

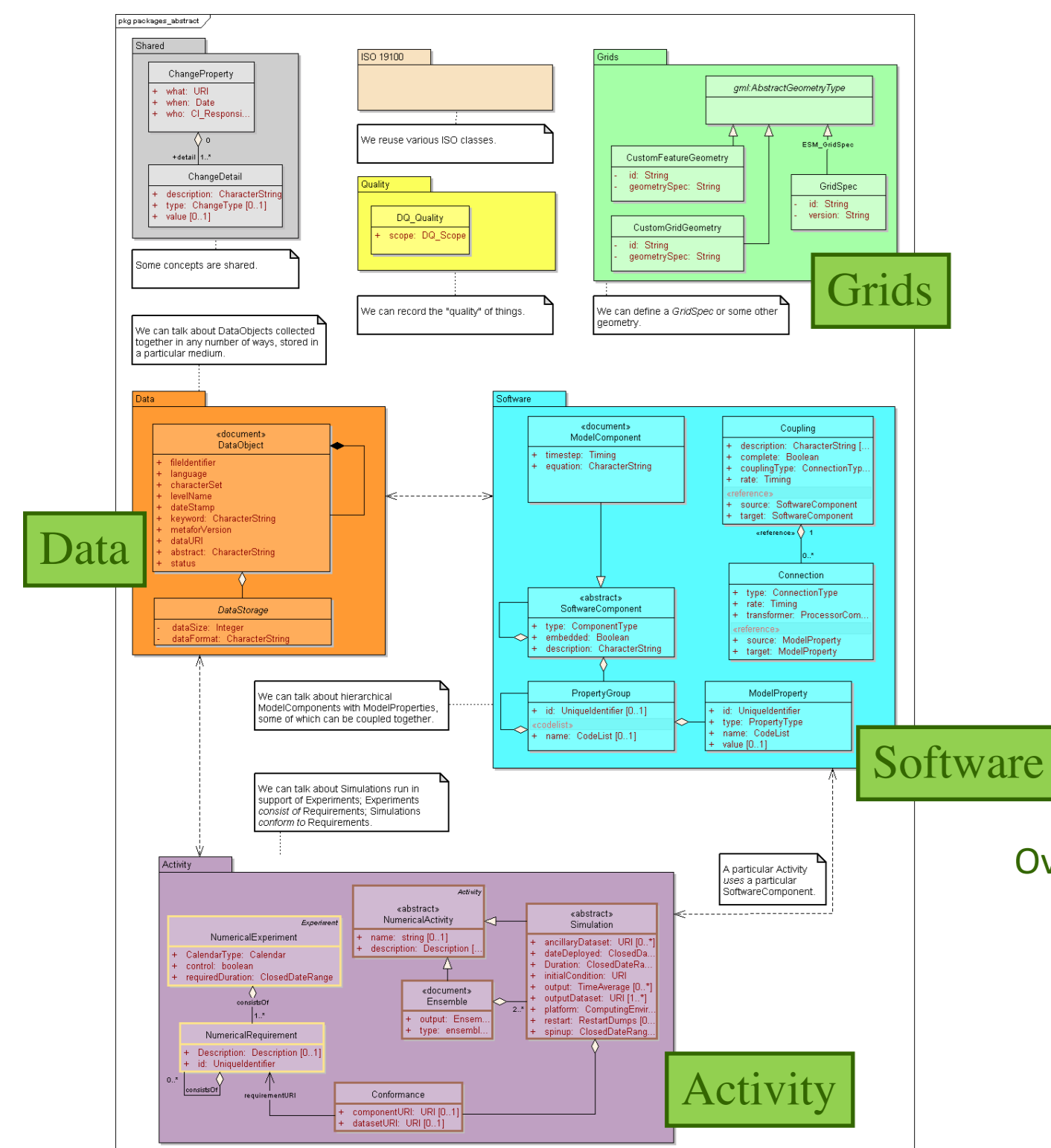
# Supporting the climate community by providing common metadata for climate modelling digital repositories: the METAFOR project

