ECO$_2$Clouds

Experimental Awareness of CO_2 in Federated Cloud Sourcing

Newsletter March 2014

New to ECO$_2$Clouds? Here is a a short summary...

The ECO$_2$Clouds project investigates strategies that can both ensure effective application deployment on the cloud infrastructure and reduce energy consumption as well as CO_2 emissions. The need for novel deployment strategies becomes more evident if an application spans multiple Clouds.

ECO$_2$Clouds provides a challenging and innovative approach to Cloud computing service delivery by:

- developing extensions and mechanisms for cloud application programming interfaces to quantify their environmental impact;
- developing energy-efficient cloud sourcing and application deployment strategies.

The carbon-aware mechanisms are being integrated into the FIRE facility BonFIRE.

Call for Papers

ECO$_2$Clouds workshop on Energy Efficient Sytems

ICT4S: ICT for Sustainability. August 24-27, Stockholm

Deadline: May 15, 2014

Topics include (not limited to):

- Energy efficient system design
- Energy efficient application deployment strategies
- Adaptation approaches to minimize energy consumption of application and systems
- Optimization models for energy efficiency
- Green Computing
- Energy efficient application or system design
- Methodologies and tools to support energy efficiency in large scale data centers and cloud

http://eco2clouds.eu/workshop-on-energy-efficient-systems-at-ict4s/
http://2014.ict4s.org/

Focus of this issue:

- **Architecture update**
- **Optimization and Runtime adaptation**
- **Dissemination and Engagement**

Architecture update

During this period the architecture has been updated.

Optimization and Runtime adaptation mechanisms for runtime adaptation of application deployments are developed to ensure minimum environmental impact during the execution of Cloud applications.

Dissemination and Engagement:

ECO2Clouds final workshop – call for papers at ICT4S August 2014

DEMO at FIA 2014 (Athens) a demonstration and project booth was organized at Future Internet Assembly 2014.

Energy Efficient Systems Special Session at IEEE SMC Conference (Manchester) a special session was organized at IEEE SMC conference in Manchester.

EuroEcoDC Workshop a joint workshop with other EC funded projects was organised at Karlsruhe.

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This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 318048

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Architecture update

The latest version of the ECO$_2$Clouds Architecture was issued this period. It specifies the key aims of the ECO$_2$Clouds solution.

Briefly, these are as follows:

1. Provide an eco-aware scheduler, to use eco-data from eco-aware facilities, which will optimise deployment of virtual machines and provide runtime adaptation actions.

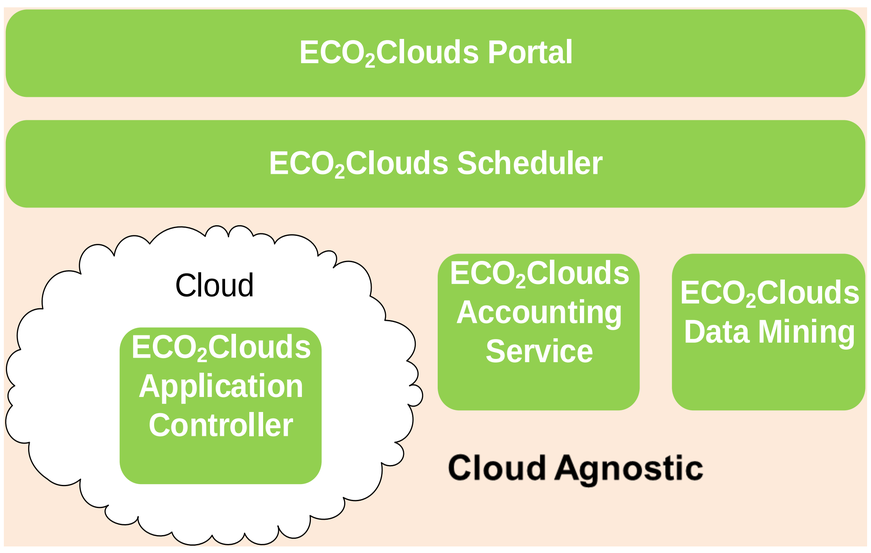
2. Offer an application level controller, which will provide runtime adaptation actions at an application level.

3.Define the eco-metrics that are required in order to express energy consumption and CO_2 footprint of cloud facilities.

