E-Infrastructures

H2020-EINFRA-2015-1

EINFRA-5-2015: Centres of Excellence for computing applications

EoCoE

Energy oriented Center of Excellence for computing applications

Grant Agreement Number: EINFRA-676629

D6.12 - M24

D6.12 Delivery of 4 short movies on WP1 to 5

Project and Deliverable Information Sheet

EoCoE	Project Ref:	EINFRA-676629
	Project Title:	Energy oriented Centre of Excellence
	Project Web Site:	http://www.eocoe.eu
	Deliverable ID:	D6.12 M24
	Lead Beneficiary:	BSC
	Contact:	Guillermo Marin
	Contact's e-mail:	guillermo.marin@bsc.es
	Deliverable Nature:	Report
	Dissemination Level:	PU*
	Contractual Date of Delivery:	M24 30/09/2017
	Actual Date of Delivery:	M29 07/02/2018
	EC Project Officer:	Carlos Morais-Pires

* - The dissemination level is indicated as follows: PU – Public, CO – Confidential, only for members of the consortium (including the Commission Services) CL – Classified, as referred to in Commission Decision 2991/844/EC.

Document Control Sheet

Document	Title :	D6.12 Delivery of 4 short movies on WP1 to 5
	ID :	D6.12 M24
	Available at:	http://www.eocoe.eu
	Software tool:	Microsoft Word
Authorship	Written by:	Guillermo Marin
	Contributors:	Guillermo Marin
	Reviewed by:	George Kirkos, Nathalie Girard – PEC members

Change Log

Version	Author	Description
V1.0	Guillermo Marin	Initial Document
V2.0	Nathalie Girard	Revision
V3.0	Guillermo Marin	Corrected Document
V4.0	George Kirkos	Revision
V5.0	Guillermo Marin	Final document

Table of Contents

Executive Summary

The aim of this deliverable is to present the short thematic movies of the work packages that produce simulation data, and to explain the process of creating them.

1. Introduction

This deliverable presents the 5 short thematic videos of visualizations from the data produced by Work Packages 1 to 5, and explains in detail the procedure followed to create the videos. The aim of creating these movies was: a) To become familiar with the research topics and data types produced in the various WPs of the project, in order to develop the overall aesthetics and data conversion pipeline that will be used later in D6.16, "Producing one long movie on EoCoE overall results", and b) To provide dissemination material from the simulations produced in the project, that is appealing and comprehensive to the project target groups. These videos will be disseminated in conferences, workshops, and the website and social media of EoCoE.

The videos are uploaded in EoCoE's official Youtube channel. The links are provided in section 2, along with a short description.

To illustrate the process of creating the movies, Annex 1 contains before-after snapshots of the process, where before are the original visualizations produced by EoCoE researchers, and after are the final, high-end renderings that appear in the videos.

2. Description of the videos

2.1 Video 1

Video title: WIND ENERGY: modelling of wind flow at on-shore wind farms accounting for complex terrain and turbine wakes
Relevant WP: 2
Duration: 0:01:40
Description: The video shows a stationary simulation of wind flow at height 0 to 50 m over an on-shore windfarm, from various viewpoints.
Link: https://youtu.be/q7Lzz86D6As

2.2 Video 2

Video title: Heterojunction Solar Cell
Relevant WP: 3
Duration: 0:01:03
Description: The video shows the electronic and optical properties of an interface between crystalline silicon and hydrogenated amorphous silicon.
Link: https://youtu.be/sucMl-CXg5g

2.3 Video 3

Video title: Perovskite
Relevant WP: 3
Duration: 0:00:46
Description: The visualization shows the dynamical nature of $FAPbI_3$.
Link: https://youtu.be/ZCvi-0-dNi4

2.4 Video 4

Video title: Blue energy and desalination with nanoporous carbon electrodes
Relevant WP: 3
Duration: 0:01:03
Description: The video shows a molecular simulation of realistic electrochemical cells based on aqueous electrolytes and nanoporous carbon electrodes.
Link: https://youtu.be/7u_v1kMMc_g

2.5 Video 5

Video title: Borehole Heat Exchanger
Relevant WP: 4
Duration: 0:00:45
Description: The video shows a simulation of heat flow in the geothermal energy and heat displacement concept of the E.ON ERC main building.
Link: https://youtu.be/zmqPzTT73zM