Sarah Callaghan, RAL Space, STFC, United Kingdom, Mark Morgan, IPSL, France, Eric Guilyardi, NCAS-Climate, Univ. Reading, UK & IPSL/LOCEAN, Paris, France, Sophie Valcke, CERFACS, France, Charlotte Pascoe, RAL Space, STFC, United Kingdom, Bryan Lawrence, RAL Space, STFC, United Kingdom, Antoinette Alias, Meteo France/CNRM, France, V Balaji, Princeton University, USA, Phil Bentley, UK Met Office, United Kingdom, Roxana Bojariu, ANM, Romania, Reinhard Budich, Germany, Antonio S. Cofiño, University of Cantabria, Spain, Cecelia DeLuca, NOAA, USA, Sebastien Denvil, CNRS/IPSL, France, Gerry Devine, University of Reading, UK, Francisco J. Doblas Reyes, IC3, Spain, Rocky Dunlap, USA, Mark Elkington, UK Met Office, United Kingdom, Laurent Fairhead, CNRS/IPSL, France, Rupert Ford, University of Manchester, United Kingdom, Luigi Fusco, ESA, Wilco Hazeleger, KNMI, the Netherlands, Ian Henderson, University of Reading/NCAS, United Kingdom, Stephan Kindermann, Germany, Michel Kolaninski, Climpact, France, Michael Lautenschlager, MPG, Germany, Marie-Pierre Moine, CERFACS, France, Sylvia Murphy, NOAA, USA, Hans