4. Offer a data mining solution which will analyse the collected eco-metrics data in order to identify interrelations.

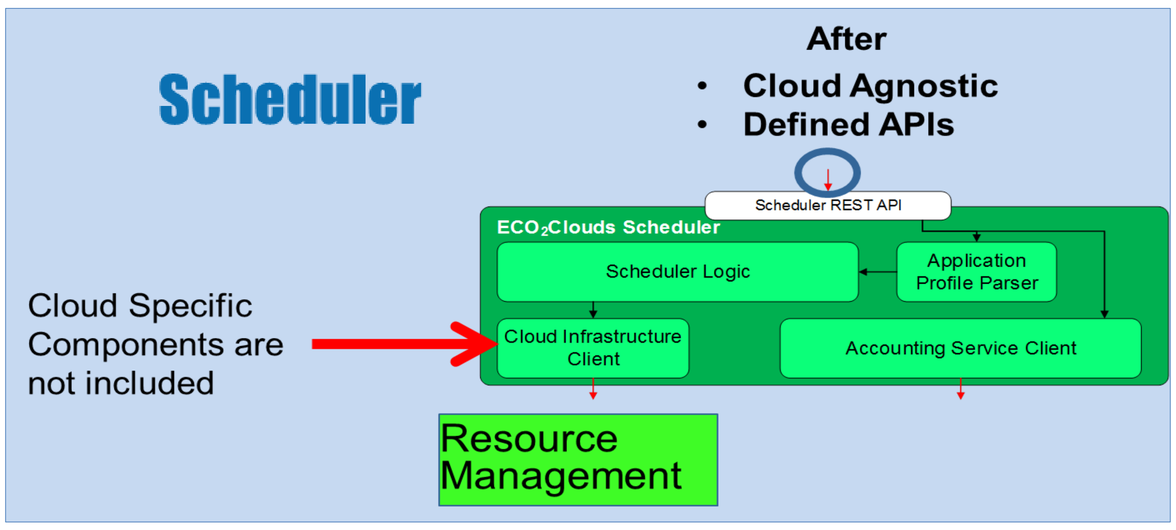
5. Offer a reporting mechanism that will provide a final usage report at the end of an experiment.

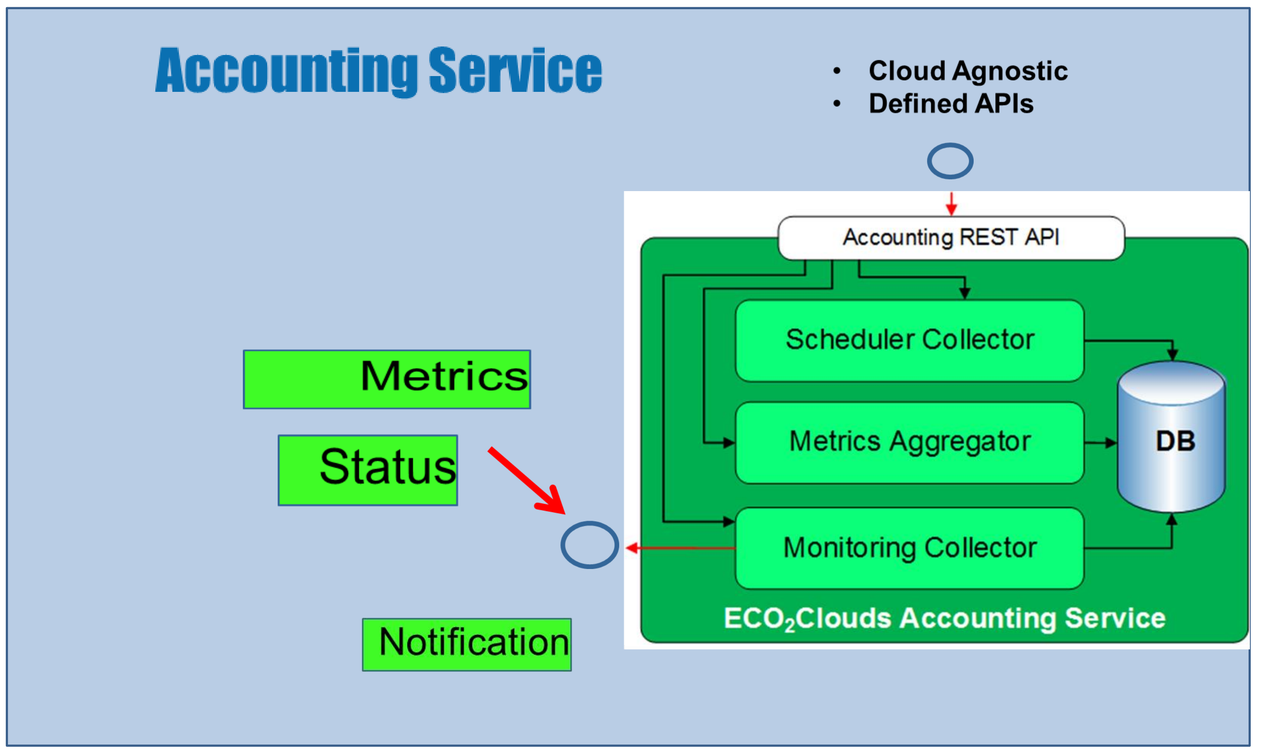
6. Support the above using a cloud agnostic implementation.

