



## CloudBook

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### Partners:

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BEIA Consult International S.R.L., Romania

EXPERIS IT, Spain

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### Project Website

[www.celticplus.eu/project-cloudbook](http://www.celticplus.eu/project-cloudbook)

## A Cloud-aware distributed parallel compiler

CloudBook proposes to create a “cloud compiler”, allowing today’s programmers to compile and deploy in the whole available distributed hardware

### Main focus

The main focus of the project CloudBook is to unify the cloud and the compiler in one piece, freeing programmers from thinking on distributable designs and taking benefit from non-reliable hardware and parallel computation mechanisms.

### Approach

1. The state of the art in cloud computing, grid computing, remote monitoring, HPC, security, scripting, etc. will be studied in order to find innovative solutions that could help or be the base for that project. It will focus on the needed gap to be covered by the CloudBook project.

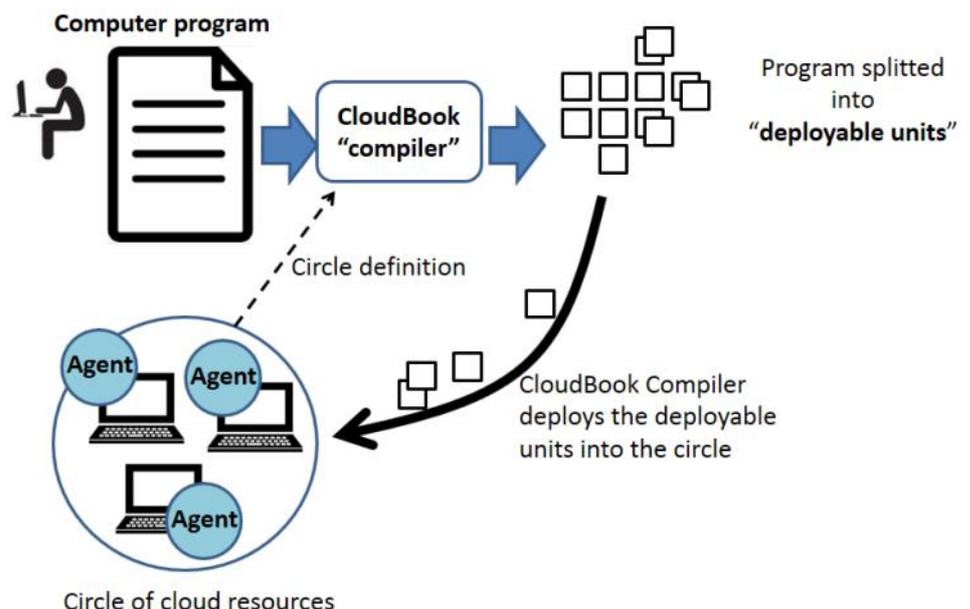
2. Design, definition and implementation of a **graph analyser** component that will analyse the input program (dependencies

between functions) in order to assist the splitting process.

3. Taking the output of graph analyser as input, a cloud-aware splitter will be designed. The splitter will split the input program into different pieces of code (**deployable units**) to be executed by agents that will be installed in distributed machines.

4. Design of a **deployer** algorithm which decide on the fly when, where and, how distribute the deployable units in order to achieve an optimum execution performance. Implementation of a monitoring tool of the execution of the deployable units that will act as input feedback to the intelligent dynamic deploying algorithm.

5. Different **use cases** will be developed to run on top of the CloudBook platform (**videogames, stochastic processes, crypto mining, machine learning, supercalculator**). For each use case, scenarios, limitations and business potential will be assessed.



## Main results

- ◆ A document analysing the opportunities and technological challenges, Business Models and feasibility for every model (**HTC & HPC**) describing the main Technological challenges and Business KPIs.
- ◆ Compiler definition and architecture, and compiler software. This compiler will be the most important result of the project. This software is in charge of analysing the code (**graph analyser**) splitting the input program (**splitter**) into deployable units. This is a milestone that has never been achieved before and will be a great differential with the State of the Art
- ◆ Static deployer & Basic executor. Based on input program analysis and available machines, the CloudBook platform generates the deployable units and executes it's deployment.
- ◆ Dynamic deployer & executor. This software will allow to deploy the set of deployable units and control their workflow while considering a number of resources that can vary during the execution.
- ◆ Evaluation Report. Includes Methodology Analysis Test results, Computational Platforms Tests results and final evaluation

conclusions with focus on the defined scenarios an in addition on Security, HTC, HPC, Continuous deployment, Remote Management and Monitoring, Scripting Interoperability and Legacy Integration.

## Impact

CloudBook results will materialize in a compiler product, available from internet and testable by any scientific, industrial, social, educational, etc. It will be a cloud-aware open platform that brings the following advantages to developers:

- ◆ Allows executing programs in a distributable way without the need for a distributed programming design. This execution is not coordinated by any central node neither follow the master-slave paradigm, which is an unprecedented innovation.
- ◆ Access a higher pool of computing resources that could be required by programmers needs (supercomputers, commercial clouds, individual user resources) attached to CloudBook and forming a "circle" of cloud resources.
- ◆ Split the code into deployable units taken into account the available computation resources and the programmer requirements in terms of resources usage or performance.

- ◆ Simulate results taking into account the different components and their reliability, QoS or real to verify the result of the service before launching it.

- ◆ Regarding use cases, the most relevant impacts are new possibilities for videogames user experience such as video-wall visualization and mobile phones resource sharing. In artificial Intelligence will allow speed up the learning process for different machine learning algorithms used for different applications. In HPC projects it allows to convert the cluster architecture into architecture in the cloud that communicates the clusters, improving many capacities

The designs and developments to be carried out as part of CloudBook will be based on open standards. Nevertheless, it is important to mention that within the field of research in which this proposal fits, what can be really said is de facto standard. This is so because libraries, APIs or tools already created for providing whatever capacity in compilation present a wide diversity and it is their further spread and adoption by huge communities what turn them in de facto standards.

## About Celtic-Plus

Celtic-Plus is an industry-driven European research initiative to define, perform and finance through public and private funding common research projects in the area of telecommunications, new media, future Internet, and applications & services focusing on a new „Smart Connected World“ paradigm. Celtic-Plus is a EUREKA ICT cluster and belongs to the inter-governmental EUREKA network. Celtic-Plus is open to any type of company covering the Celtic-Plus research areas, large industry as well as small companies

or universities and research organizations. Even companies outside the EUREKA countries may get some possibilities to join a Celtic-Plus project under certain conditions.

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