Ramthun, MPG, Germany, Graham Riley, University of Manchester, United Kingdom, Paul Slavin, University of Manchester, UK, Lois Stenman-Clark, University of Reading /NCAS, United Kingdom, Kristin Stock, UK, Karl Taylor, PCMDI, USA, Frank Toussaint, MPG, Germany, Allyn Treshansky, Coelacanth Consulting

## Climate model results for scientists, governments and the private sector.

There is more interest than ever in the results of climate models; users are no longer limited to the scientific and academic communities, and can now be found in as diverse areas as local government, policy and the general public.

Climate modeling is a complex process, which requires accurate and complete metadata (data describing data) in order to identify, assess and use the climate data stored in digital repositories and made available to these users.



Climate Modelling = an activity using a software to produce data on a grid to be archived in a repository.

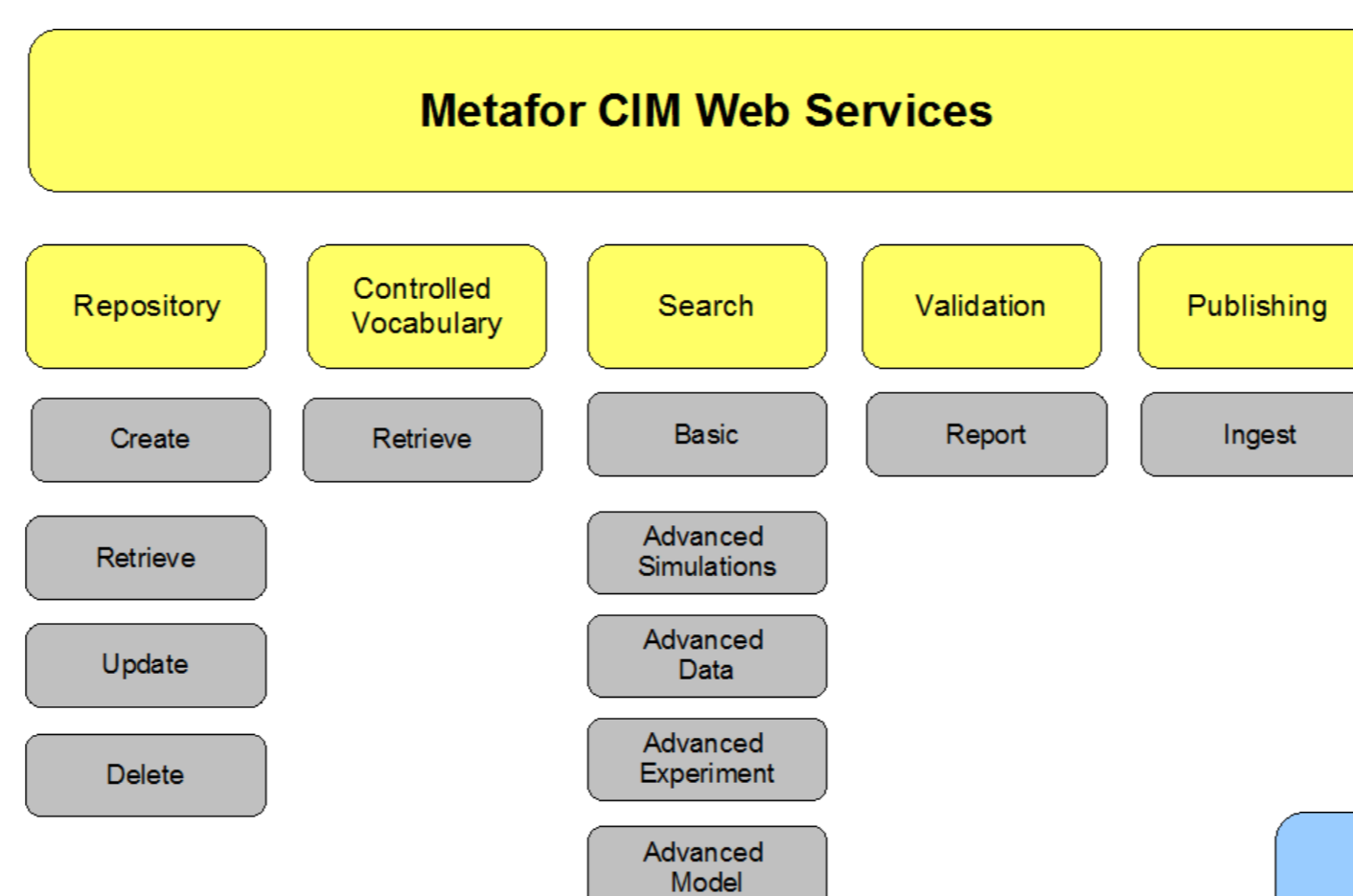
Overview of the CIM UML packages (left). The CIM is currently in version 1.5 and is freely available