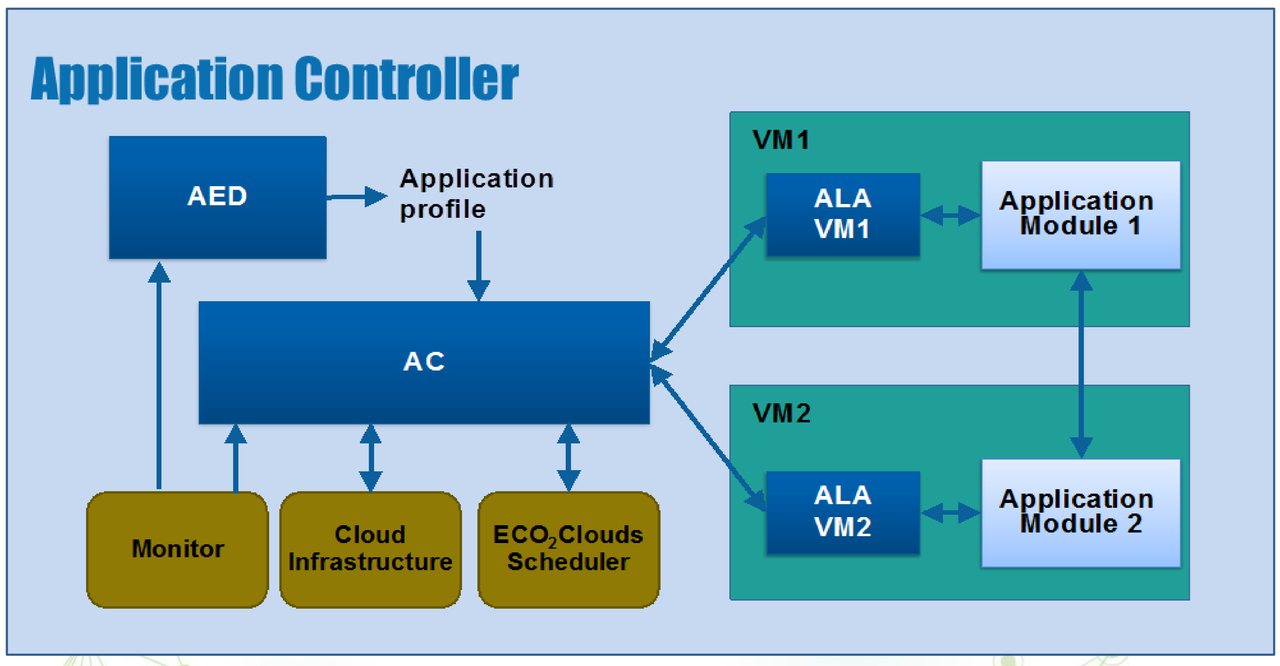


Although developed on top of the BonFIRE FIRE testbed, ECO$_2$Clouds is prototyping software that can be adopted by Cloud facilities in general, and the architecture has been updated to reflect this. There is now a clear distinction between the ECO$_2$Clouds components and the target infrastructure, with interfaces between them. The documentation identifies the functionalities that a Cloud needs to expose so as to be able to adopt ECO$_2$Clouds and this includes a set of metrics reflecting energy consumption and CO_2 emissions.

This concludes the bulk of the Architecture work in the project, with minor adjustments expected to feedback as a result of the implementation currently under way.







