMAR, Kiel, D; Inst. for Oceanogr., Univ. Hamburg, Hamburg, D; GKSS, Geesthacht, D; IPSL, Jussieu, Paris, F; KNMI, Utrecht, NL; Cerfacs, Toulouse, F; INGV, Bologna, I; Martin Ryan Institute, Univ. of Ireland, Galway, IR; Inst. Meteorol., Univ. Bonn, D.

The SCE & SRE toolbox, based on shell scripts, has been adapted to NEC SX, SGI, IBM, CRAY, Linux, and VPP platforms.

The development of the shell script version was done with the goal to:

- accommodate all Earth System climate research component models;
- provide a common look&feel to the user with all models and on all platforms;
- keep the system and its operating as simple as possible;
- minimize the changes required in the component model codes for the adaptation to the SCE & SRE;
- allow flexible exchange of components in coupled constellations;
- maximize safety for the user;
- minimize maintenance for the software support team by:
  - minimizing redundant code,
  - providing tools for analyses,
  - enable automatic processing;
- allow to interface with the PRISM GUIs.

The SCE & SRE are documented in the PRISM reports [3] and [4].

3.3.3 Tasks for 2005-2008

With the above summarized philosophy kept in mind we propose classes of activities as listed below. The activities are called standing activities (StA) if they are triggered by requirements from the user community; these cannot be dated or detailed.

During the PRISM project development phase, the main issue was to develop a portable compiling and running infrastructure that can accommodate all models of interested groups. Emphasis has been put also on safety for the user. The possibility of misoperating has been minimised. It is now desirable to investigate how the performance of the infrastructure system can be improved, and to give additional user support both for setting up experiments and for model development. Task 4.1-Task 4.3 below are referring to the performance aspect, and Task 4.4 to the user support aspect.

StA 4.1 Upgrade the SCE/SRE to accommodate new component models

Any model that expresses interest to be adapted to the SCE/SRE is first examined whether it fits into the systems or not. If not, it is then examined whether the model should be modified or the environments. This is done in close cooperation by the PSI team member in charge and the model user or developer.

For any necessary extension of the SCE/SRE, it is examined whether a unified formulation can be found for all model and platforms. Model and platform specific formulation are kept at a minimum. All models in the PRISM system have to be tested with the new formulation, if possible on all PRISM platforms.

No regional model has been adapted to the system so far. Whereas the SCE should meet the demands of regional models, the adaptation of regional models to the SRE requires adjustments of the environment and is a major task (3D forcing data needs to be provided).

StA 4.2 Acceptance in the user community

A standing activity is to further increase the acceptance of the SCE & SRE within the climate research community. This requires individual support and advice on the usage of old and new features of the environments. The handbooks on the SCE & SRE ([3], [4]) will be upgraded regularly, and the corresponding web pages are maintained. An important aspect is to keep the SCE & SRE upward compatible with the adaptation effort already done by the modelers. Any model adapted to any aspect of the SCE & SRE will remain so for any new feature.

Acceptance by the user community also depends on the ease of use of the SCE & SRE. In this respect important issues are (roughly ordered by priority):

- Minimum impact on the component models: The impact on the component model source codes must be kept as small as possible. This has to be balanced with keeping the SCE & SRE simple.
- A modular design: It is possible to use the SCE without using the SRE and vice versa. Besides, it is possible to use any other tools separately (e.g. the dependency checker for Makefile generation). We will continue to enable the usage of single aspects of the system, by keeping a layered structure with each layer being independent from the others. On the other hand, it is shall be possible to use SCE & SRE including the GUIs as one tool and therefore interfaces between the different layers have to fit together. This design will be kept for the future developments.
- Interface with the PRISM GUIs: the SCE & SRE can be used with or without the GUI. This was enabled for all PRISM models (per definition, those which have been adapted to the PRISM software and infrastructure during the PRISM project) at the end of the PRISM project phase, but not for all PRISM platforms. The SCE & SRE shell script toolbox and the GUI system will be kept compatible (see section 3.4).
- Easy adaptation: if time allows, customizing the SCE & SRE for new applications or platforms will be further simplified. At the same time, the possibility of misoperating has to be minimized.

StA 4.3 Review of existing compiling and running environments

There exist other compilation and running environments within the European climate modeling community. To mention are the FCM (Met Office) and ECMWF environments. It is a standing action of the work group to review these environments, and to find out differences, advantages and drawbacks of the different environments, as well as possible fields for cooperations. It is an aim to develop the environments into the same direction.