3. Video working process

3.1 Task leader and contributors

The main task leader for the production of these videos was Guillermo Marin from the Scientific Visualization team of the Computer Applications in Science and Engineering department at BSC. The videos will be disseminated by the EoCoE dissemination team. The simulation data used to produce the visualizations was provided by:
Video 1 - Herbert Owen and Arnau Folch (BSC).
Video 2 - Simone Giusepponi and Massimo Celino (ENEA).
Video 3 – Dibya Gosh and Alison Walker (University of Bath).
Video 4 – Matthieu Salanne (UPMC).
Video 5 – Jan Niederau and Johanna Bruckmann (Aachen University).

3.2 Phase 1: Video development process

The video creation process was as follows:

- The first phase was to exchange information about the simulation data jointly with the WP leaders, researchers and engineers working in EoCoE. This task was done both in person and via teleconference. The aim was for researchers to provide a technical description of their work, and to assess what data they could provide to create data visualizations to be included in the videos.

- The second phase was the development of proprietary tools to convert the datasets to standard formats that could be loaded in commercial 3D software packages.
- The third phase was to produce visualization tests and get feedback from the researchers about their content and quality. Several iterations of this process were made before producing the final renderings.
- The final phase was to edit various shots of each visualization to produce the 5 independent videos, 1 for WP2, 3 for WP3, and 1 for WP4. Each of those videos was enriched with legends and annotations, so they work as stand-alone information pieces. The videos were approved by each WP leader and by the researchers that provided the data.

3.3 Phase 2: Data conversion

The aim of the short thematic movies in this deliverable was to show high-end visualizations of the simulation data from EoCoE research activities. The high-end visualizations were made using the same commercial software used in feature film productions. Thus, to produce such high-end visualizations, the second phase was the development of a suite of scripts to convert the various datasets to standard formats that could be loaded in the commercial software packages.
The data from WP2 and WP4 was mainly volumetric data, which was converted to voxels. Then, the voxel fields were used to generate particles that contained the variables from the original datasets. The data from WP3 was exclusively molecular dynamics, and was converted to particle systems which contained bonds and molecules. The tools developed in this phase are valuable because they can be reused for the production of the longer movie of D6.16.

3.4 Phase 3: Visualization tests

The third phase of development was producing visualization tests. The first approach was to load the datasets in the same scientific visualization tools used by the researchers to identify the most interesting and informative features. A key part of this process was the communication with the researchers that produced the data. Then, the converted datasets were loaded into the commercial 3D software Maya to produce shading, texturing, lighting, and render tests until the desired aesthetics for each video was achieved.

3.5 Phase 4: Video editing and validation

Once the aesthetics of each video was defined, the complete sequences were rendered in Arnold Render, passed through a colour correction process, and were finally edited to produce the final videos. In the editing process, each video was enriched with relevant information, such as titles, annotations, legends, and colour scales. As a result, the final videos work as stand-alone pieces that can be viewed without further guidance. The final videos were reviewed and approved internally, and premiered during the SuperComputing 2017 SC conference in Denver, USA.

4. Final notes

The videos were showed to all EoCoE members present in the Face to Face meeting in Toulouse, France, in October, 29th, 2017. It was agreed there to extend the videos with an audio narration, before proceeding to full dissemination and promotion.