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Grant agreement no: 318048

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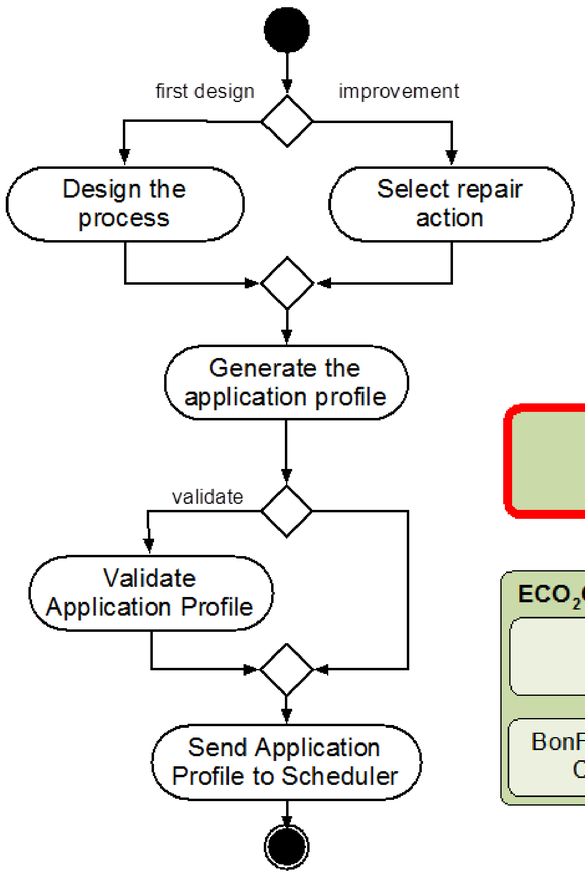
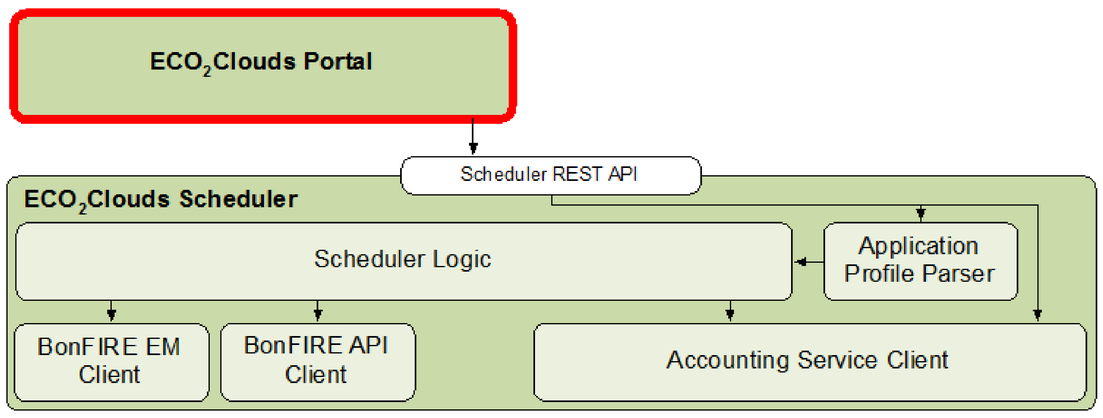
Development Work