The EU-funded METAFOR project has developed a Common Information Model (CIM) to describe in a standard way climate data and the models and modelling environments that produce this data. Climate modelling is a complex process with a wide degree of variability between different models and different modelling groups. The CIM exists to document the whys, wherefores and issues associated with any particular simulation, and has been designed to be highly generic and flexible. The CIM's generic structure can be paired with more specific "controlled vocabularies" in order to restrict the range of valid CIM instances. Although the CIM is primarily associated with global climate modelling, statistical downscaling data can also be easily described through the metadata framework developed for global climate modelling.

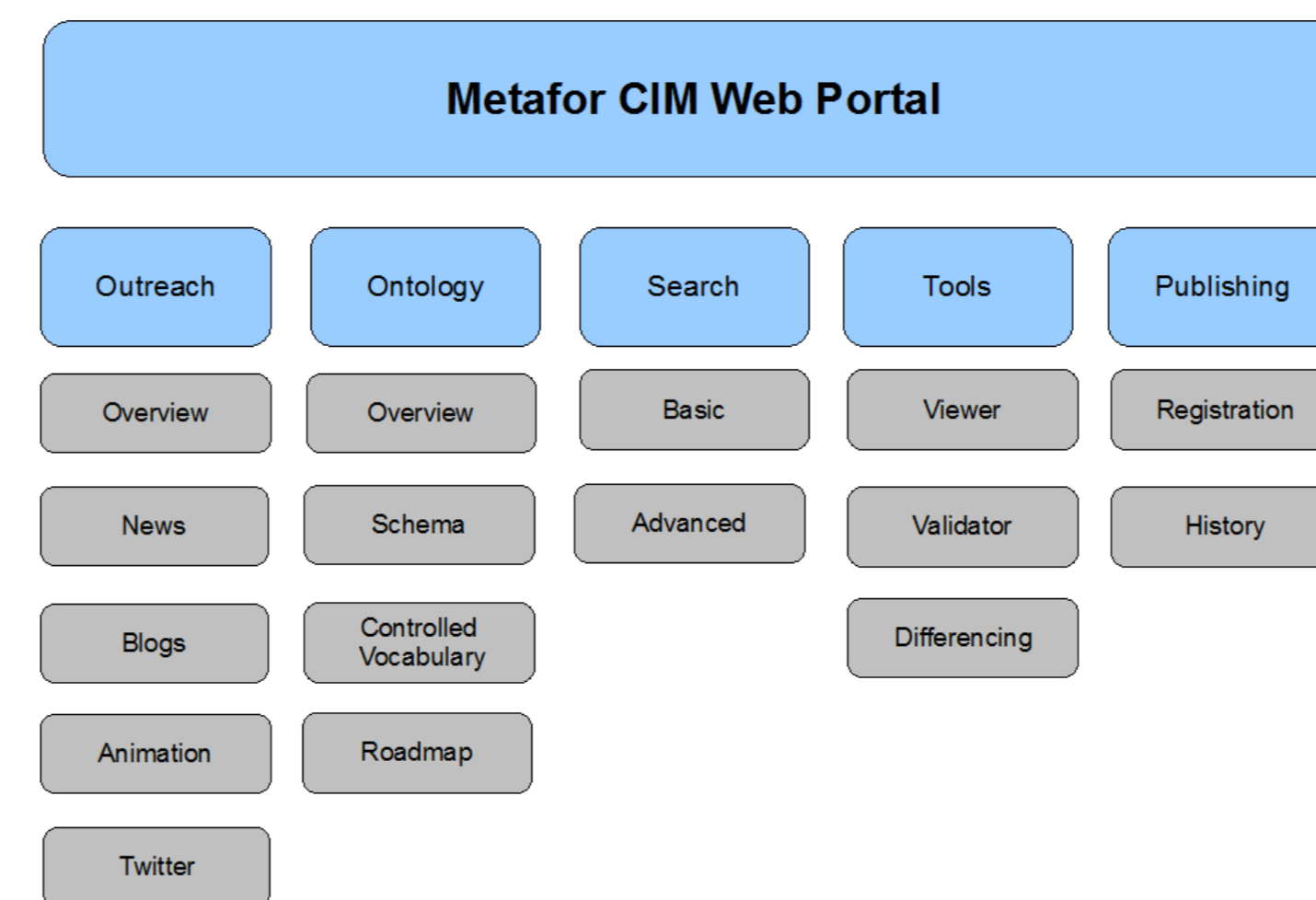
## Using the Common Information Model (CIM)

Whilst informationally rich, the CIM is largely an inert artefact. In order to encourage the development of a vibrant CIM based eco-system, Metafor is constructing a CIM web portal plus associated CIM web-services and tools.

The web portal encapsulates a diverse set of use cases: CIM knowledge base, CIM search, CIM record validation, CIM record viewing, CIM record comparison, etc. It also allows metadata administrators to register metadata servers for overnight harvesting into the CIM system. The associated CIM web-services and tools allow institutes to either fully automate CIM metadata publishing, or to integrate functions such as search, validation and viewing directly into their own portals. The portal, web-services and tools benefit from modern software engineering techniques predicated upon a service orientated architecture underpinned by loosely coupled components.



The CIM web services and the CIM web portal are developed in conjunction with each other, but are separate entities. This allows other users to integrate all or part of the CIM services into their own institutional or project portals.