Task 4.1 Parallel compilation

The increase in complexity of component models leads to an increase of the time needed for compilation. Thus parallel compilation becomes an issue. A report will be provided evaluating existing

solutions on the PRISM platforms. This requires collaboration with people having access to diverse platforms (NEC SX, SGI, VPP, CRAY, Linux, ...). Only portable solutions will be considered for implementation into the SCE & SRE.

Task 4.2 Shared usage of precompiled code

The usefulness of shared usage of precompiled code was pointed out by the UK Met Office infrastructure requirements. For codes configured by the use of cpp flags (controlling conditional compilation), this requires that the (g)make related part of the SCE is enabled to detect changes of that code due conditional compiling and to react appropriately (i.e. trigger the minimum of activity).

Task 4.3 Increased automating of the SCE

1. enable the 'Dependency checker' to work for the libraries as well
2. enable automatic generation of Makefiles (model Makefiles and full library Makefiles)

Task 4.4 Browsing software

The source code of a coupled model and of the libraries it uses, is spread over several directories. To facilitate viewing a model's source code it is planed to develop source code browsing tools embedded in the PRISM environments.

Task 4.5 Pre- and postprocessing

So far, postprocessing is supported for the ECHAM5 model output, only. The model brings it own postprocessing tools. We plan to integrate the tools provided by DMDV workgroup (see section 3.6) into the SRE to create a flexible pre- and postprocessing environment. Preprocessing becomes especially important for regional models as preprocessed forcing data must be provided.

Task 4.6 Graphical quality control of experiments

Graphical views of running experiments shall be provided for quality control. It is planed to integrate visualization tools developed in DMDV workgroup (see section 3.6) into the SRE. This allows the scientist to view time series and snap-shots of significant quantities automatically updated while the experiment progresses.

Task 4.7 Access to the climate data base

Within the PRISM project phase initial data was provided from a central CVS server. This is not satisfying for production runs. We plan to make a climate data base accessible from the SRE. This allows for automatic retrieval of initial and forcing data as well as for output archiving.

3.3.4 Milestones and deliverables

The time that can be spend for further development of the SCE & SRE highly depends on the effort needed for the standing activities StA 4.1 and StA 4.2. Besides, some of the tasks highly depend on input given from other working groups. Within the next years, it might turn out that other aspects of the SCE & SRE, not listed in the work plan, need further improvement. For these reasons it is impossible to define fixed deadlines for the specific tasks. The dates listed below must be interpreted as a rough estimation.

1. M1 (July) Report on possible solutions to Task 4.1
2. M2 (End of 2005) Simple postprocessing tools for all model output in NetCDF format should be integrated in the SRE (Task 4.5). More complex features will be included later on.
3. M3 (End of 2005) Online visualization of running experiments (Task 4.6).
4. M4 (End of 2005) A connection to a data base should be integrated to the SRE to provide input data.
5. D1 (End of 2005) A SCE based on shell scripts that works as described in Task 4.2

3.3.5 People involved

- M&D:
  - S. Legutke: Total involvement in PRISM is 0,25 py/y. Activities in this workgroup: Lead; SCE upgrade according the requirements of models; StA 4.1, StA 4.2, StA 4.3, Task 4.1-Task 4.3
  - V. Gayler: Total involvement in PRISM is 0,75 py/y. Activities in this workgroup: SRE upgrade according to the requirements of models; StA 4.1-StA 4.3, Task 4.4-Task 4.7
- CERFACS:
  - S. Valcke: review of the UK Met Office compile system; StA 4.3
- CNRS:
  - M.-A. Foujols: review of the UK Met Office compile system; StA 4.3
- ECMWF:
  - N. Wedi: comparison of the PRISM, FCM and ECMWF compile systems; StA 4.3

3.3.6 Interactions with other PSI workgroups

- Coupler and I/O: The inclusion of OASIS4 and its applications into the SCE & SRE will probably require an upgrade of the SCE & SRE beyond the simple extension for new models.
- GUI & WSS: All new functionalities (including new models) of the SCE & SRE should be tested with the GUI system and made compatible.
- SVCE: Version control is an important issue for the SCE as well as for the SRE.
- DMDV: The postprocessing and graphical tools used for Task 4.5 and Task 4.6 are developed in this workgroup ; Task 4.7 needs close cooperation with DMDV workgroup.

