

Chapter 2

The PRISM framework

2.1 The genesis of the PRISM framework

System specification

The PRISM system specifications were produced by the PRISM System Specification Work group (SSW) in the first 6 months of the project (Guilyardi et al. 2003). The work group ensured initial (and then continuous) gathering and coordination of inputs and requirements from the Earth system scientific and information technology communities. It surveyed the existing solutions, tools and associated expertise the project could benefit from. A two steps approach was followed. A first stage addressed the "Requirements, Design Options and Constraints (REDOC) which summarized the requirements of a coupling system that is regarded as 'ideal' in the sense that it fits the perceived long-term (order 5/10 years) requirements of the scientific community undertaking earth-system simulations, both from a scientific point of view as well as from the users point of view. The REDOC document in addition gave relevant design options as well as foreseeable constraints by models and technologies. In a second stage, the actual work done during the 3 years of the project was described in the section "Architecture Choices, Detailed Design and Implementation" (ARCDI). Due to the novelty of the undertaking and the numerous interactions between the groups, several issues were not initially resolved or even foreseen and required more testing and/or inputs from the community.

This development process, i.e. obtain early requirements from and involve the Earth Science community (model component developers and users), develop from latest proven technology (with extra care taken not to re-invent the wheel), build from existing ESMs (Fig. ??) has proven to be effective and remains the driving system specifications strategy of PRISM. The detailed development phases of each PRISM tool are presented in more details in the next chapters.

Collaborations

Because of the very nature of the project (a common infrastructure), early collaboration with related projects became key in order to avoid incompatible frameworks. After many meetings and exchanges, working collaboration are now established with:

- the NASA led Earth System Modelling Framework (ESMF) project in the USA, with the two

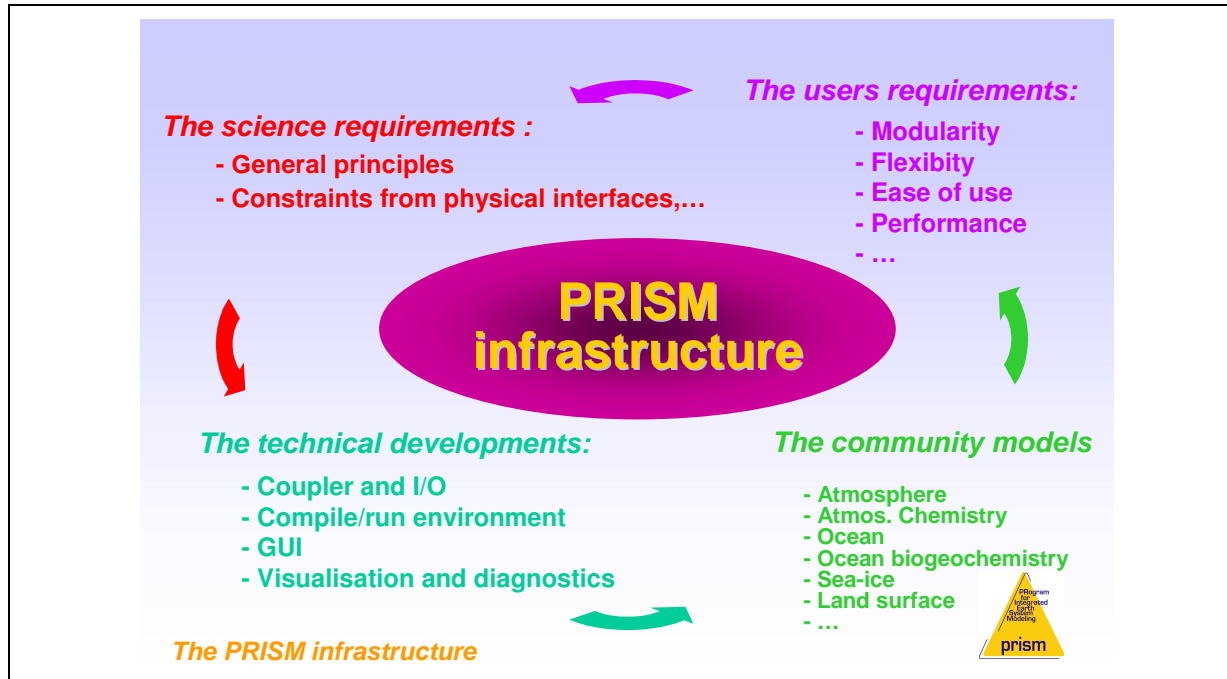


Figure 2.1: PRISM system specification strategy, including early requirement capture from Earth System science community, development of core PRISM software and adaptation of existing community models.

projects now aiming leveraging each other (among other projects, PRISM providing some coupling infrastructure software and ESMF providing some supporting software, see Fig. ??)

- the UK Met Office led Flexible Unified Model Environment (FLUME), which aims at the complete rewrite of the Met Office very complete suite of tools for ESMs management.
- and many other groups/projects addressing similar issues where collaboration is key (PCMDI, CF,...)

All the major projects are now aware of each other and seeking either to collaborate to agree on common interfaces or to merge. The PRISM project has been (and the PRISM team now is) a driving force and has put Europe in the loop for long-awaited community-wide convergence on basic standards in ES modelling.