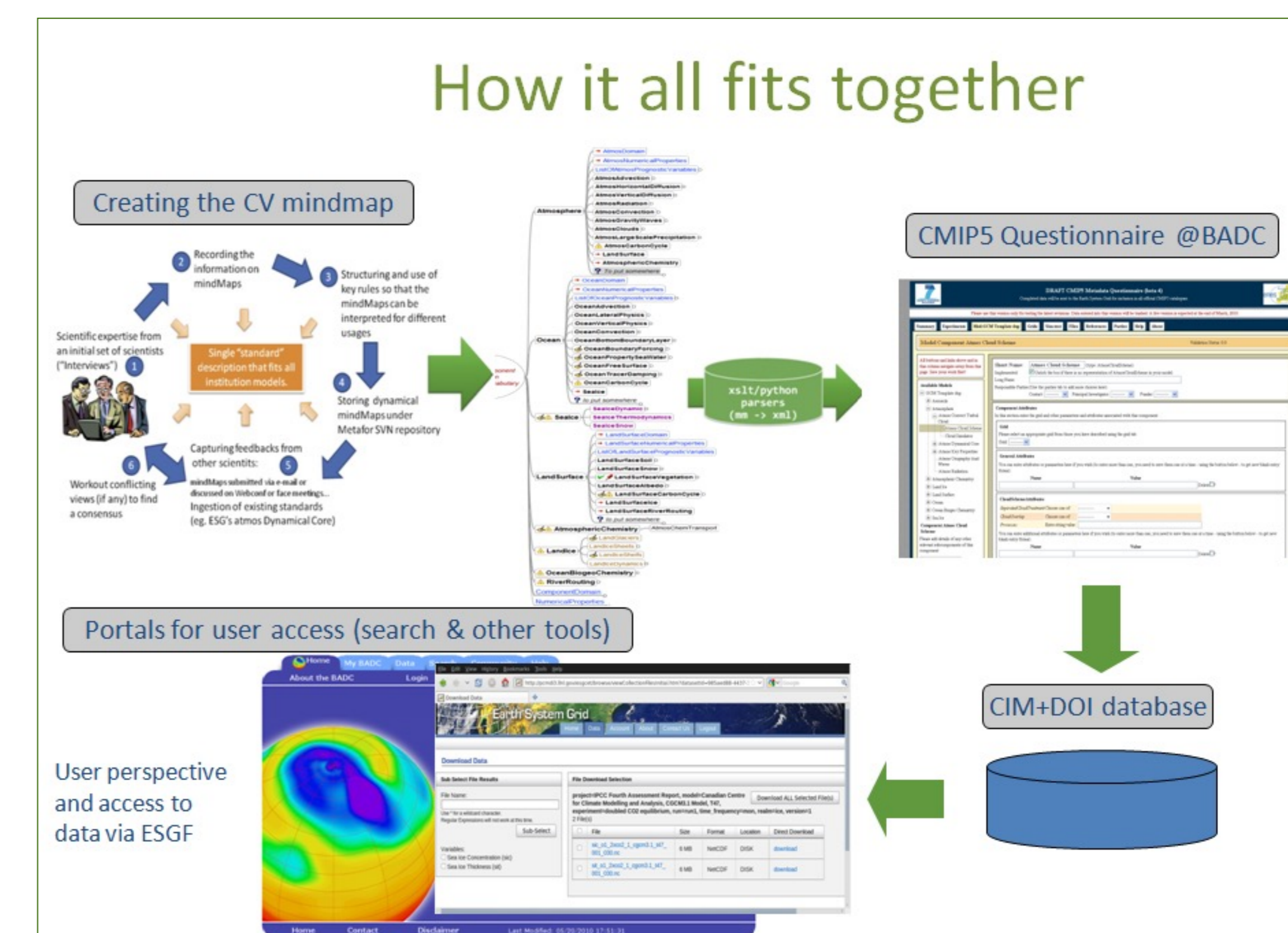


The CIM web portal will be an important resource, not only for the ontologies and schema developed for the CIM, but also for the controlled vocabularies collected for the CMIP5 climate modelling metadata questionnaire.

## From Controlled Vocabularies to Web Tools

Metafor was charged by the Working Group on Coupled Modelling (WGCM) via the Coupled Model Inter-comparison Project (CMIP) panel to define and collect model and experiment metadata for CMIP5. To do this, the project team developed a web-based questionnaire to collect this information from the CMIP5 modelling groups. The outputs of the questionnaire will be CIM xml instances, which will document the climate models in sufficient detail so that the CMIP5 data can be located and compared in a scientifically meaningful way by a wide and diverse community. The questionnaire outputs will also form a significant proportion of the input documents into the tools and services also being developed.

A new set of "controlled vocabulary" has been produced to describe in a standard and structured way the dynamics, physics, numerical schemes and other parameterisations of the components (ocean, atmosphere, land surface, sea ice, atmospheric chemistry, etc.) of the earth system models used in CMIP5. These controlled vocabularies exist independently of, but are complementary to the CIM, and governance structures for the CIM, controlled vocabularies and the CIM tools and services are being put in place to allow them to improve and develop further, even after the completion of the Metafor project.