3.3.7 Particular issues

- The GEMS project community has expressed interest to use the OASIS4 coupling software for the IFS/CTM interaction. The community will be invited and supported to do this in the SCE & SRE infrastructure as far as possible.
- IPCC experiments with regional models (CLM) will be performed at the MPI in Hamburg. Support will be given to do that in the SCE & SRE infrastructure as far as possible.

3.4 Graphical User Interface and Web Services System (GUI & WSS)

Lead: ECMWF (N. Wedi)

3.4.1 Scope

More details on the Graphical User Interface and Web Services System can be found in [5].

The GUI allows the user to prepare coupled experiments by visualisation, in a user friendly way, of standardised configuration data defined in XML repositories that would otherwise be too complex to manipulate for modellers.

It does this by means of a configuration process consisting of three basic phases:

- The **definition phase** comprises the definition of all component models to be coupled (model interfaces and metadata - PMIOD), transformation entities, I/O options, post-processing options, diagnostic options, statistic options, etc.
- During the **composition phase**, the PRISM user sets up a specific coupled experiment through the user interface by:
  - selecting individual model components to couple,
  - configuring the constitution of each individual model component (Specific Model Input and Output Configuration - SMIOC),
  - composing the coupling configuration (Specific Coupling Configuration -SCC),
  - selecting other pre-/post-processing options,
  - selecting the site and computing resources to use.
- During the **deployment phase**, an abstract compact description of an experiment is generated. This is defined as a configuration instance. A configuration instance details how to run the coupled experiment on a computer in a format, that can be understood by the computer's operating system. Further, it contains information on the coupling communication between models and the internal communication of each model component on the chosen platform. Consistency checking before deployment ensures a correct configuration for each task.

The configuration instance instruments the SCE and SRE which executes the experiment under the supervision of SMS (Supervisor Monitor Scheduler). The experiment execution progress can be monitored through the WebCDP GUI, a client to SMS, which uses a system of colour coding to graphically visualise the status of the individual tasks of the experiment. Each task's status can be manipulated through the GUI. The GUI components can be run locally from the command line or be accessed from a web browser to achieve a complete Web Services System for remote configuration, monitoring and execution of coupled climate experiments.

The main objectives of the GUI & WSS activities are to:

- provide an efficient and usable configuration tool for coupling experiments using the OASIS coupler;
- support a Web Services System (WSS) installation of the PRISM Standard Compile Environment (SCE) and PRISM Standard Running Environment (SRE) on a Linux platform;
- maintain a reference version of the WSS system at ECMWF on the platform used for IFS.

3.4.2 Summary of current achievements

The PRISM installation package

As a result of the PRISM project, a PRISM WSS installation package exists that allows for a number of "toy" models coupled with the OASIS3 coupler to be built by the Standard Compile Enviroment and

executed by the Standard Run Environment and configured using the GUI. This system requires a basic Linux PC and can be installed without system expertise.

OASIS4 configuration module

A prototype OASIS4 configuration module has also been developed using the PMIOD and SMIOC standardised XML meta data files. This module enables the climate modeller to visually compose a coupled configuration ensuring that a number of complex requirements are met automatically and removing the need for understanding of the complex XML structures that are used to describe the configuration.

Refence implementation of Web Services System

A test implementation using the PRISM installation had been installed in Hamburg and a reference installation of a complete Web services system (WSS) is being maintained at ECMWF.

3.4.3 Tasks and sub-tasks for 2005-2008

Permanent tasks

- Bug fixing in the developed software.
- Liaison with the SCE & SRE workgroup regarding changes that will affect the WSS.
- Liaison with the Coupler and I/O workgroup regarding changes that will affect the OASIS GUI.
- Support the reference installation at ECMWF.
- Support the installation package with updates to the software.
- Support the installations of new PRISM sites.

Development tasks

- To develop extensions to the GUI needed to support the OASIS4 coupler, for example:
  - Integration of analysis of the XML file describing an application
  - Flexible SCC generation
  - Enhancement of visual coupling
  - Integration of the PMIOD into prepIFS rules database.
- To improve/enhance the GUI with new features requested by the user group.

Possible additional tasks

The coming years will see the following activities taking place:

- The incorporation of new models into the PRISM system trough the GEMS project and by others.
- Rapid development of GRID computing and related standards.
- Further development of meta data specifications for coupling and possibly also for the PRISM models themselves.
- Increased activity in the area of collaboration with other groups/standards.
- The creation of new PRISM sites as the project matures.