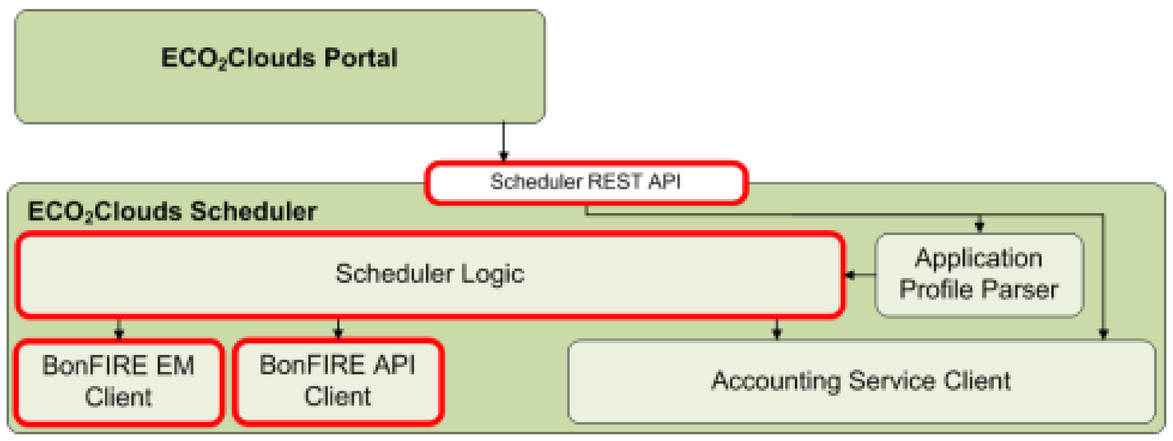
Optimization and Runtime adaptation

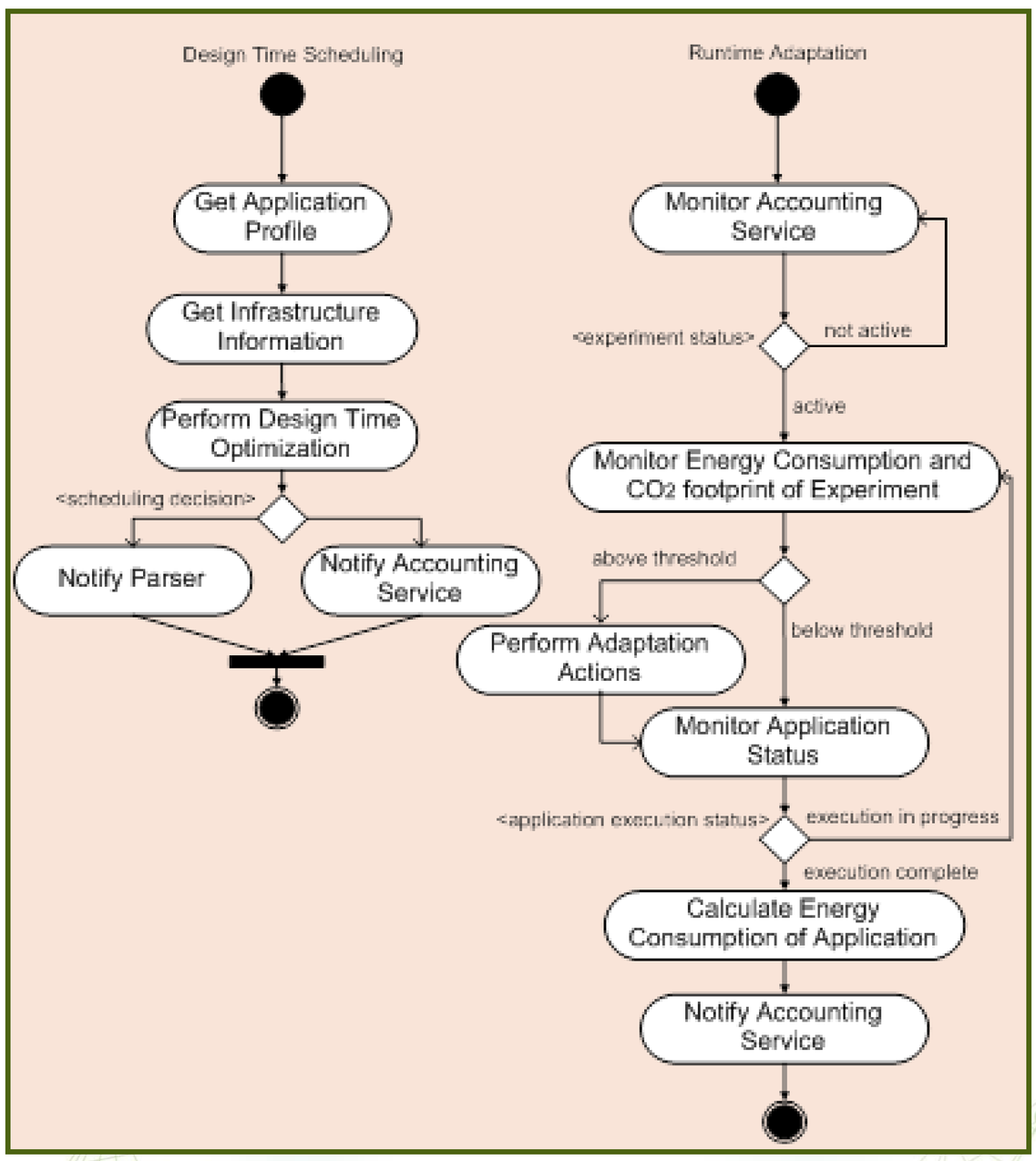
A key research area of ECO$_2$Clouds concerns the optimization of energy consumption and CO_2 footprint of Cloud application. In this respect, mechanisms for runtime adaptation of application deployments are developed to ensure minimum environmental impact during the execution of Cloud applications.