2.2 Overview of the existing PRISM tools and standards

The PRISM infrastructure is a collection of software tools designed to help configure, execute and analyse in a standard way Earth System models composed of a number of components developed in the community. Following the proven OASIS philosophy, minimal changes to the original codes are required. The PRISM tools can be viewed as a set of concentric shells, from the inner shell, incorporating libraries compile with the Earth System model component code, to outer shells which form the standard configuring/running/monitoring environments (Fig. ??).

A major delivery of the PRISM project is the new OASIS4 coupler (see relevant chapter). The coupler is composed of three functions: the PSMILe library, which forms the interface of the component model to the rest of the framework, the Driver which conducts the ESM integration and performs coherence checks, and the Transformer which performs any time/space transformation needed from one component to another

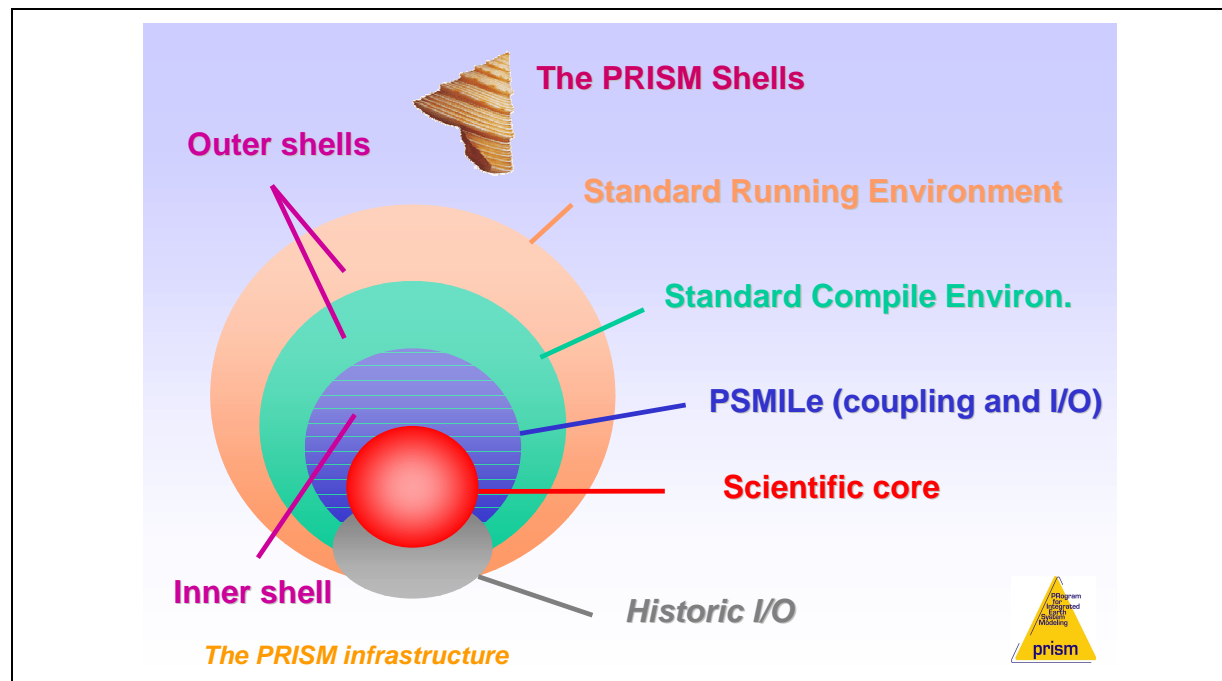


Figure 2.2: The PRISM tools are organised in concentric shells, from inner shells, incorporating libraries compile with the Earth System model component code to outer shell which form the standard configuring/running/monitoring environments.

(grid interpolation, time filtering,...). The user configures the work of the coupler via a set of XML files that describe the coupling in full (SMIOC/AD/SCC - see relevant chapter),.

Assembling ES components with PRISM requires to perform a number of adaptation steps. The components are first adapted to the coupling layer of OASIS (PSMILe library) and meta-data describing the coupling fields has to be provided (PMIOD = Potential Model I/O Description). They are then organised to meet the standard compiling (SCE) and runtime (SRE) environments. The User Interface provides a unified view of the different tools/environments (Fig. ??). The modular design allows independent use of each tool, and the level of adaptation can vary from just use of OASIS4 (PMSILe) up to full environments and GUI.

The configuration management and the model deployment are organised around the SCE and SRE which are script-based environments (see relevant chapter) (Fig. ??). The user configures the components needed for the specific ESM intended and produces binary executables via the SCE. These are then assembled with the Driver and the Transformer (if needed) in the SRE. When the execution starts, the Driver launches the individual components and establishes the communications between them (and via the transformer if needed). Disk storage is viewed by the coupler as an additional “component” and I/O can therefore be performed in the same framework, rendering the historic component I/O obsolete in time (Fig. ??).

The Graphical User Interface, built from PrepIFS, offers a user-friendly interface to these scripts and to the PMIOD/AD/SMIOC/SCC files. Thanks to specifically developed web services integrated in the GUI, the user can configure a coupled model with a remote access to the PRISM repositories and then deploy this configuration to any remote site where the PRISM infrastructure is instrumented (and provided he has the proper access rights) (Fig. ??).

The model output analysis is performed in two ways: “Low end” (LE) analysis and graphics are performed