In view of the above mentioned activities the permanent tasks will take up the majority of the resources during 2005, 2006 and 2007. The development tasks will be driven by user requests and demands for new functionality as well as keeping the existing system in line with upcoming and changing standards.

3.4.4 Milestones and deliverables

Now – Jan 2006

- May 2005: new release of prepIFS supporting visually enhanced configuration change tracing.
- June 2005: final testing phase for the OASIS4 GUI module. information.
- September 2005: Web enabled access to the OASIS4 configurations in the referece implementation at ECMWF.
- November 2005: WebCDP access enabled in the reference system at ECMWF.
- January 2006: PRISM installation package updated with new functionality.

3.4.5 People involved

ECMWF (C. Larsson, N. Wedi, K. Mogensen): 0.5 py/y

3.4.6 Interactions with other PSI workgroups

- Coupler & I/O : Follow the evolution of the PMIOD and Coupler.
- SCE & SRE : Integration of new input parameters to models in the GUI; support for writing GUI configuration files; support for SMS task creation.
- DMDV : Support in creation of GUI meta data and SMS tasks

3.4.7 Particular issues

The GEMS project will provide a good testbed for the usability of the GUI and the connection with the coupler. It will also drive the integration of the GUI and the Coupler with the SRE & SCE. The reference system will need this capability in summer of 2006.

3.4.8 Conclusions

There are many forces that will drive the development of the Coupler and the GUI over the next years. This period will be crucial for the acceptance of the GUI and we must concentrate our effort to provide the functionality and usability needed.

3.5 Standard Version Control Environment (SVCE)

Lead: UK Met Office (M. Carter)

3.5.1 Scope

The Version Control workgroup will review and develop procedures and tools for version control of the software in PRISM. This includes the following:

1. Provision of a central repository for PRISM software and related policies and procedures
2. Tools to support software development
3. Tools to support configuration management of models
4. Policy and solutions to manage access control
5. Solutions for the problems of Version Control in a distributed development environment

3.5.2 Summary of current achievements

Within PRISM, a CVS server has been set up and maintained, with a mirror server for backup purposes. This CVS server distributes the PRISM software tools and example coupled models based on adapted component models. Naming conventions (release tagging) and processes have been devised to allow well defined codes to be provided by the CVS server. Basic integration between the repository and the SCE has been developed. It should be noted that the primary server at bedano will need to be relocated.

An important related issue that needs to be clarified is the role of the PRISM repository: it is still to be decided, in interaction with the PRISM User Group, if the PSI will support a repository (a) distributing the software tools only, or (b) the software tools with examples of (frozen) coupled climate models, or (c) the software tools with evolving state-of-the-art versions of climate component models from participating institutions. The effort to devote to tasks 5 and 6 below strongly depends on the conclusion on this issue.

3.5.3 Tasks and sub-tasks for 2005-2008

1. To seek PSI acceptance of the Met Office analysis that Subversion, the version control tool, used in conjunction with the Trac system for change request management, is the best open source tool for Version Control available now and a good choice for development and a strategic direction for PRISM.
2. The Met Office work to develop a process and supporting scripts around Subversion that is particularly aimed at the software development process and the management of developed scientific configurations (rather than the lodging of released versions of PSI codes). This development, at the Met Office, is the Version Control part of the Met Office FCM project that will also includes a new compile system. Here we call the Version Control part of the project FCM(VC). This project will deliver documentation and prototype software and proposed naming conventions for Version Control by end July 2005 with some information available for review before that date. This tool will be available for the development of the PRISM software but also for the development of the component models at the different institutions.
3. The CVS server at Bedano (currently mirrored at M&D) will be changes to a Subversion and moved to M&D simultaneously and at a time to be announced.
4. PSI groups will be encouraged to act as beta-testers for FCM(VC) both for PSI infrastructure development (like the coupler) and for supporting live models at the own institutions. The Coupler development group have agreed to act as beta-testers for Subversion and/or FCM(VC).
5. The workgroup will devise a policy and supporting processes for software access control (who can have access to which models, how to get the access, how uploading is done).

6. After we have we gain experience with Subversion and the FCM(VC) scripts and processes, the team should meet and design a process to deal with distributed development, specifically multiple repositories, and the possible replacement of the CVS server.