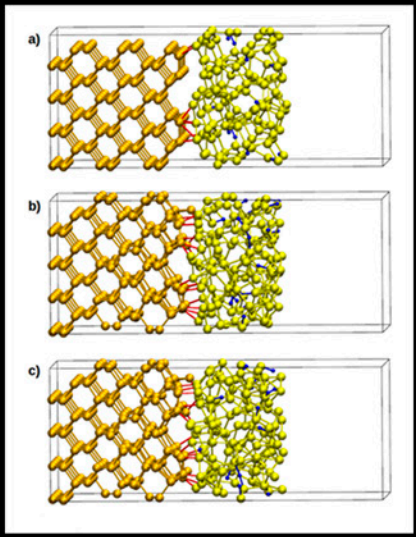
Annex 1

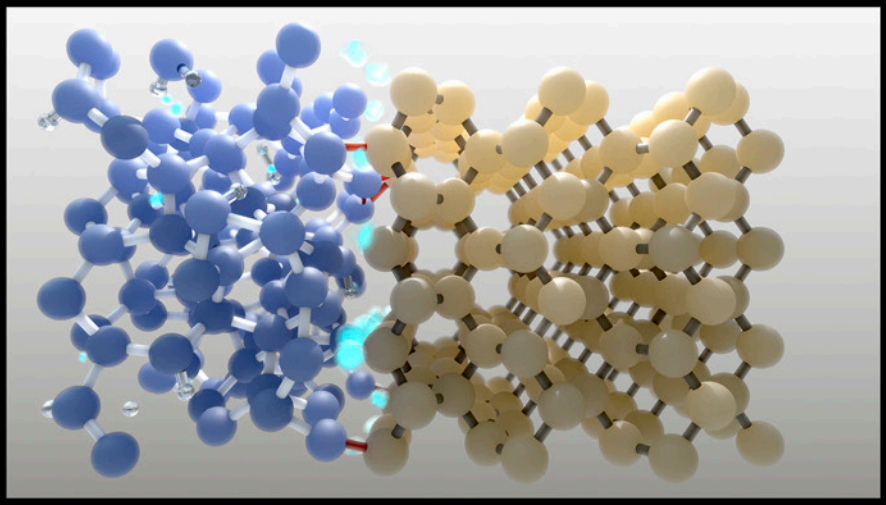
WP 3

Original

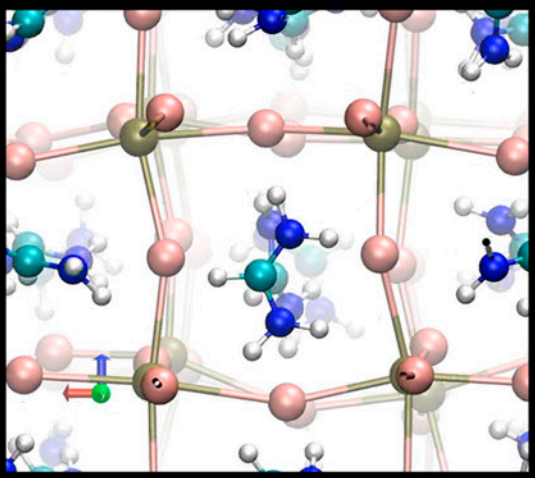
Final

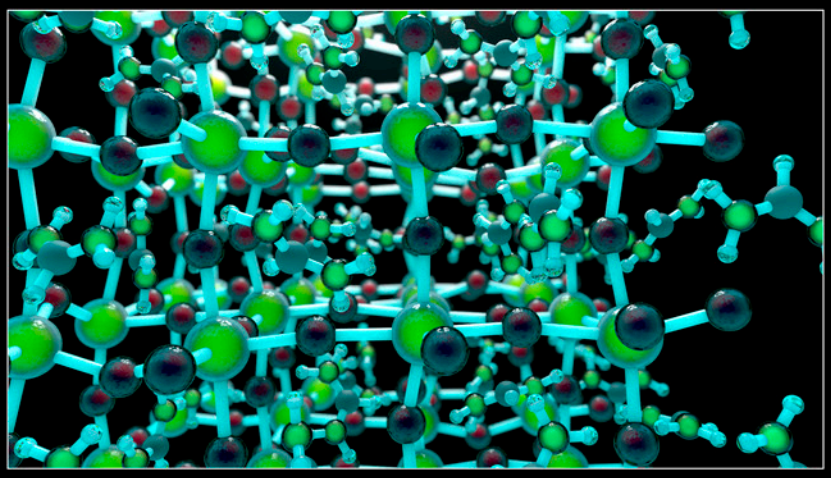
Interface



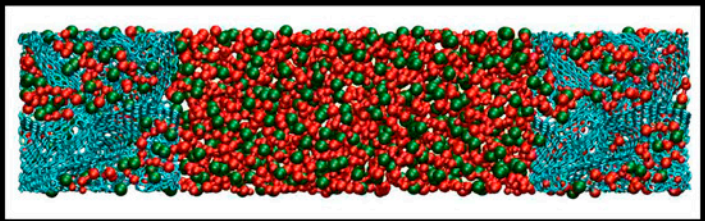


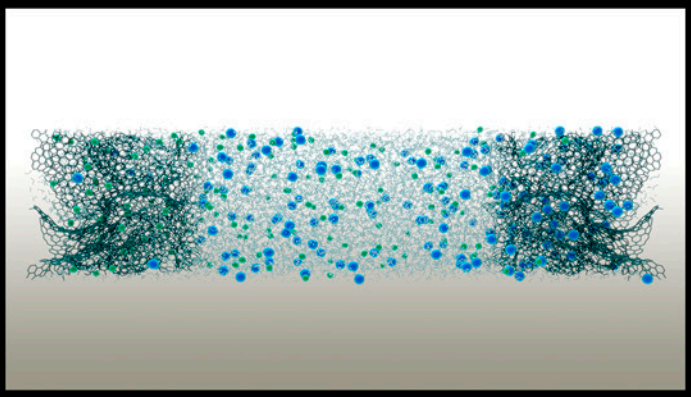
Perovskite