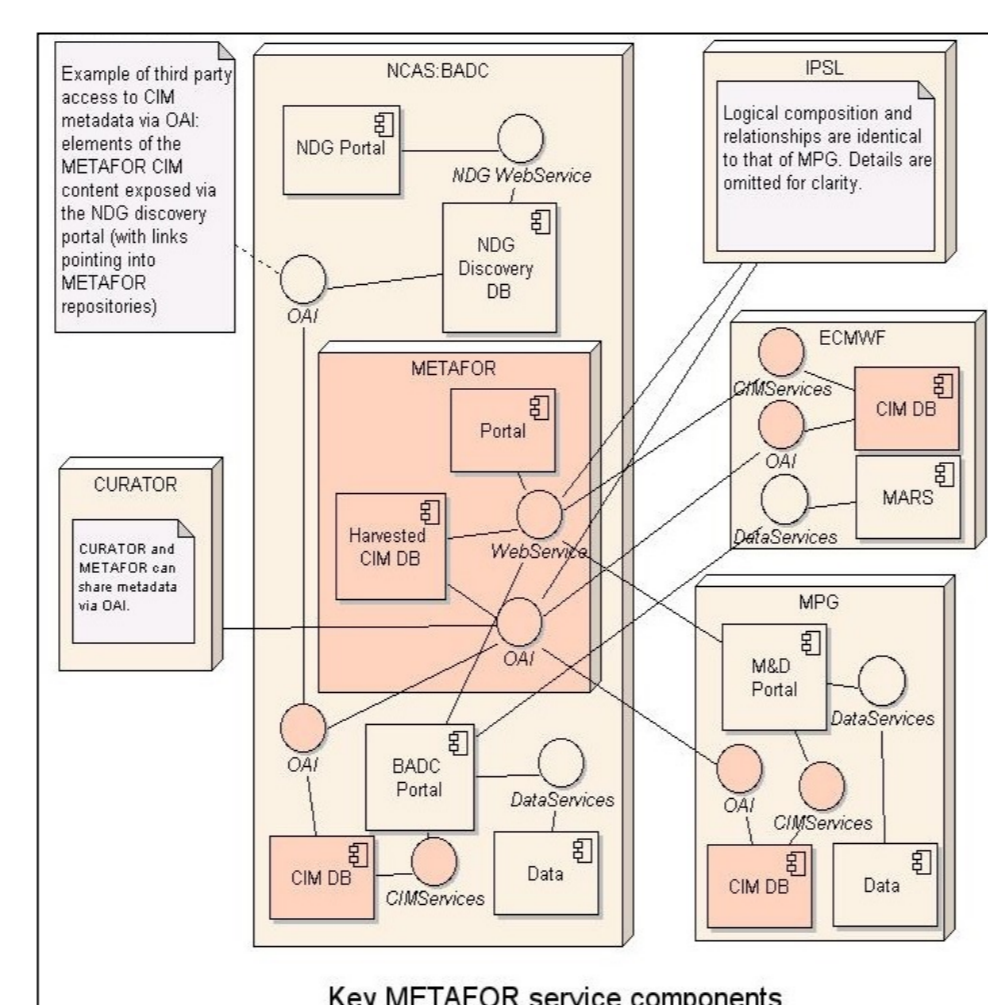
**Metafor at a glance:**

Project title: Common Metadata for Climate Modelling Digital Repositories (Metafor)