3.5.4 Milestones and deliverables

- July 2005: Met Office provide prototype FCM(VC) and associated documentation for review.
- August 2005: Subversion based repository at M&D. Date to be defined as no experience of Subversion within the project yet.
- September 2005: Policy for software access control with associated work plan.
- December 2005: Analysis of the distributed development requirement with discussion of options.

3.5.5 People involved

- UK MetOffice (M. Carter for planning; D. Matthews and FCM(VC) team for FCM(VC) development and support): 0.85 py/y
- M&D (V. Gayler for repository development and integration with SCE): 0,1 py/y
- CCRL-NECE (R. Redler), CERFACS (S. Valcke), CNRS (M.-A. Foujols), ECMWF (N. Wedi), M&D (S. Legutke): Review and tests

3.5.6 Interactions with other PSI activities

1. No explicit action is planned for the integration of FCM(VC) with the SCE because:
   - The current SCE was not tightly coupled with the current Version Control system (CVS).
   - There are no plans within the SCE project to increase the coupling between the SCE and Version Control.
   - The FCM(VC) system was modularised with respect to any compile system via the extraction system. The SCE could use the extraction system of FCM(VC) or directly extract the sources to compile from the repository.
2. Interaction with GUI&WSS workgroup for possible integration of FCM(VC) in GUI: setting up jobs through a user interface is a type of configuration management and integration with software version control would have a lot of advantages. The FLUME project is also likely to look at this topic at some time.

3.6 Data Management, Diagnostic and Visualisation (DMDV)

Lead: M&D (J. Wegner)

3.6.1 Scope

The main objectives of the Diagnostic and Visualisation subgroup are to select, watch, tryout, develop and provide tools for model data manipulation based on the results from the PRISM project.

The main objectives of the Data Management subgroup are to define scientific data management within PRISM and to prepare PRISM data archives for networking with related but geographically distributed archives. Agreements on data storage formats, metadata models, data storage structures and data archives federation architectures have to be obtained.

The Data Management subteam, which integrates new aspects to the PSI environment works in close cooperation with the Diagnostic and Visualisation subteam, which contributes to the maintainance of results from the EU project PRISM.

3.6.2 Summary of current achievements

More details on the PRISM Diagnostic and Visualisation tools can be found in [6].

There was a decision in PRISM to use CDAT/CDMS for "Low End Graphic", VTK and OpenDX for "High End Graphic" and COCO for diagnostic. A additional tool for diagnostic worth to be watched is cdo, a developement from MPIHH that works with NetCDF and GRIB formatted files.

Prototypes of the integration of data processing and data storage structures have been developed for M&D's PRISM installation (IMDI : Integrated Model and Data Infrastructure):

- A prototype quick-look facility (LE-Graphics) for key variables is available from the PRISM project.
- The automatic fill process from the PRISM model ECHAM5/MPI-OM into the database tables of the WDC Climate has been implemented and used for the IPCC AR4 SRES scenario integrations. The system is able to cover a data production stream of 1 TB/day. Parallel but independent developements are discussed within FLUME.

The discussion of a metadata standard and the XML-exchange of metadata has been started with BADC and the WCRP project CEOP[2].

Data sharing between BADC and the WDC Climate (WDCC) had been agreed on ERA40 data. Time series data are available from the WDCC, original data structures are disseminated by the BADC[3].

3.6.3 Tasks and sub-tasks for 2005-2008

The following tasks are not necessarily listed by order of priority:

- Tests and test installations of CDAT/CDMS, COCO and LE-Graphics
- Integration of data processing for model run quick-looks into SRE
- Further developement of LE-Graphics as a stand alone graphic package with integration of new functionality on users demand
- Distribution and support for cdo as an alternative tool for diagnostic
- Tests and test installations of "High End" visualisation tools
- Discussion within the PRISM Team (PT) of data structure for archiving and corresponding SRE interface

[2]More information can be obtained from: http://wini.wdc-climate.de

[3]More information including links to the partner archives can be obtained from: http://era40.wdc-climate.de

- Discussion within the PT of application of NetCDF/CF (CF-Checker, other Standards)
- Discussion within the PT of standards for metadata and metadata exchange
- Discussion within the PT of standards for data exchange between geographically distributed data archives
- Implementation of a common authentication and authorisation procedure by using certificates
- Development of common data catalogue
- Grid enabling of the PRISM data network
- Development of a portal for catalogue inspection and data retrievals in PRISM data network
- Development of an implementation strategy for an Grid enabled data archive network (Earth System Model Data Processing Grid)