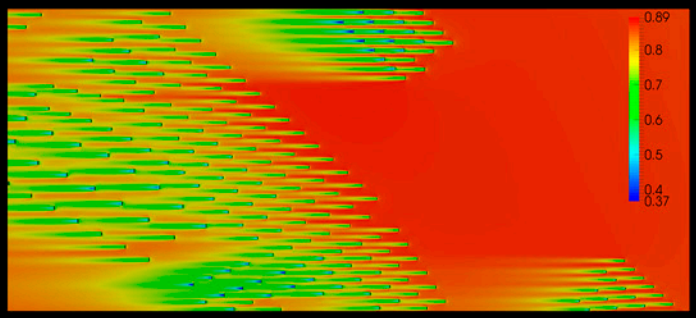
Supercapacitor



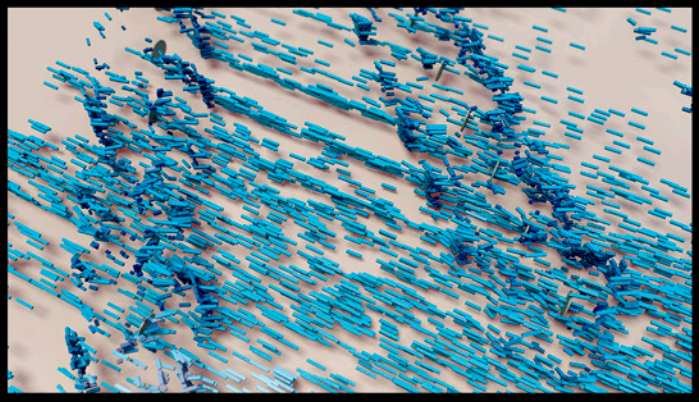


WP 2 - Wind simulations

Original

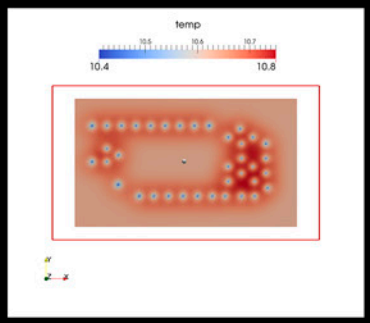


Final

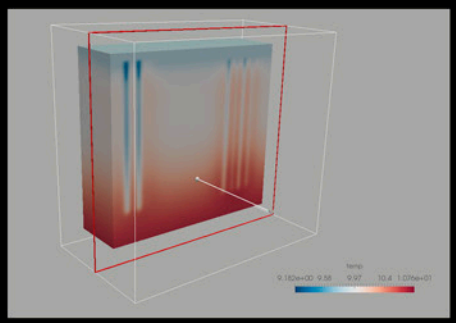


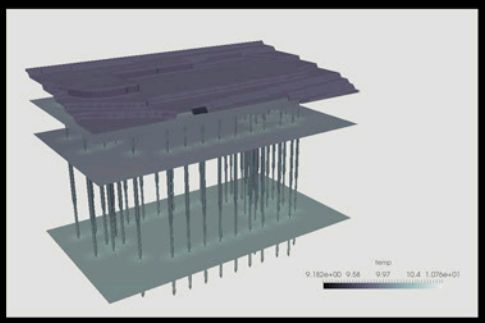
WP 4 - Borehole heat exchange

Original



Tests





Final