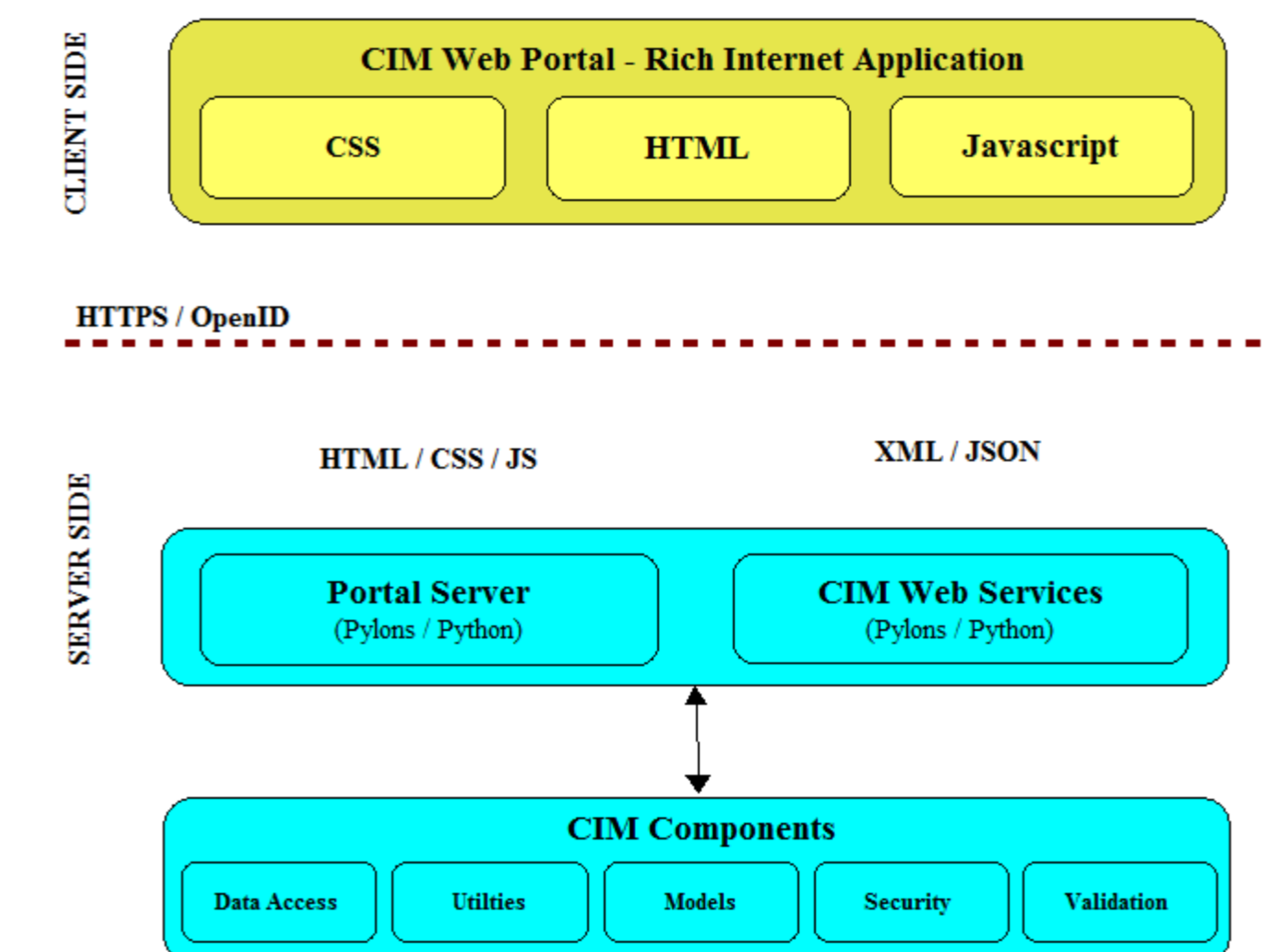
Project coordinator: Prof Eric Guilyardi (University of Reading, UK and IPSL, France) email: [E.D.A.Guilyardi@reading.ac.uk](mailto:E.D.A.Guilyardi@reading.ac.uk)

Project manager: Dr Sarah Callaghan (BADC- UK) email: [sarah.callaghan@stfc.ac.uk](mailto:sarah.callaghan@stfc.ac.uk)

METAFOR is funded by the EU 7th Framework Programme as an e-infrastructure (project # 211753)



Key Metafor service components, links to external tools and services, and the surrounding software and organisational environment.



Schematic of the tools used in the Metafor portal, both on the client and the server side.

The Metafor portal is currently in development (a screenshot of an early version can be seen to the right).

The portal will provide the user with an easy and convenient way to search for CIM documents in the database, view them and compare them. For those users writing CIM documents outside the framework of the CMIP5 questionnaire, the portal will also provide a validator to check the conformance of the document to the CIM schemas.