The figures on this page depict the ECO$_2$Clouds Scheduling workflow and the placement of ECO$_2$Clouds Scheduler in the architecture. The ECO$_2$Clouds Scheduler is responsible for optimization of energy consumption and CO_2 footprint of application, which is achieved by enacting runtime adaptation actions on the deployment of running applications.









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ECO$_2$Clouds Engagement

- Demo at FIA March 17-18, 2014 Athens:

Trying to make the world greener!!! #eco2clouds pic.twitter.com/Hi7ALScz6Q

- ECO2Clouds organized the Energy Efficient Systems Special Session at IEEE International Conference on Systems, Man and Cybernetics (SMC), October 13–16, 2013, Manchester, UK
  http://eco2clouds.eu/ees/

ECO2Clouds related workshops: eChallenges 2013 (Organized by HRLS).

EuroEcoDC Worksop:

ECO2Clouds co-organized the EuroEcoDC (E2DC) Workshop co-located with the 3rd International Conference on Cloud and Green Computing (CGC), Sept. 30–Oct. 2, 2013, Karlsruhe, Germany.
http://www.all4green-project.eu/EuroEcoDC

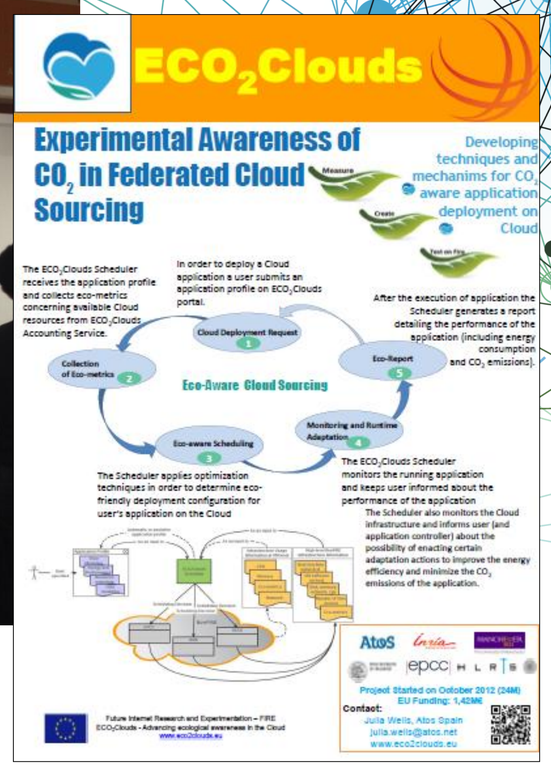
Recent publications

April 2014 - Pernici B and Wajid U. Assessment of the environmental impact of applications in federated clouds. SmartGreens 2014, Barcelona, April 2014 (accepted for publication)

February. 2014 – Vitali M. and Pernici B.. A survey on energy efficiency in information systems. International Journal on Cooperative Information Systems (accepted for publication)

January 2014 Fugini M.G., Pernici B, Wajid U. ECO2Clouds: models and eco-metrics, FIRE Magazine

Our team at FIA



Consortium

ATOS, Spain

Atos is an international company focused on Services for Information Technologies (IT) and currently with headquarters located in Paris, with presence in 42 countries.

University of Manchester, UK

The University of Manchester (UNIMAN) is the largest campus based university in UK with close links to industry.

HLRS, Germany

The High Performance Computing Center is a research and service institution affiliated to the University of Stuttgart. It has been the first national supercomputing center in Germany offering services to academic users and industry.

EPCC, UK

EPCC is the High-Performance and Novel Computing Centre of University of Edinburgh. EPCC provides a wide variety of services to academia and industry.

Politecnico di Milano, Italy

Politecnico di Milano is a State University in Italy, established in 1863, ranked as one of the most outstanding European universities.

Inria, France

Inria is the only public research body fully dedicated to computational sciences. Inria collaborates with the main players in public and private research in France and abroad.

ECO2Clouds
Advancing ecological awareness in the Cloud

Identifying good practices to improve energy efficiency of Cloud data centers

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Developing techniques and mechanisms for CO2 aware application deployment on Cloud

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