3.6.4 Milestones and deliverables

- 2005
  - GO-ESSP Workshop in Rutherford: first discussion on data storage format, data processing, visualisation, meta data exchange, cooperation with ESMF
  - Workshop on metadata standard, data storage format, data storage structure (planned for autumn in Hamburg)
  - Agreement within the PT on application of NetCDF/CF and data storage structures
  - Integration of quick-look facilities into the SRE
- 2006 and later
  - Agreement on standard for metadata and metadata exchange
  - Agreement on standard for data exchange
  - Definition of prototype for PRISM Grid enabled data archive network
  - Presentation of LE-Graphics as an “easy to use standalone visualisation package”

3.6.5 People involved

- M&D (J. Wegner, K. Meier-Fleischer, M. Lautenschlager): 1 py/y
- BADC (A. Stephens, B. Lawrence)
- UK MetOffice

3.6.6 Interactions with other PSI activities

- SCE & SRE:
  - NetCDF/CF
  - Integration of data processing
  - Data storage structures
- GUI & WSS:
  - Authentication and authorisation
  - Common Data Catalogue
  - Grid enabling
  - Portal
  - Implementation strategy for Grid enabling

3.6.7 Particular issues

- ENSEMBLES project: M&D with its WDCC archive framework has accepted climate model data management tasks with respect to climate scenario integrations. PSI members are involved in ENSEMBLES and are contributing to the climate model archive as well. Data management in PSI may be coordinated with ENSEMBLES.

3.6.8 Conclusions

Milestones and deliverables could not be defined precisely at this point because only minor additional funding is availabe. All partners operate on the basis of common interests and therefore progress depends strongly on individual motivation and on available institutional resources.

Another degree of freedom enters because technical developments a few years ahead cannot estimated very precisely. Especially today it is not clear when Grid technology will be operationally available. Therefore the group will focus on near term aspects (integration of quick-look facilities into SRE, application of NetCDF/CF and definition of data storage structures) without neglecting future developments.

Chapter 4

The PRISM User Group

Lead: MPI (R. Budich)

4.1 Scope

The main objective of the establishment of a PRISM User Group (PUG) is to organize the provision of input and feedback to the PSI team. This input will not mainly be driven politically, but by the day-to-day requirements of the technical and scientific users of the PRISM system. The success of the user group will depend critically on the community Buy-In, and, as such, on the quality of the framework and the PR-methods PSI will employ. A successful audit (or community review) (see below) and continued support by the core institutions will help a lot.

The tasks, milestones and deliverables for 2005-2008 are listed below; they will very much depend on the involvement of the user community in general - so this work plan obviously is a moving target and has to be reiterated quite often.

4.2 Tasks for 2005-2008

- Audit (community review):

  The tools and standards developed during the FP5 project are to be reviewed corresponding to the community needs and expectations. For this purpose, an audit will be realized in the next few months in the PRISM User community to evaluate the existing software and standards. About 20 groups that have already used or tested the PRISM software tools will be interviewed to gather their experience, ideas and requirements for future evolution. Some funding could be available from CNRS to perform this review. G. Riley and R. Ford from U. Manchester were contacted and expressed interest to perform this audit. The tasks will be the following:

  - Establish a list of questions that will be asked to different users.
  - Interview the different users and compile their answers to the questions
  - Write a summary of the different experiences, ideas and requirements

  The results of this audit should be available at the end of October 2005.
- Find means and methods for the organisation of the PUG
  - Mailing lists
  - Opportunities and places to exchange information like
  - Meetings
  - Wiki
  - Other e-science methods, etc.

- Establish strong links to other initiatives and projects; in particular:
  - ENSEMBLES
  - GEMS
  - COSMOS
- Identify core users for the activities of the PSI work groups in order to liaise with them
- Foster “Community Buy-In” where possible

4.3 Milestones

- M1- Organisation of next PRISM course (potential dates are November 16-18 2005)
- M2- Organisation of a first PUG meeting alongside the next PRISM cours;, discussion of the audit report

4.4 Deliverables

- D1 (10/2005)- Audit report
- D2 (11/2005)- Report on the first PUG meeting

4.5 People involved

- MPI (R. Budich): 0,1 py/y until August 2008
- Others to be defined

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